Barton Malow

Design/Construction Services

Troy School District
2004 Bond Program
Troy, MI

International Academy East

Bid Package # 9444

PROJECT MANUAL

Issue Date: July 5, 2007
Pre-Bid Conference: July 10, 2007 @ 3:00PM
Bid Due Date: July 31, 2007 @ 3:00PM

SECTION 00010
PROJECT MANUAL
TABLE OF CONTENTS

INTRODUCTORY INFORMATION		ISSUE DATE
00001	Project Manual Cover	July 5, 2007
00010	Table of Contents	July 5, 2007
00015	List of Drawings	July 5, 2007
00030	Information and Identities	July 5, 2007
BIDDING REQUIREMENTS*		
00100	Advertisement to Bid	July 5, 2007
00200	Instructions to Bidders	July 5, 2007
00210	Description of Work/Special Provisions	July 5, 2007
00220	Work Scopes	July 5, 2007
00230	Schedule and Phasing	July 5, 2007
00400	Bid Proposal Form	July 5, 2007
00410	Familial Relationship Disclosure Form	July 5, 2007
CONTRACTING REQUIREMENTS		**ISSUE DATE**
00500	Agreement Form (Contract)	July 5, 2007
00610	Bonds	July 5, 2007
00620	Insurance	July 5, 2007
00700	General Conditions of the Contract	July 5, 2007
00800	Supplementary General Conditions	July 5, 2007
00810	On-Site Project Safety and Loss Control Program	July 5, 2007
00840	Hazardous Materials	July 5, 2007
00870	Labor Relations	July 5, 2007
00880	Regulatory Requirements	July 5, 2007
00890	Permits	July 5, 2007
DIVISION 1 GENERAL REQUIREMENTS		**ISSUE DATE**
01140	Use of Premises	July 5, 2007
01210	Allowances	July 5, 2007
01250	Changes in the Work	July 5, 2007
01290	Payment Procedures	July 5, 2007
01310	Meetings	July 5, 2007
01320	Communications	July 5, 2007
01330	Submittals	July 5, 2007
01360	Coordination (General)	July 5, 2007
01400	Quality Requirements	July 5, 2007
01450	Testing and Inspection Services	July 5, 2007
01510	Fire Precautions and Protection	July 5, 2007
01520	Temporary Construction Facilities & Controls	July 5, 2007
01530	Field Engineering and Layout	July 5, 2007
01540	Cutting and Patching	July 5, 2007
01550	Clean-up and Final Cleaning	July 5, 2007

01600	Forms	July 5, 2007
01630	Product Substitutions	July 5, 2007
01700	Contract Close-out	July 5, 2007
01720	Project Record Documents	July 5, 2007
01730	Operations and Maintenance Data	July 5, 2007
01740	Warrantees and Guarantees	July 5, 2007
01750	Systems Demonstration, Operational Instructions and Start-up	July 5, 2007

DIVISIONS 2 THROUGH 16 TECHNICAL SPECIFICATIONS

Prepared by Kingscott Architects, Engineering, Interior Design are issued under a separate Cover

DOCUMENTS ISSUED FOR BID PACKAGE NUMBER # 9444

Kingscott Architects, Engineering, Interior Design Specifications dated **May 11, 2007**

Construction Documents for International Academy East prepared by Kingscott Architects, Engineering, Interior Design Dated **May 11, 2007**

Barton Malow Company Project Manual dated **July 5, 2007**

SECTION 00015
PROJECT MANUAL
LIST OF DRAWINGS
International Academy East

T1	5/11/07	TITLE SHEET
T2	5/11/07	DATA SHEET
SITE		
C1.01	5/11/07	SITE DEMOLITION AND LAYOUT PLAN
C2.01	5/11/07	SITE GRADING AND LANDSCAPE PLAN
ARCHITECTURAL		
A0.0	5/11/07	CODE COMPLIANCE PLAN
A0.1	5/11/07	ROOF PLAN
D1.1	5/11/07	DEMOLITION PLAN – UNIT 100
D1.2	5/11/07	DEMOLITION PLAN – UNIT 200
D1.3	5/11/07	DEMOLITION PLAN – UNIT 300
D1.4	5/11/07	DEMOLITION PLAN – UNIT 400
A1.1	5/11/07	FLOOR PLAN – UNIT 100
A1.2	5/11/07	FLOOR PLAN – UNIT 200
A1.3	5/11/07	FLOOR PLAN – UNIT 300
A1.4	5/11/07	FLOOR PLAN – UNIT 400
A1.11	5/11/07	EQUIPMENT PLAN – UNIT 100
A1.12	5/11/07	EQUIPMENT PLAN – UNIT 200
A1.13	5/11/07	EQUIPMENT PLAN – UNIT 300
A1.14	5/11/07	EQUIPMENT PLAN – UNIT 400
A2.1	5/11/07	REFLECTED CEILING PLAN – UNIT 100
A2.2	5/11/07	REFLECTED CEILING PLAN – UNIT 200
A2.3	5/11/07	REFLECTED CEILING PLAN – UNIT 300
A2.4	5/11/07	REFLECTED CEILING PLAN – UNIT 400
A2.5	5/11/07	PARTITION TYPES
A5.1	5/11/07	BUILDING DETAILS
A6.1	5/11/07	DOOR SCHEDULE
A6.2	5/11/07	DOOR DETAILS
A6.3	5/11/07	DOOR DETAILS
A6.4	5/11/07	DOOR DETAILS
A8.1	5/11/07	COLOR LAYOUT PLAN – UNIT 100
A8.2	5/11/07	COLOR LAYOUT PLAN – UNIT 200
A8.3	5/11/07	COLOR LAYOUT PLAN – UNIT 300
A8.4	5/11/07	COLOR LAYOUT PLAN – UNIT 400

FS1.1	5/11/07	FOOD SERVICE
STRUCTURAL		
S1.1	5/11/07	STRUCTURAL PLAN
S1.2	5/11/07	STRUCTURAL PLAN
S1.3	5/11/07	STRUCTURAL PLAN
S1.4	5/11/07	STRUCTURAL PLAN
S2.1	5/11/07	STRUCTURAL DETAILS
MECHANICAL		
P0.1	5/11/07	PLUMBING FOUNDATION DEMOLITION PLAN – UNIT 100
P0.2	5/11/07	PLUMBING FOUNDATION DEMOLITION PLAN – UNIT 200
P0.3	5/11/07	PLUMBING FOUNDATION DEMOLITION PLAN – UNIT 300
P1.1	5/11/07	PLUMBING FOUNDATION PLAN – UNIT 100
P1.2	5/11/07	PLUMBING FOUNDATION PLAN – UNIT 200
P1.3	5/11/07	PLUMBING FOUNDATION PLAN – UNIT 300
P2.1	5/11/07	PLUMBING DEMOLITION PLAN – UNIT 100
P2.2	5/11/07	PLUMBING DEMOLITION PLAN – UNIT 200
P2.3	5/11/07	PLUMBING DEMOLITION PLAN – UNIT 300
P3.1	5/11/07	PLUMBING PLAN – UNIT 100
P3.2	5/11/07	PLUMBING PLAN – UNIT 200
P3.3	5/11/07	PLUMBING PLAN – UNIT 300
P3.4	5/11/07	PLUMBING PLAN – UNIT 400
M0.1	5/11/07	HVAC DEMOLITION PLAN – UNIT 100
M0.2	5/11/07	HVAC DEMOLITION PLAN – UNIT 200
M0.3	5/11/07	HVAC DEMOLITION PLAN – UNIT 300
M0.4	5/11/07	HVAC DEMOLITION PLAN – UNIT 400
M1.1	5/11/07	HVAC PLAN – UNIT 100
M1.2	5/11/07	HVAC PLAN – UNIT 200
M1.3	5/11/07	HVAC PLAN – UNIT 300
M1.4	5/11/07	HVAC PLAN – UNIT 400
MR1.1	5/11/07	MECHANICAL ROOF PLAN
M2.1	5/11/07	ENLARGED BOILER ROOM PLAN
M3.1	5/11/07	SEQUENCE OF OPERATION
M3.2	5/11/07	SEQUENCE OF OPERATION
M4.1	5/11/07	MECHANICAL DETAILS
M4.2	5/11/07	MECHANICAL DETAILS
ME1.1	5/11/07	MECHANICAL/ELECTRICAL DETAILS
ME1.2	5/11/07	MECHANICAL/ELECTRICAL DETAILS

ELECTRICAL

E0.1	5/11/07	ELECTRICAL SITE PLAN
E1.1	5/11/07	LIGHTING PLAN – UNIT 100
E1.2	5/11/07	LIGHTING PLAN – UNIT 200
E1.3	5/11/07	LIGHTING PLAN – UNIT 300
E1.4	5/11/07	LIGHTING PLAN – UNIT 400
E2.1	5/11/07	POWER PLAN – UNIT 100
E2.2	5/11/07	POWER PLAN – UNIT 200
E2.3	5/11/07	POWER PLAN – UNIT 300
E2.4	5/11/07	POWER PLAN – UNIT 400
E3.1	5/11/07	ELECTRICAL DETAILS
E3.2	5/11/07	ELECTRICAL DETAILS
E3.3	5/11/07	ONE LINE DIAGRAM
E3.4	5/11/07	IDS REFERENCE SHEET

END OF SECTION 00015

SECTION 00030
PROJECT MANUAL
INFORMATION AND IDENTITIES

This Project Manual contains the Bidding and Contract Requirements for Troy School District – International Academy East, Bid Package No. 9444 in Troy, Michigan. Review of this Manual is important in fulfilling the Contract Requirements. Any questions regarding this Manual or any of the Bidding or Contract Requirements should be directed to the Barton Malow Company.

PROJECT:	**Troy School District** **2004 Bond Program** **International Academy East** **Bid Package No. 9444**
OWNER:	**Troy School District** **4400 Livernois Road** **Troy, MI 48098**
Construction Manager:	**BARTON MALOW COMPANY** **1301 Boyd** **Troy, MI 48083** **Leah Bossert, Project Manager** **Phone: 248-823-4631** **Fax: 248-823-4672** **Email: leah.bossert@bartonmalow.com**
ARCHITECT:	**Kingscott Architecture, Engineering, Interior Design** **229 East Michigan, Suite 335** **Kalamazoo, MI 49007-6403**

SECTION 00100
ADVERTISEMENT TO BID

1. Barton Malow Company, requests Bid Proposals on behalf of Troy School District for the **International Academy East** for Bid Package No. 94444 work. Bid Proposals will be received by Troy School District, 1140 Rankin, Troy, MI 48098 delivery or mail, to the attention of Frank Lams by 3:00 p.m. local time on Tuesday, July 31, 2007. (The clock used for receiving bids is located at the Rankin office in Nancy Cryderman's area. The clock is linked to the TSD computer resource center). Proposals must be sealed with Bidder's name on the outside of the envelope and designated as follows:

   Sealed Proposal
   International Academy East
   Bid Package No. 9444
   Bid Category: _____
   Contractor Name, Address, Phone Number

2. Proposals shall be based on the requirements set forth in the Project Manual by Barton Malow Company and Specifications and Construction Documents prepared by Kingscott Architects, Engineering, Interior Design dated May 11, 2007 for:

BID PACKAGE NO. 9444, International Academy East
2004 Bond Program

Bid Category	Titles
1.1	Demolition
2.1	Sitework
3.1	Concrete
4.1	Masonry
5.1	Structural Steel
6.1	Carpentry
7.1	Roofing
8.1	Aluminum Doors, Windows and Glazing
9.1	Painting
9.2	Ceramic Tile
9.3	Carpet, Resilient Tile and Base
11.1	Food Service Equipment
15.1	Mechanical
15.2	Temperature and Lighting Controls
15.3	Mechanical Testing and Balancing
16.1	Electrical

3. Accepted Bidders will be required, as a condition precedent to award of Contract, to furnish in the amount of 100% of the contract price, satisfactory Performance Bond and Payment Bond and Certificates of Insurance as required in the Project Manual.

4. Unless otherwise specifically set forth in Section 00880 of the Project Manual, this Project is subject to state sales and/or use taxes and Bidder is required to include such taxes in its Bid Proposal.

5. Barton Malow Company has been contracted by the Owner in the capacity of **Construction Manager,** for the Project, and as such has the rights and obligations set forth in its contract with the Owner for those services, and shall act as representative of the Owner to the extent required/allowed under its Owner contract.

6. Bid Proposals will be publicly opened immediately following receipt of bids by the Troy School District and Barton Malow Company, evaluated by Barton Malow Company, Owner and the Architect, with awards subsequently made by Troy School District, Barton Malow Company and Kingscott Architects, Engineering, Interior Design.

   The Owner shall not open, consider, or accept a Bid Proposal that is received after the date and time specified for bid submission in this Advertisement for Bids.

7. Bidding Documents will be available for examination and distribution on or after Thursday, July 5, 2007. Examination may be made at the following locations:

   - Barton Malow Company Site Office, 1301 Boyd, Troy, MI 48083
   - Construction Association of Michigan, 43636 Woodward Ave., Bloomfield, MI 48302
   - F. W. Dodge, 21415 Civic Center Drive, Suite 115, Southfield, MI 48076
   - Construction News Services 1793 R. W. Berends Dr. SW Wyoming, MI 49519

8. A **STRONGLY ENCOURAGED PRE-BID CONFERENCE** and site tour will be held for all trades at the existing Baker Middle School (1291 Torpey Troy, MI 48083), on **Tuesday, July 10, 2007, at 3:00 p.m.** All Bidders should plan to attend the pre-bid conference. Pre-bid conference minutes will be distributed to all attendees by Barton Malow Company. But, Barton Malow Company, the Architect and Owner are not responsible for providing information to those who do not attend the pre-bid conference. Information disclosed in the pre-bid conference minutes will be considered part of the Bidding and Contract Documents.

9. A deposit of **$100** per document set is required. Deposit check should be made payable to the Troy School District. Each Bidder shall provide its shipper number for shipping fees if the Bidder desires to have plans sent by ground or air transportation. More than one set is available upon payment of printing and shipping costs. **Deposits will be refunded upon return of the Bidding Documents to the Barton Malow Company by August 21st, 2007**, provided the Bidding Documents are returned complete, in clean and usable condition, and free of marks or other defacements. **DEPOSIT WILL NOT BE REFUNDED FOR DRAWINGS RETURNED AFTER August 21st, 2007.** Successful Bidders shall retain their set of Bidding Documents and their deposits will be refunded upon execution of the Agreement.

10. Bid Proposals shall be on forms furnished by **Barton Malow Company in Section 00400**. Bidders will be required to submit with their Bid Proposals, a notarized Familial Relationship Disclosure Form furnished by **Barton Malow Company in Section 00410**, a Bid Security by a qualified surety authorized to do business in the State of Michigan where the Project is located, an OSHA Form 300 for the most recent completed year, their worker's compensation Experience Modification Rate (EMR) factor, and any other information required in the Instructions to Bidders. Bidders shall not withdraw Bid Proposals for a period of **ninety (90)** Days after date for receipt of Bid Proposals.

11. The successful Bidder(s) will be required to enter into an agreement with Troy School District on the Agreement Form identified in Section 00500 of the Project Manual.

12. The right to accept or reject any or all Bid Proposals, either in whole or in part, to waive any informalities or irregularities therein and to award the contract to other than the low bidder is reserved by Troy School District.

13. All Bid Proposals shall be accompanied by the sworn and notarized statement included in Section 00410 of the Project Manual, in accordance with MCL 380.1267, disclosing any familial relationship that exists between the owner(s) or any employee of the Bidder and any member of the School board or the superintendent of the School District. Bid Proposals that do not include this sworn and notarized disclosure statement will not be considered accepted.

BARTON MALOW COMPANY

Troy School District
Leah Bossert
Project Manager

END OF SECTION 00100

SECTION 00200
INSTRUCTION TO BIDDERS

PART 1 – DEFINITIONS

1.01 Capitalized terms used in this Project Manual shall have the meanings set forth below. If a capitalized term is used herein but not defined in this Section, 00200, Part 1, it shall have the meaning set forth in other applicable Contract Documents (such as the Agreement or Conditions of the Contract).

1.02 "**Addenda**" means the written and graphic instruments issued by the Architect and/or Barton Malow Company prior to the execution of the Agreement that modify or interpret the Bidding Documents by additions, deletions, clarifications, or corrections.

1.03 "**Agreement**" means the document defined as such in Section 00500, including all other documents incorporated by reference in the Agreement.

1.04 "**An Alternate Bid**" (or "**Alternate**") is an amount stated in the Bid Proposal to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

1.05 "**Architect**" means the person or entity listed in Project Manual, section 00030 as such, and may include professional engineers if so designated.

1.06 "**Base Bid**" is the sum stated in the Bid Proposal for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added to or deducted from for sums stated in Alternate Bids.

1.07 A "**Bidder**" is a person or legal entity that submits a Bid Proposal in conformance with the Bidding Documents. After award of the Agreement, the Bidder will be referred to as **Contractor: "All Contractors on this project are considered prime/principal contractors"**.

1.08 "**Bid Categories**" are units of Work performed by a Contractor and its Subcontractors which form part of the total Project. The term "Bid Category" should not be confused with the term "**Technical Section**". Technical Sections of the Specification (Division 2 through Division 17) establish quality and performance criteria, and the Bid Categories designate work scope and assignment.

1.09 A "**Bid Category Description**" is a written description of the scope of Work to be performed by a Bidder for a Bid Category. A description of the Work is provided in the Scope of Work for each Bid Category.

1.10 "**Bidding Documents**" means the Bidding Requirements, the Contract Documents, and the Resource Drawings collectively.

1.11 A "**Bid Package**" means a series of Bid Categories that are released for bidding in the same set of Bidding Documents.

1.12 "**Bidding Requirements**" include the **ADVERTISEMENT TO BID**, Instructions to Bidders, Information Available to Bidders, and Bid forms and supplements.

1.13 "**Bid Proposal**" is a complete and properly signed proposal to do the Work of an individual Bid Category (ies) for the sums stipulated therein, submitted in accordance with the Bidding Documents.

1.14 The "**Contract Documents**" consist of all Contracting Requirements set forth in Division 0 of this Project Manual, including, but not limited to, the Contract Forms (the Agreement, Performance/Payment Bonds, and Certificates), the Conditions of the Contract (General, Supplementary or Special), the Division 1-General Requirements of this Project Manual, the Specifications set forth in Division 2 through 17 of this

Project Manual, the Drawings, and all other documents incorporated into the Agreement by reference, all Addenda issued prior to and all modifications issued after execution of the Agreement.

1.15 "**Day**" means calendar day, unless otherwise defined in the particular Contract Document.

1.16 "**Hazard Communications Program**" means the **Contractor** own hazard communications program that will govern project safety for such **Contractor** Work and that must be submitted to Barton Malow Company by each successful Bidder before commencing Work. The Hazard Communications Program will be no less stringent than Section 00810 - On Site Safety and Loss Control Program included in the Bidding Documents. Each **Contractor** shall be fully responsible for the safety of its Work and the Work of its Subordinate Parties.

1.17 "**Hazardous Materials**" means asbestos; asbestos containing material; lead (including lead-based paint); PCB; molds; any other chemical, material, or substance subject to regulation as a hazardous material, hazardous substance, toxic substance, or otherwise, under applicable federal, state, or local law; and any other chemical, material, or substance that may have adverse effects on human health or the environment.

1.18 "**Lowest Responsive, Responsible Bidder**" means a Bidder whose Bid Proposal conforms in all material aspects to the terms, conditions, specifications and requirements of the solicitations and who has demonstrated the ability to properly perform the Work.

1.19 "**MBE/WBE/SBE**" means Minority Owned Business Enterprise/Women Owned Business Enterprise/ Small Business Enterprise as these terms are defined in the applicable ordinances and laws governing the Project. Refer to Project Manual, Section 00861 for more specific requirements.

1.20 "**Project Safety Program**" means the **Contractor** own site safety program that will govern project safety for such **Contractor** Work, and that must be submitted to Barton Malow Company by each successful Bidder before commencing Work. The Project Safety Program will be no less stringent than Section 00810 - On Site Safety and Loss Control Program included in the Bidding Documents. Each **Contractor** shall be fully responsible for the safety of its Work and the Work of its Subordinate Parties.

1.21 "**Resource Drawings**" are drawings that do not form a part of the Contract Documents and are included in the Bidding Documents as a courtesy only. The Bidder is not entitled to rely upon the accuracy of the Resource Drawings and they are not warranted to be correct or reliable by the Owner or Barton Malow Company. The Bidder is expected to have conducted its own investigation into the reliability or accuracy of any Resource Drawings, and no adjustment to the Base Bid shall be made if such request arises or results from the Bidder's failure to conduct such investigation.

1.22 "**Subordinate Parties**" means all of **Contractor** employees, workers, laborers, agents, consultants, suppliers or subcontractors, at any tier, who perform, assist with, or otherwise are involved in any of the Work.

1.23 A "**Unit Price**" is an amount stated in the Bid Proposal as a price per unit of measurement for materials or services as described in the Bidding Documents or in the proposed Contract Documents.

PART 2 - BIDDERS REPRESENTATIONS

2.01 QUALIFICATION OF BIDDER

A. The **Owner** reserves the right to request qualification forms or additional information from and Bidder before issuing documents, receiving Bid Proposals or awarding an Agreement. The **Owner** may, at their sole discretion, accept or reject Bidders as qualified. The right to waive any informalities or irregularities in qualification materials is reserved by the **Owner**.

2.02 BIDDER BY MAKING ITS BID REPRESENTS THAT:

A. Bidder has carefully read, reviewed and understands the Bidding Documents and its Bid Proposal is made in accordance therewith.

B. Bidder's Bid Proposal is based upon the materials, systems and equipment required by the Bidding Documents without exception.

C. Bidder certifies that it has examined the Project site, has carefully reviewed the Bidding and Contract Documents, has compared its examination of the Project site with the Bidding and Contract Documents, including the Drawings and Specifications, and is satisfied as to the condition of the Project site, any surface or subsurface obstruction, the actual levels, and all excavating, filling in, removal and demolition, measurements and quantities involved in the Work, and is familiar with weather conditions of the Project area, and has taken account of all of these factors in preparing and presenting its Bid Proposal. Bidder further certifies that it has fully acquainted itself with the character and extent of the Owner's, Barton Malow Company's and other contractor's operations in the area of the Work, and it has taken account of coordination of operations of others in its construction plans set forth in the Bid Proposal. No change orders will be issued to the **Contractor** for or on account of costs or expenses occasioned by its failure to comply with the provisions of this paragraph, or by reason of error or oversight on the part of the **Contractor**, or on account of interferences by the Owner's Barton Malow Company's or other contractor's activities.

D. The Bidder, by submitting its Bid Proposal, represents that it has carefully reviewed the project schedule, along with the related requirements of Section 00230 - Schedule and Phasing, and acknowledges that these are acceptable and have been taken into account in preparing its Bid Proposal.

PART 3 - BIDDING DOCUMENTS

3.01 COPIES

A. Bidders may obtain Bidding Documents pursuant to the requirements in the **Advertisement to Bid**.

B. Bidders shall use complete sets of Bidding Documents in preparing Bid Proposals. Neither the Owner, Barton Malow Company nor the Architect shall be responsible for errors, omissions or misinterpretations resulting from the Bidder's use of partial sets of Bidding Documents.

C. Copies of the Bidding Documents are being made available on the above terms for the purposes of obtaining Bid Proposals for the Work only. Bidders shall not use the Bidding Documents for any other purpose. Neither the Owner, Barton Malow Company nor the Architect warrants the completeness and/or adequacy of the Bidding Documents.

D. The Architect will provide, for a fee, electronic data files, and compatible with AutoCAD 2000, for contractors convenience and use in the preparation of shop drawings. Requests for electronic data and fee quote shall be in written form through the architect. Prior to the release of electronic files, the Architect will require a signed waiver of release and payment of the fee. See section **01330-5.03E** for fee.

E. The Contractors shall be responsible to review Bid Documents before start of construction, and bring any items that could be considered errors or omissions to the attention of the Construction Manager and Architect. Any error or omission items discovered after start of construction shall be the responsibility of the Contractor if determined to be reasonable by the Architect and Construction Manager.

3.02 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

A. Bidder shall promptly notify the Architect through Barton Malow Company of all ambiguities, inconsistencies, or errors that it may discover upon examination of the Bidding Documents or upon examination of the Project site and local conditions. Bidders requesting clarification or interpretation of the Bidding Documents shall make a written request, which shall reach Barton Malow Company by July 19, 2007.

Barton Malow Company
Attn: Leah Bossert, Project Manager
1301 Boyd
Troy, MI 48083
PH: 248-823-4631
FAX: 248-823-4672

B. Any interpretation, correction, or change of the Bidding Documents will be made by Addendum. Interpretations, corrections, or changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon such interpretations, corrections and changes. Addenda will be mailed, faxed or delivered to all who are known to have received Bidding Documents.

C. For the dissemination of information, clarification of the intent of the Bidding Documents, and a site visit/tour, a Pre-bid Conference will be held as stated in the **Advertisement to Bid**.

3.03 SUBSTITUTIONS

A. See Section 01630 Product Substitutions in the Project Manual for substitution submittal requirements. Submit all substitution request forms to Barton Malow Company who will transmit them to the Architect.

3.04 ADDENDA

A. Addenda will be mailed, faxed or delivered to all who are known by Barton Malow Company to have a complete set of Bidding Documents. Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

B. No Addenda will be issued later than **three (3)** days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bid Proposals or one, which includes postponement of the date for receipt of Bid Proposals.

C. Each Bidder shall ascertain prior to submitting its Bid Proposal that it has received all Addenda issued, and it shall acknowledge its receipt in the proper location on the Bid Proposal.

3.05 ALTERNATES

A. Each Bidder must bid on all Alternates listed in the Bid Proposal that are applicable to its Bid Category. Alternates will be fully considered in awarding the Agreement.

B. **Troy School District** shall be allowed a period of **sixty (60)** Days after date of receipt of the Bid Proposals to exercise the right to accept or reject any or all Alternates submitted on the Bid Proposal.

C. Successful Bidders shall perform all Work required for complete execution of accepted Alternates, and the Bid Proposal shall include all overhead and profit for the Work required.

3.06 VOLUNTARY ALTERNATES

A. All Bid Proposals must be based upon the Contract Documents. In addition to a Base Bid Proposal, the submission of voluntary Alternates is acceptable and encouraged. If a voluntary Alternate is submitted for consideration, it shall be expressed on the bid form as an add or deduct amount from the Base Bid. If a voluntary Alternate is submitted, the Bidder shall also submit sufficient information in the form of drawings, specifications, test data, delivery dates, scheduling issue considerations, and all other information necessary and sufficient for analysis of the Alternate. The **Owner** reserve the right to unilaterally accept or reject voluntary Alternates and to determine if the voluntary Alternates will be considered in the awarding of the Agreement.

3.07 UNIT PRICES

A. Each Bidder must bid on all unit prices listed in the Bid Proposal that are applicable to its Bid Category. Unit Prices will be fully considered in awarding the Agreement.

B. Successful Bidders shall perform all Work required for complete execution of accepted Unit Prices, and such Unit Prices shall include all overhead and profit for the Work required.

3.08 SALES TAX

A. Unless specifically stated otherwise in Section 00880 of the Project Manual, this Project is subject to state Sales Tax and/or Use Tax and the Bidder's Bid Proposal shall include all applicable sales and use tax.

3.09 NO DISCRIMINATION

A. All Bidders shall ensure that employees and applicants for employment are not discriminated against because of their race, color, religion, sex, national origin, age, marital status, sexual orientation, or disability and in conformance with local, state and federal laws, regulations and ordinances.

B. In regard to any Agreement entered into pursuant to this Bid Package, minority and women owned business enterprises will be afforded full opportunity to submit Bid Proposals in response to the **Advertisement to Bid** and will not be discriminated against on the grounds of race, color, religion, sex, national origin, age, marital status, sexual orientation, disability or any other status protected by applicable law.

3.10 PHASES OF CONSTRUCTION

A. The Bidder, if awarded the Agreement, agrees to proceed under the method known as phased construction whereby construction commences prior to completion of all working drawings for subsequent Work.

B. The Project has been and may be bid in the following phases:

BID PACKAGES	**ESTIMATED DUE DATE**
International Academy East (BP#9444)	**July 31, 2007**

C. Bidder shall acquaint itself with the nature and content of the other Bid Packages of this Project. Bidder shall be familiar with the current phase(s) of construction and the extent of how this and the other Bid Packages affect its Work.

3.11 OTHER BID CONSIDERATIONS

A. PREVAILING WAGES – The successful Bidder and its Subordinate Parties shall comply with the Prevailing Wage requirements described in Section 00870 Labor Relations in the Project Manual.

PART 4 - BIDDING PROCEDURE

4.01 FORM AND STYLE OF BIDS

A. Bid Proposals shall be submitted in triplicate on the Bid Proposal Form included in Section 00400 with the Bidding Documents.

B. All blanks on the Bid Proposal Form shall be filled in by typewriter or manually in ink.

C. Where so indicated by the makeup of the Bid Proposal Form, sums shall be expressed in both words and figures, and in case of discrepancy between the two, the amount written in words shall govern.

D. All interlinear marks, alterations or erasures shall be initialed by the signer of the Bid Proposal.

E. All requested Alternates and/or Unit Prices shall be bid. A dollar amount of each Alternate and/or Unit Price in both words and numerals, even if the amount is $0.00, shall be included. Terminology such as "No Bid", "Not Applicable", "No Change" or "Does Not Apply" shall not be used. If the Alternate and/or Unit Price do not apply to the Bidder, an amount of $0.00 shall be included.

F. Each copy of the Bid Proposal shall include the legal name of the Bidder and a statement that the Bidder is a sole proprietor, a partnership, a corporation, or some other legal entity. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract of the size and scope of the Agreement. A Bid Proposal by a corporation or LLC shall further indicate the state of incorporation or registration. A Bid Proposal submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

G. The Work of an individual Bid Category described in these documents is the sole responsibility of the successful Bidder for that Bid Category. Bids will only be accepted on the full scope of Work outlined by this Bid Package/Bid Category. The Work of each Bid Category is described in Section 00220 Work Scopes.

H. Each Bid Proposal received shall be in strict conformity with the requirements of the Bidding Documents, including, but not limited to, the Description of the Work/Special Provisions, Work Scopes and Scheduling information.

4.02 BID SECURITY

A. Bid security in the form of a bid bond issued by a qualified surety, certified check or cashier's check in the amount of five percent (5%) of the Base Bid amount will be required at the time of submission of the Bid Proposal. Bid bonds shall be duly executed by the Bidder, as principal and by a surety that is properly licensed and authorized to do business in the state in which the Work is to be performed. All sureties providing bonds for this Project must be listed in the latest version of the Department of Treasury's Circular 570, entitled "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies", with the bond amount less than or equal to the underwriting limitation, and/or have an A.M. best rating of A- or better.

B. Bid bond shall pledge that the Bidder, with the understanding that if its Bid Proposal is accepted, will enter into the Agreement with **Troy School District** for any of the Bid Category (ies) accepted from its Bid Proposal and will, if required, furnish performance and payment bonds covering the faithful performance of the Agreement and the payment of all obligations arising there under. The attorney-in-fact, who signs the surety bond, must submit along with the bond, a certified and effectively dated copy of his/her power of attorney.

C. Bid bond form AIA Document A310 is approved for use on this Project.

D. The bid security obligees shall be **Troy School District** and the amount of the bid security shall become **their** property in the event that the Bidder fails, within **Sixty (60)** days of notice of award or receipt of the Agreement form, to execute the Agreement, and deliver the performance and payment bonds as described in the Project Manual, section 00610. In such case, the bid security shall be forfeited to **Troy School District** as liquidated damages, not as a penalty

E. The Owner will have the right to retain the bid security(ies) of Bidders to whom an award is being considered until either (a) the Agreement has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bid Proposals may be withdrawn, or (c) all Bid Proposals have been rejected.

F. Bid security will be returned to the successful Bidders after the Agreement has been executed, and acceptance of required performance and payment bonds. The bid security of Bidders that are not under consideration for award of the Agreement will be returned to those Bidders.

4.03 SUBMISSION OF BIDS

A. All copies of the Bid Proposal, the bid security and any other documents required to be submitted with the Bid Proposal shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, if applicable, the designated portion of the Work for which the Bid Proposal is submitted. If the Bid Proposal is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face of the envelope.

B. Bid Proposals shall be deposited at the designated location prior to the time and date for receipt of Bid Proposals indicated in the **Advertisement to Bid**, or any extension thereof made by Addendum. Bid Proposals received after the date and time for receipt of bids will be returned unopened.

C. The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bid Proposals.

D. Oral, telephonic, facsimile, e-mailed or telegraphic Bid Proposals or bid securities are invalid and will not receive consideration.

E. Bid Proposals will only be accepted for individual Bid Categories. Bidders are required to bid an entire Bid Category. Bidders may bid more than one Bid Category. Combined bids covering several Bid Categories may not be accepted unless separate bid amounts are listed for each Bid Category making up the combined bid amount. The amount for a combined bid, however, need not be equal in amount to the total of the individual category bids.

4.04 MODIFICATION OR WITHDRAWAL OF BID PROPOSAL

A. A Bid Proposal may not be modified, withdrawn or canceled by the Bidder after the stipulated time period and date designated for the receipt of Bid Proposals, and each Bidder so agrees in submitting its Bid.

B. Prior to the time and date designated for receipt of Bid Proposals, any Bid Proposal submitted may be modified or withdrawn by notice to the party receiving Bid Proposals at the place designated for their receipt. Such notice shall be in writing over the signature of the Bidder.

C. Withdrawn Bid Proposals may be resubmitted up to the time designated for the receipt of bids provided that they are then fully in conformance with these Instructions to Bidders.

D. Bid security under B. or C., above shall be in an amount for the Base Bid as modified or resubmitted.

PART 5 - CONSIDERATION OF BIDS

5.01 OPENING OF BIDS

A. Bid Proposals received on time will be open **publicly**.

B. Bid Proposals shall be held open and irrevocable for **Forty-five (45)** Days after the date for receipt of bids.

5.02 REJECTION OF BIDS

A. **Troy School District** shall have the right to reject any or all Bid Proposals and to reject a Bid Proposal not accompanied by the required bid security or by other information required by the Bidding Documents, or to reject a Bid Proposal which is in any way incomplete or irregular.

B. Bids Proposals are considered irregular and may be rejected for any of the following reasons unless otherwise provided by law:

1. If Bid Proposal Form furnished is not used or is altered.

2. If there are unauthorized additions, qualified or conditional Bid Proposals, or irregularities of any kind which may make the Bid Proposal incomplete, indefinite, or ambiguous as to its meaning.

3. If Bidder adds any provisions reserving right to accept or reject any award, or enter into the Agreement pursuant to an award.

4. If Unit or Lump Sum prices or Alternates contained in the Bid Proposal are obviously unbalanced either in excess of, or below, reasonable cost analysis values.

5. If Bidder fails to complete the Bid Proposal Form where information is requested so the Bid Proposal form cannot be properly evaluated.

6. Bidder is deemed to not be the Lowest Responsive, Responsible Bidder by definition and prevailing statutes.

7. Bidder does not submit with its Bid Proposal a sworn an notarized statement of Familial Disclosure.

5.03 ACCEPTANCE OF BID (AWARD)

A. It is the intent of the **Troy School District** to award the Agreement to the Lowest Responsive and Responsible Bidder provided the Bid Proposal has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. **Troy School District** shall have the right to waive any informality or irregularity in any Bid Proposal received and to accept Bid Proposals which, in its judgment, are in its own best interest which includes not awarding to the low bidder. **Troy School District** reserves the right to reject any Bid Proposal in **its** sole discretion except where otherwise provided by law.

B. **Troy School District** shall have the right to accept Alternates in any order or combination and to determine the low Bidder on the basis of the sum of the Base Bid, Voluntary Alternates, and Alternates accepted.

C. **Troy School District** shall have the right to accept combination bids from a Bidder for more than one Bid Category.

5.04 To the extent that these Instructions to Bidders and applicable public bidding laws, rules, regulations or ordinances conflict with each other, the provisions of the applicable bidding laws, rules, regulations or ordinances shall govern.

PART 6 - POST BID INFORMATION

6.01 POST BID INFORMATION

A. After the Bids are received, tabulated, and evaluated, the apparent low Bidders **when so requested by the owner and/or Barton Malow Company shall** meet with the Barton Malow Company at a post-bid meeting for the purposes of determining completeness of scope and any contract overlaps or omissions. If requested, the Bidder shall submit additional qualification forms or other information as required in the Instructions to Bidders. The Bidder will provide the following information at the post-bid meeting:

1. Designation of the Work to be performed by the Bidder with its own forces including manpower for the **Contractor** and that of its Subordinate Parties.

2. Detailed cost breakdown of the Bidder's Bid Proposal including labor, equipment and material unit prices.

3. A list of names of the Subordinate Parties proposed for the principal portions of the Work.

4. The proprietary names and suppliers of principal items or systems of materials and equipment proposed for the Work.

5. The names and backgrounds of the Bidder's key staff members including superintendent and assistants. Bidder shall be requested to establish the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

6. Commitment to construction schedules, identification of items requiring long lead deliveries and manpower information in accordance with Section 00230 of the Project Manual.

B. Prior to award of the Agreement, Barton Malow Company will notify the Bidder if either the Owner, the Architect, or Barton Malow Company, after due investigation, has reasonable objection to any proposed Subordinate Party. If the Owner, Architect or Barton Malow Company has reasonable objection to any proposed Subordinate Party, the Bidder may, at its option: (1) withdraw its Bid Proposal; or (2) submit an acceptable substitute Subordinate Party with an adjustment in its bid amount to cover the difference in cost occasioned by such substitution. The **Troy School District** may, at its discretion, accept the adjusted bid amount or it may disqualify the Bidder. In the event of either withdrawal or disqualification under this Subparagraph, bid security will not be forfeited, notwithstanding the provision of Part 4, paragraph 4.04., A in the Instructions to Bidders.

C. Upon the Award of the Agreement, the **Contractor** shall submit to Barton Malow Company a complete list of all items, products, and layouts for which shop drawings, brochures, or samples are required; name of each Subordinate Party; and date of planned submission. Refer to Section 01330 Submittals of the Project Manual for additional information.

D. The Bidder will be required to establish to the satisfaction of the Barton Malow Company, Owner and Architect, the reliability and responsibility of the Subordinate Parties proposed to furnish and perform the Work described in the Bidding Documents.

E. Prior to execution of the Agreement, the Bidder shall furnish separate Performance and Payment Bonds, if required, covering the faithful performance of the **Contractor** and the payment of all obligations

arising there under equal to 100 per cent of the total amount payable by the terms of the Agreement. If the Work is to be commenced prior thereto in response to a letter of intent, the Bidder shall, prior to commencement of the Work submit evidence satisfactory to the Owner and Barton Malow Company that such bonds will be furnished. Refer to Section 00610 of the Project Manual for further information.

F. Before commencement of any Work, a Certificate of Insurance executed by Bidder's insurance agent or carrier showing evidence of required insurance coverages shall be submitted in accordance with the Insurance Requirements set forth in Section 00620 of the Project Manual.

G. The Agreement Form to be used for this project is described in Section 00500 of the Project Manual.

END OF SECTION 00200

SECTION 00210
DESCRIPTION OF THE WORK/SPECIAL PROVISIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

B. All Bidders are responsible to review all other Bid Category Work descriptions and immediately advise the Barton Malow Company of any adverse factors, conflicts or ambiguities that might affect the execution of Work of this Bid Package. Each Bidder is responsible to review all Bid Category descriptions and Contract Documents and coordinate the Work accordingly. Each Bidder shall incorporate into its Bid Proposal the cost of coordination of the Work with the requirements of all related Contract Documents, as shown, specified, or required.

C. Each Bidder shall thoroughly examine all of the Bidding Documents for the Work of all trades so as to familiarize itself both with the Work required under its Bid Category (ies) and with Work required under all other Bid Categories.

D. The Bidding Documents shall be construed so as to require the Bidder to perform all Work reasonably inferable therefrom as being necessary to produce the intended results. Bidders are required to visit and examine the Project site and may arrange the visit through Barton Malow Company.

1.02 PROJECT DESCRIPTION

A. The Project is Troy School District, International Academy East, bid pack #9444. The renovations in the school (approximately 91,380 sq. ft) consist of science room upgrades, mechanical and electrical upgrades (including a new stage conveying system), new architectural elements (including new windows, doors, flooring, ceilings, toilet partitions, cabinets, countertops, etc.), new food service equipment, as well as site work (approximately 1 Acre) and landscaping.

B. The renovations to the International Academy East are scheduled to begin Fall of 2007 and turn over to Troy School District in the Spring of 2008. See project manual section 00230 – Schedule and Phasing for further clarification.

C. A Pre-Bid Conference for this project will be held on Tuesday, July 10th, 2007 at 3:00PM at the existing Baker Middle School (located at 1291 Torpey , Troy, MI 48083).

1.03 SUMMARY OF THE BID CATEGORIES/WORK SCOPES

A. The following is a listing of Bid Categories for **Bid Package No.9444, International Academy East** for **Troy School District.** All work relative to the Bid Package is identified on plans and specifications as prepared by the Architect. Each Bid Category description identifies the Scope of Work to be performed by the Bidder as designated by Barton Malow Company.

BID CATEGORY CODE	TITLE
1.1	Demolition
2.1	Site Construction
3.1	Concrete
4.1	Masonry
5.1	Structural Steel
6.1	Carpentry
7.1	Roofing
8.1	Aluminum Doors, Windows and Glazing
9.1	Painting
9.2	Terrazzo and Ceramic Tile
9.3	Carpet, Resilient Tile and Base
11.1	Food Service Equipment
15.1	Mechanical
15.2	Temperature and Lighting Controls
16.1	Electrical

B. Specific Bid Category/Work Scope descriptions are found in Section 00220.

1.04 SPECIAL PROVISIONS

A. The following special provisions form a part of each Bid Category Work Scope and apply to each Contractor's Scope of Work found in Section 00220.

B. The Bid Category/Work Scopes should in no way be construed as being all inclusive. The Work Scope is issued as a guide to aid in the assignment of Work. If conflict regarding assignment of Work exists between the drawing notes and these descriptions, the Description of the Work and Bid Category/Work Scopes will take precedence. Notwithstanding the foregoing, the **Contractor** shall carefully review and compare the Drawings and Specifications with the Work Scopes, and if a conflict exists, the **Contractor** shall immediately notify Barton Malow Company in writing. The Bid Category numbers and the specification section numbers are not, in all cases, identical.

C. Each Bidder is to carefully examine the schedule enclosed in the Bidding Documents. Each Bidder shall be prepared to review at the post-bid meetings a schedule for the engineering, fabrication, delivery and installation of its Work. This information will be considered in the award recommendation.

D. All **Contractors** are to coordinate all Work with the work of other trades for proper function and sequence (see Section 01360). **Contractor** must furnish approved copies of shop drawings, mock-ups, and technical data to other contractors designated by the Barton Malow Company for the purposes of coordination of this Work. **Contractor** must provide to all other trades all information (drawings, diagrams, templates, embedments) and other related Work necessary for the proper coordination of the Work of all trades. Each phase of the Work shall be coordinated, and the coordination plan approved by Barton Malow Company prior to proceeding. **Contractor** shall keep informed as to Work of all trades engaged in the Project, and shall execute Work in such a manner as not to delay or interfere with the progress of other trades involved. **Contractor** is required to schedule its Work so that no other party is delayed in execution of its work. **Contractor** is required to employ competent supervision on the Project throughout the entire period of construction to ensure proper coordination.

E. **Contractor** will furnish before any Work is started, evidence of ISO Certification or documented procedures for process control, including drawings, submittals, inspection/surveillance and training. In lieu of defined procedures, **Contractor** will follow Barton Malow Company's documented procedures for process control.

F. When it is necessary to modify or tie into existing utility services, **Contractor** shall notify Barton Malow Company in writing a minimum of 48 hours prior to the planned disruption. All disruptions shall be

scheduled with Barton Malow Company and shall be kept to a minimum time. Tie-ins and shutdowns of existing utilities may have to be performed during off hours. **Contractors** are to include any required premium time in the Base Bid.

G. If Owner will occupy the premises or a portion of the premises during the construction, **Contractor** shall cooperate with Barton Malow Company and Owner in all construction operations to minimize conflict, and to facilitate Owner occupancy.

H. Information pertaining to the existing building has been obtained through photographs and investigations and is indicated on the Resource Drawings. This information is not warranted to be complete or accurate. **Contractor** shall verify all dimensions in the field prior to ordering materials or construction and any costs or expenses arising out of its failure to do so shall be borne solely by **Contractor**.

I. The **Contractor** shall examine the existing site conditions and carefully compare them to the Drawings. All measurements must be verified from actual observation at the Project site. The **Contractor** is responsible for all Work fitting in place in approved, satisfactory and workmanlike manner in every particular. If the **Contractor** encounters unexpected existing site or building conditions, it shall cease operations immediately to minimize damage and shall immediately notify Barton Malow Company in writing. **Contractor** shall bear all costs, expenses or damages arising or resulting from its failure to comply with this paragraph.

J. Hoisting of material or equipment above occupied areas will NOT be permitted unless the existing structure has been properly verified by a licensed professional Engineer to be able to bear the load of the material or equipment being hoisted if accidentally released. It is the responsibility of the **Contractor** performing such hoisting to properly and adequately reinforce existing structures.

K. Space for electrical and mechanical lines is limited for the Project. Therefore, it is imperative that **Contractor** coordinate its Work with the Work of all other trades to ensure containment of electrical and mechanical lines in space provided. Priority of space will be decided in discretion of Barton Malow Company, with no additional compensation, where unresolved conflict exists. If Work is not properly coordinated, **Contractor** shall remove and relocate Work without additional compensation.

1.05 REQUIREMENTS

A. All start-up administrative documents shall be submitted within (10) working days of award. Also, submit material and shop drawing register and delivery schedules for pre-approval.

B. Coordinate purchase, color selection, approvals, delivery and installation of new work to maintain project schedule. Include all pre-purchase and storage costs associated with securing materials. Include cost of at lease one (1) months storage in advance of installation.

C. Coordination with other trades, including mandatory participation in job meetings.

D. All contractors are responsible to have on-site supervision by associated contractor for all sub-contractors for any work occurring within the associated work scope.

E. Verify all dimensions and conditions of openings for compliance with the design intent prior to submittal of related shop drawings for fabrication of materials. For long lead items, in lieu of completed openings of as-built measurements, secure and sign-off on "Hold-Dimensions" through Barton Malow with the appropriate trade contractor(s).

F. It is the responsibility of this Bid Category to review ALL drawing notes including civil, code plans, architectural, structural, food service, mechanical and electrical drawings as well as the specifications for areas requiring work described by this Bid Category and include same in bid.

G. This contractor shall be responsible for receiving, off loading, hoisting into/onto building including the safe and secure storage of materials related to this work.

H. Furnish and install temporary partitions for dust control measures as required for work of this category. Use wet cutting methods and dust collection, engineered controls in order to eliminate silica exposure. Comply with all MIOSHA requirements. Use only electric and pneumatic equipment. Contractor shall not exceed permissible levels of exhaust from power equipment as established by MIOSHA requirements. (Gas operated equipment shall be prohibited within the building after enclosure).

I. Provide daily clean up, according to Barton Malow Company standards, including daily removal of all materials and identifiable debris related to this category. If daily clean up is not performed, the Construction Manager will provide labor to complete the clean up and the appropriate contractor will be back-charged.

J. Contractors shall be responsible for safe disposal of any Hazardous Materials as a result of their own work.

K. Provide joint sealers where shown and as required by work of this category. Contractor is responsible for all joint prep, backers, primers, caulking and sealants where installed material is adjoining a dissimilar material.

L. Provide all cold weather protection as described in section 01520 Temporary Construction Facilities and Controls section of the Project Manual.

M. All penetrations through walls, floors, and ceilings shall be fire and smoke stopped using materials and rated assemblies as required to comply with the State Fire Marshall Requirements as identified on the code plan for building separations.

N. Protection of new construction shall be part of this bid. Cover and protect adjacent items when installing work of this category in order to prevent any damage. If any adjacent surfaces are damaged it will be the sole responsibility of the contractor at fault to completely repair and replace all damaged construction to the satisfaction of the Owner, Construction Manager, and Architect.

O. Remove packaging labels and final clean all surfaces of items installed by this category. Verify acceptance and secure sign-off with Construction Manager prior to leaving the site.

P. Final cleaning must be included as part of this base bid.

Q. This contractor shall furnish, upon completion of work, as-built reproducible drawings showing the installation of the work as completed and three sets of operating and maintenance manuals as described in the specifications.

R. Deliver maintenance stock to Owner's Maintenance Facility, as required. Check with Barton Malow Company prior to delivery. Provide a signed transmittal of these items by Owner for a close out file.

S. Any and all time tickets are to be signed by Barton Malow and submitted on a daily basis. No time tickets will be accepted unendorsed. Allowance, when billed, shall be exclusive of mark-ups and fees. Any money not used at the end of the project will be deduced from the contract.

END OF SECTION 00210

ROOFING NOTES: TAKEN FROM SHEET A0.1

(1) EXISTING ROOFING

5.1, 7.1, 15.1 (2) PATCH EXIST. ROOF AS REQ. @ DEMO'D RTU. PROVIDE NEW DECK PATCHING, CURBS, FLASHING AND OTHER REQUIRED ROOFING MATERIALS AS REQ. FOR NEW EQUIPMENT AND EQUIPMENT UTILITY CONNECTIONS. COORDINATE W/ MECH. DWG'S AND MECH. CONTRACTOR

5.1, 7.1 (3) NEW MECHANICAL EQUIPMENT LOCATION. PROVIDE NEW HOLE IN ROOFING AND DECKING. COORDINATE WITH MECHANICAL FOR LOCATION AND SIZE. PROVIDE FLASHING AS REQ. FOR NEW PENETRATION FOR EQUIP. AND ALL UTILITY CONNECTIONS.

7.1 (4) PATCH ROOF OPENINGS FOR UNIT AND UTILTIY CONNECTIONS W/ NEW DECK, AND ROOFING MATERIALS TO MATCH EXISTING.

7.1 (5) PROVIDE NEW FLASHING AS REQ. TO REUSE EXISTING MECHANICAL PENETRATION.

15.1 (6) PROVIDE NEW ROOF TOP PIPE AND OR DUCK SUPPORTS TO ROOF SURFACE, COORDINATE W/ MECHANICAL CONTRACTOR.

(7) EXISTING ROOF TOP EQUIPMENT, NO NEW WORK

1.1 (8) REMOVE EXISTING ROOF TOP MECHANICAL EQUIPMENT AND ASSOCIATED ITEMS.

5.1, 7.1, 15.1 (9) NEW MECH. UNIT. COORDINATE W/ MECH. CONTRACTOR. PROVIDE EQUIPMENT RAILS PERPENDICULAR TO EXIST. ROOF JOIST AND MIN. 12" LONGER THAN JOIST SPACING. SET UNIT AND RAILS CENTERED BETWEEN TWO JOISTS. FLASH RAILS TO EXIST. ROOFING AS REQ.

5.1, 7.1, 15.1 (10) NEW MECH. UNIT. COORDINATE W/ MECH. CONTRACTOR. PROVIDE EQUIPMENT RAILS PERPENDICULAR TO EXIST. ROOF JOIST AND SET UNIT AND RAILS CENTERED OVER EXIST. ROOF BEAM. FLASH RAILS TO EXIST. ROOFING AS REQ.

1.1, 5.1, 7.1, 15.1 (11) REMOVE EXISTING MECHANICAL ITEM. ENLARGE EXIT. ROOF OPENING AS REQ. FOR NEW MECHANICAL WORK. PROVIDE NEW CURB, FLASHING, AND STRUCTURAL SUPPORT OF DECK.

1.1, 5.1, 7.1, 15.1 (12) REMOVE EXISTING MECHANICAL ITEM. ENLARGE EXIT. ROOF OPENING AS REQ. FOR NEW MECHANICAL WORK. PROVIDE NEW CURB, FLASHING, AND STRUCTURAL SUPPORT OF DECK.

GENERAL ARCHITECTURAL DEMO NOTES: TAKEN FROM DEMO PLANS

ALL 1. THE DEMOLITION PLANS GENERALLY INDICATE AREAS OF EXTENSIVE REMOVALS AND DO NOT INDICATE ALL OF THE WORK. THE CONTRACTOR SHALL PERFORM ALL THE DEMOLITION WHICH IS NECESSARY FOR THE PROPER EXECUTION OF THE PROJECT, WHETHER OR NOT SAID DEMOLITION IS SPECIFICALLY INDICATED WITHIN THE DOCUMENTS.

ALL 2. CONTRACTOR IS RESPONSIBLE TO INFILL, PATCH AND/OR REPAIR EXISTING WALLS, FLOORS AND CEILINGS TO MATCH EXISTING WHERE DEMOLITION OCCURS OTHER THAN AS DESCRIBED IN THESE DOCUMENTS.

4.1 3. IT IS THE INTENTION OF THESE DOCUMENTS THAT THE DEMOLITION OF PORTIONS OF MASONRY WALLS (BOTH INTERIOR AND EXTERIOR) ARE GENERALLY TO BE DONE ALONG JOINT AND COURSING LINES.

ALL 4. PATCH AND REPAIR REMAINING ADJACENT SURFACES AT AREAS OF REMOVAL AND/OR ALTERATION TO MATCH EXISTING. PROVIDE A SOUND AND PROPER SUBSTRATE FOR NEW FINISH. COORDINATE WITH ROOM FINISH SCHEDULE. WHERE A NEW FINISH IS NOT INDICATED, MATCH EXISTING ADJACENT FINISHES.

1.1, 6.1, 8.1 5. COORDINATE DEMOLITION WORK FOR DOOR AND FRAMES W/ DOOR SCHEDULE

ALL 6. CLEAN AND PREPARE ALL EXISTING SURFACES WHICH ARE TO BE PAINTED/ PATCHED. PREPARATION TO INCLUDE MINOR PATCHING.

6.1, 8.1 7. VERIFY WITH OWNER AS TO WHAT DEMO'D HARDWARE IS TO BE RETURNED TO OWNER. PROPERLY DISPOSE OF ALL REMAINING HARDWARE.

ALL 8. COORDINATE WITH MECHANICAL AND ELECTRICAL DRAWINGS FOR FURTHER DEMOLITION NOTES.

ALL 9. CONTACT IDS EMIDIATELE IF EXISTING TECHNOLOGY WIRING CONFLICTS W/ DEMO WORK.

2.1 10. SEE SITE PLAN FOR DEMOLITION OF SIDEWALKS, STOOPS AND OTHER SITE RELATED MATERIAL

1.1, 3.1, 9.2, 9.3 11. SAW CUT EXISTING CONCRETE SLAB FOR NEW MECHANICAL &/OR ELECTRICAL INSTALLATION. COORDINATE WITH MECHANICAL AND ELECTRICAL DRAWINGS AND TRADES. PATCH FLOOR SLAB TO MATCH EXISTING CONC. SLAB. PREPARE FOR NEW FLOOR FINISH. COORDINATE WITH COLOR LAYOUT PLANS FOR NEW FLOOR FINISH.

ALL 12. SEE WALL SECTIONS AND DETAILS FOR ADDITIONAL DEMOLITION INFORMATION

1.1, 6.1 13. REMOVE AND REINSTALL GRID AND TILE FOR MISCELLANEOUS ELECTRICAL AND MECHANICAL WORK.

ALL 14. SEE ROOF PLAN FOR ROOFING, MECHANICAL, AND OTHER ROOF LEVEL DEMOLITION WORK.

ARCHITECTURAL DEMOLITION NOTES : TAKEN FROM DEMO PLANS

4.1 ① REMOVE EXISTING MASONRY WALL CONSTRUCTION AND ANY RELATED BRACING/SUPPORTS. PATCH AND REPAIR REMAINING FLOOR AND/OR WALL SURFACES TO MATCH EXISTING AND/OR TO RECEIVE NEW FINISH. SEE ROOM FINISH SCHEDULE.

4.1 Coord. w/ 6.1, 8.1 ② REMOVE EXISTING MASONRY UNITS AS REQUIRED FOR THE PROPER INSTALLATION OF A NEW DOOR ASSEMBLY, WINDOW ASSEMBLY OR OPENING. COORDINATE WITH FLOOR PLANS AND MANUFACTURER'S REQUIREMENTS.

1.1 ③ REMOVE AND DISPOSE OF EXISTING CEILING TILES. EXISTING GRID TO REMAIN PREPARE FOR NEW CEILING TILES.

1.1 ④ REMOVE AND DISPOSE OF EXIST. CEILING FINISH AND FRAMING.

1.1 ⑤ REMOVE AND DISPOSE OF DOOR, FRAME, AND HARDWARE. REMOVE ALL EXIST. SEALANT MATERIAL FROM WALLS AND CEILINGS AROUND EXIST. FRAMES.

1.1, 6.1, 9.1 ⑥ REMOVE AND DISPOSE OF EXISTING CASEWORK, RACK OR SHELVING AND ASSOCIATED ITEMS. REMOVE ANCHORS WHERE APPLICABLE. PATCH AND PREPARE REMAINING SURFACES FOR EITHER NEW FINISHES OR TO MATCH EXIST. WHERE NEW CASEWORK IS NOT INSTALLED. (SEE COLOR AND EQUIPMENT PLANS).

1.1, 6.1, 9.1 ⑦ REMOVE & DISPOSE OF MARKER BOARD, CHALKBOARD, OR TACK BOARD. PATCH AND PAINT WALL AS REQ.

1.1, 9.3 ⑧ REMOVE AND PROPERLY DISPOSE OF EXISTING VCT FLOORING AND BASE. PATCH AND PREPARE CONCRETE SLAB FOR NEW FLOOR FINISH. COORDINATE WITH COLOR LAYOUT PLANS FOR NEW FLOOR FINISHES.

1.1 ⑨ REMOVE AND DISPOSE OF EXIST. WINDOW FRAMING AND GLASS.

1.1 ⑩ REMOVE MECHANICAL OR PLUMBING ITEM. REFER TO MECHANICAL & PLUMBING PLANS FOR ADDITIONAL INFORMATION.

1.1, 9.2 ⑪ REMOVE AND DISPOSE OF TOILET PARTITIONS, SCREENS, AND ALL ATTACHED COMPONENTS INCLUDING TOILET ACCESSORIES. PATCH ALL SURFACES WHERE EXISTING FASTENER HOLES WILL NOT BE REUSED OR COVERED BY NEW PARTITIONS.

1.1, 9.3 ⑫ REMOVE AND PROPERLY DISPOSE OF EXISTING CARPET FLOORING TO EXISTING CONCRETE SLAB. PATCH AND PREPARE CONCRETE SLAB FOR NEW FLOOR FINISH. COORDINATE WITH COLOR LAYOUT PLANS FOR NEW FLOOR FINISHES.

1.1 ⑬ REMOVE MECHANICAL EQUIPMENT. SEE MECHANICAL PLAN FOR ADDITIONAL INFORMATION.

1.1 ⑭ REMOVE EXIST. FLOOR FINISH AND FLOOR SLAB AS REQUIRED TO INSTALL NEW PLUMBING PIPING.

ARCHITECTURAL DEMOLITION NOTES : CONTINUED.... MS

1.1 (15) REMOVE AND REINSTALL GRID AND TILE CEILING AS REQ. FOR NEW MECH. PIPING OR DUCT WORK.

9.3 (16) VAT FLOORING REMOVAL BY OWNER. PREP FOR NEW FLOORING AND BASE.

1.1 (17) REMOVE EXIST. LOUVER, GRATE, LINTEL AND MASONRY WALL MATERIAL AS REQ. FOR NEW LOUVER OPENING. COORDINATE W/ MECHANICAL PLANS FOR LOUVER SIZES.

1.1 (18) REMOVE STUD WALL.

1.1 (19) REMOVE DISPLAY CASE.

1.1 (20) REMOVE FLOOR FINISH AND FLOOR SLAB.

1.1 (21) REMOVE LOUVER, GRATE, AND UV SLEEVE AS REQUIRED AND PREP FOR NEW MASONRY INFILL.

1.1 (22) REMOVE AND REINSTALL EXIST. CEILING TILE AND GRID AS REQ. FOR NEW DOOR AND WALL CONSTRUCTION.

9.3 (23) TRIM CARPET AS REQ. TO INSTALL NEW DOOR FRAME SIDE LITES. CARPET TO REMAIN IN DOOR OPENING.

1.1 (24) REMOVE EXISTING KILN AND TURN OVER TO OWNER.

1.1 (25) REMOVE FLOOR TILE AND GROUT BED DOWN TO STRUCTURAL SLAB

1.1, 6.1 (26) REMOVE P-LAM FINISHED WOOD SILL AND PREP FOR NEW WOOD SILL

1.1, 6.1 (27) REMOVE ACOUSTICAL WALL PANELS, PANEL CLIPS AND FASTENERS. PATCH ALL FASTENER HOLES.

1.1 (28) REMOVE & REINSTALL DOWN SPOUT AS REQUIRED FOR WINDOW REPLACEMENT.

4.1 (29) REMOVE FACE OF CMU ON CLASSROOM SIDE AS REQ. TO RUN GAS PIPE FROM FLOOR TO CEILING. ALSO CUT IN CORRIDOR FACE AS REQ. FOR NEW GAS SHUTOFF BOX. COORDINATE W/ MECHANICAL. DO NOT CUT WALL UNDER EXISTING BEAMS OR WITHIN 36" OF BEAM BEARING LOCATIONS.

1.1 (30) EXIST. PIPE TUNNEL. REMOVE SLAB AND METAL SLAB FORMING PLATE. DO NOT DAMAGE OR REMOVE TUNNEL STRUCTURE.

1.1 (31) REMOVE SMALL AREA OF FLOOR SLAB AND PATCH AS REQUIRED TO REMOVE PIPE CONNECTION TO DEMO'D FIN TUBE.

GENERAL NOTES TAKEN FROM FLOOR PLANS

ALL TRADES

1. CONTRACTOR TO FIELD VERIFY ALL DIMENSIONS PRIOR TO CONSTRUCTION. THE GENERAL INTENT FOR DIMENSIONS GIVEN ALONG BLOCK WALL IS TO ALIGN WITH BLOCK JOINTS.
2. REFER TO DEMOLITION PLANS, REFLECTED CEILING PLANS, COLOR PLANS, PLUMBING PLANS, MECHANICAL PLANS, AND ELECTRICAL PLANS FOR ADDITIONAL NOTES REGARDING PATCHING AT AREAS OF REMOVAL AND/OR ALTERATION. COORDINATE WITH PLUMBING MECHANICAL, AND ELECTRICAL CONTRACTORS.
3. INFILL/PATCH AT ALL AREAS OF CONCRETE FLOOR CUTTING WITH A MINIMUM OF 4" CONCRETE TO LEVEL OF EXISTING FLOOR, TYPICAL AT ALL FLOOR CUTTING/PATCHING.
4. SEAL ALL PENETRATIONS AND OPENINGS IN BOTH EXISTING AND NEW NON-FIRE WALL CONSTRUCTION WITH ACOUSTICAL SEALANT.
5. PROVIDE MATERIALS TO MATCH ADJACENT EXISTING MATERIALS AT LOCATIONS OF ARCHITECTURAL, STRUCTURAL, MECHANICAL, AND ELECTRICAL WORK WHERE NOT SPECIFIED OTHERWISE.
6. CONTRACTOR TO TOOTH IN MASONRY AT ALL LOCATIONS WHERE NEW MASONRY ABUTS, OR IS INFILLED AT EXISTING MASONRY.
7. ALL PARTITIONS TO RUN TIGHT TO DECK, U.N.O.
8. ALL RECESSES IN FIRE WALLS SHALL HAVE SOLID MASONRY OR MULTIPLE LAYERS OF GYP. BRD. TO MAINTAIN FIRE RATING.
9. REFER TO EQUIPMENT PLANS FOR CASEWORK, VISUAL DISPLAY BOARDS, ETC.
10. (XXXX) INDICATES DOOR. REFER TO DOOR SCHEDULE FOR DOOR DETAILS, SHEET A6.1
11. NEW CONSTRUCTION IS TO MATCH EXISTING CONSTRUCTION EXACTLY THE EXISTING BUILDING SHALL SERVE AS REQUIRED DETAILS FOR CONSTRUCTION IF A DETAIL IS NOT PROVIDED. ALL NEW CONSTRUCTION SHALL ALIGN WITH EXITING MASONRY COURSING AND BRICK BANDING. WINDOWS AND DOORS INCLUDING SIDE LIGHT FRAMING SHALL MATCH EXISTING COLOR, SIZE, FRAMING LAYOUT, GLASS, AND DOOR HARDWARE.
12. MASONRY CONTRACTOR TO INSTALL LOOSE LINTELS FOR MISCELLANEOUS OPENINGS NOT INDICATED ON DRAWINGS BUT REQUIRED FOR MECHANICAL, ELECTRICAL, FOOD SERVICE EQUIPMENT OR OTHER ITEMS THAT NEED TO PASS THROUGH A WALL. STEEL LINTELS SHALL BE SUPPLIED BY THE MISCELLANEOUS STEEL CONTRACTOR.

4.1, 5.1

ARCHITECTURAL NOTES TAKEN FROM FLOOR PLANS

4.1	1	INFILL WITH MASONRY AND ANY ADDITIONAL MATERIALS TO MATCH EXISTING. PROVIDE MASONRY TO MATCH EXISTING SIZE, TEXTURE, FINISH, COLOR, COURSING, ETC. TOOTH/KEY NEW MASONRY INTO EXISTING MASONRY TO MATCH.
4.1, 6.1, 9.2	2	PATCH AND REPAIR WALL SURFACE @ WALL DEMOLITION LOCATION
4.1	3	PATCH/REPAIR AND/OR REPLACE EXISTING MASONRY AS REQUIRED AT AREAS OF ALTERATION AND/OR REMOVAL.
4.1, 6.1	4	ALIGN NEW WALL WITH EXISTING WALL.
6.1, 15.1	5	NEW TOILET PARTITION AND TOILET ACCESSORIES. MATCH EXISTING PARTITION LAYOUT AND REPAIR ALL UNUSED ANCHOR HOLES THAT ARE NOT COVERED BY NEW MATERIALS. SEE SPEC FOR TOILET ACCESSORIES. PROVIDE BARRIER FREE GRAB BARS FOR AMBULATORY ACCESSIBLE STALLS WHERE SHOW.
3.1	6	PATCH/REPAIR EXIST. CONCRETE FLOOR SLAB AS REQ. AT REMOVED WALL OR DEMO'D FLOOR AREA. SEE TYP. SLAB PATCH DETAIL.
6.1	7	NEW P-LAM FINISHED WINDOW SILL, SEE WINDOW DETAILS
4.1, 6.1	8	PATCH JAMBS AT NEW DOOR OPENING INCLUDING GLASSED STRUCTURAL TILE BASE TO MATCH EXISTING.
4.1	9	INFILL OLD LOUVER OPENING IN BRICK AND CMU WALL BELOW
4.1, 15.1	10	PROVIDE NEW LARGER UV LOUVER OPENING W/ NEW MASONRY JAMBS TOOTH/KEYED INTO EXISTING WALL. PROVIDE NEW LOUVER, SEE MECHANICAL PLANS.
6.1	11	P-LAM FINISHED DUCT COVER TO MATCH CABINET FINISH. COORD. W/ MECH. CONTRACTOR FOR SIZE AND LOCATION.
5.1	12	NEW 42" GAURD RAIL SYSTEM WITH HANDRAIL.
15.1	13	REMOVE, CUT DOWN LENGTH, AND REINSTALL EXISTING PIPE COVER. PAINT AS REQ.
4.1	14	PATCH MASONRY AS REQ. AT NEW GAS PIPE SHUT OFF VALVE BOX AND FLOOR TO CEILING PIPING CUT INTO EXIST. CMU WALL.
3.1, 5.1	15	PATCH FLOOR SLAB AT UV CONNECTION POINT. COORDINATE LOCATION W/ MECHANICAL CONTRACTOR. PROVIDE GALV. 14 GA. STEEL PLATE COVER ON PIPE TRENCH AS REQ. TO FORM SLAB.
5.1	16	PROVIDE GALV. 14 GA. STEEL PLATE COVER ON PIPE TRENCH AS REQ. TO FORM NEW FLOOR SLAB.
4.1	17	REMOVE AND PATCH CMU AS REQ. TO SET NEW BEAM AND BRG. PLATES. REMOVE CMU AT CORRIDOR AS REQ. TO SLIDE BEAM THROUGH WALL TO SET BEAM IN EXTERIOR WALL POCKET.
6.1	18	ADD ⅝" TYPE-X GYP. TO EXIST. STUD WALL AND FIRE SEAL ALL PENETRATIONS AND TOP OF WALL.

SECTION 00220
WORK SCOPE

BID CATEGORY – Demolition 1.1

The Work of this Bid Category includes but is not limited to providing all labor, equipment, materials, scaffolding, hoisting and incidentals to complete all in accordance with the Contract Documents and applicable codes. All Work is to be performed as shown on the plans and specified in the following technical Specification sections:

Section	Name
01230	Alternates
01731	Cutting and Patching
01732	Selective Demolition

In addition to the above, this Bid Category requires adherence to but not limited to the Bidding Documents, the Bidding and Contract requirements and Division 1 General Requirements of the Project Manual and coordination with various other technical Specifications interfacing with this Work. The Bidder is advised to review the Work descriptions of the other Bid Categories as set forth in Section 00210 of the Project Manual so as to not misunderstand scope responsibilities.

THE SCOPE OF WORK IS TO INCLUDE, but is not limited to, the following items:

1. Reference sheets behind section 00210 Description of the Work for work scope designations to "General Architectural Demo Notes" #1-14, "Architectural Demo Notes" #1-30, and "Roofing Notes" #1-12.

2. Removal of guard rail and handle system is the responsibility of this contractor.

3. Reference specification section 15050-3.1 Mechanical Demolition for specified demolition procedures of mechanical items.

4. Removal of existing incinerator is the responsibility of this contractor. Coordinate with 16.1 Electrical and 15.1 Mechanical for disconnection. Refer to enlarged boiler room plan and enlarged boiler room demolition notes. Provide permanent caps for all open piping.

5. Refer to Enlarged boiler room demolition notes; the following numbers are the responsibility of this contractor: #1, #3 through #7. 15.1 Mechanical will perform permanent/temporary capping for all open piping as shown on drawings. Coordinate with 15.1 Mechanical for successful mechanical demolition.

6. Removal of wall between Mechanical Room #422 and Storage #423 is the responsibility of this contractor.

7. Saw cutting of existing floor slabs and removal of concrete is the responsibility of this contractor.

8. Contractor to clean areas of demolition daily, to maintain dust & debris.

9. Dumpsters will NOT be performed by the Owner or this category. Include use and disposal of dumpsters in this bid.

10. Provide alternate pricing for alternate A-1 as listed on Bid Proposal Form.

EXCLUDED FROM THIS CONTRACTOR'S WORK is:

1. Removal and reinstallation of fin tube as required for masonry work around new window openings. Reference sheet A1.4.

2. Roofing demolition, to be done by 7.1 Roofing.

3. Masonry demolition, to be done by 4.1 Masonry.

4. Electrical demolition, to be done by 16.1 Electrical.

SPECIAL CONSIDERATIONS:

1. This Bidder is required to submit unit prices identified in the Bidding Documents which pertain to their work. These prices must be separate from their base bid on the Bid Proposal Form as described in Section 0200 Instructions to Bidders.

2. All work under this scope shall comply with proper trade jurisdictions, even if it is necessary to assemble composite crews or subcontract to appropriate trades.

3. The special provisions outlined in **Section 00210 Description of the Work** form a part of this bid category work description and apply to this Bidder's scope of work.

4. Take special precautions when working near occupied spaces with regards to fumes, noise and pollution levels. Some work may be necessary to be performed after the school day is over at this contractor expense.

5. Any in-place temporary protection that requires any disassembly to perform work, etc. must be replaced by contractor installing new work. Temporary protection must be restored to condition intended.

6. Section **00410, Familial Disclosure Statement, must** be filled out and included with your Bid for your Bid to be accepted.

END OF SECTION 00220 – DEMOLITION 1.1

SECTION 00220
WORK SCOPE

BID CATEGORY – Sitework 2.1

The Work of this Bid Category includes but is not limited to providing all labor, equipment, materials, scaffolding, hoisting and incidentals to complete all in accordance with the Contract Documents and applicable codes. All Work is to be performed as shown on the plans and specified in the following technical Specification sections:

Section	Name
01731	Cutting and Patching
01732	Selective Demolition
02230	Site Clearing
02300	Earthwork
02751	Cement Concrete Pavement
02764	Pavement Joint Sealants
02920	Lawns and Grasses
02930	Exterior Plants
10350	Flagpoles

In addition to the above, this Bid Category requires adherence to but not limited to the Bidding Documents, the Bidding and Contract requirements and Division 1 General Requirements of the Project Manual and coordination with various other technical Specifications interfacing with this Work. The Bidder is advised to review the Work descriptions of the other Bid Categories as set forth in Section 00210 of the Project Manual so as to not misunderstand scope responsibilities.

THE SCOPE OF WORK IS TO INCLUDE, but is not limited to, the following items:

1. Reference sheets behind section 00210 Description of the Work for work scope designations to "General Architectural Demo Notes" #1-14, "Architectural Demo Notes" #1-30, and "Roofing Notes" #1-12.

2. All site demolition including concrete removal (with sub base), removal of parking signage, removal of existing electrical sign with foundation, removal of trees and shrubs, and removal of existing flagpole is this contractors responsibility.

3. All temporary tree protection is the responsibility of this contractor.

4. Provide and install ADA Tactile Detectable warning strips as shown (refer to sheet C1.01).

5. Provide and install flagpoles, including footing, as shown on drawings.

6. Maintain street sweeping along Torpey Road and throughout the entire parking lot of the new International Academy East building (South and West parking lots). Street sweeping shall be done a minimum of one day a week. More street sweeping may be necessary throughout the duration of construction and should be included in base bid.

7. This contractor is responsible to maintain and keep all site utilities/systems in working order that are within the work limits. Site utilities should be identified and marked by this contractor to

proactively prevent interruptions in service. Employ the service of an independent contractor (such as Power Plus – 248-344-0200) to identify and mark underground services. Provide as-built drawings to BMC for distribution to other trades. It is this contractor's responsibility to review survey drawings and Barton Malow record drawings prior to excavation. It is also this contractor's responsibility to walk site with the Barton Malow superintendent before start of work.

8. Perform all layouts as required to complete the work of this contract.

9. This contractor is responsible to have on-site supervision by this contractor for all sub-contractors for any work occurring within this work scope.

10. Only wet cutting will be permitted on silica containing materials.

11. Perform all rough and finish grading. Place topsoil and seed where shown on drawings. Reference Specification Section 02920-3.5-I for watering requirements of lawns and grasses. It is the responsibility of this contractor to follow these requirements.

12. Exterior footings (including concrete walls and piers) required for new masonry piers are the responsibility of this contractor. Coordinate with 4.1 Masonry for footing placement. Reference sheet S1.3.

13. Furnish and install all landscaping as specified and shown. Refer to Specification Section 02930-1.7 and 1.7 for coordination and maintenance requirements. It is the responsibility of this contractor to follow these requirements.

14. Furnish and install all concrete paving, concrete sidewalks, concrete curbs and gutters. Re-grade and dress all existing areas of stone base and sub base prior to placement concrete and curbs.

15. Perform all dewatering necessary for **any** contractor.

16. Furnish and install all necessary site signage per plans and specifications.

17. Provide 48-hour notice to the Construction Manager prior to placement of backfill, concrete and asphalt so the testing laboratory can be scheduled to test these materials. This contractor will be responsible for the cost of emergency testing services if the 48-hour notice is not given. The contractor's on-site foreman shall be present during testing and field reviews conducted by various inspection agencies.

18. Coordinate with the site superintendent regarding a designated wash out area. It will be this contractor's responsibility to remove their spoils at the appropriate time.

19. Furnish, install, maintain and replace if needed, all erosion control measures and protection barriers, tree protection and drainage structure protection that is in place and is required by authorities having jurisdiction(City of Troy and Oakland County), until City of Troy acceptance is granted, erosion control measures are this contractor's responsibility.

20. This contractor shall provide a soil erosion operator and comply with the Environmental Protection Agency's storm water regulations and the Michigan Department of Environmental Quality's National Pollutant Elimination System. This includes, but is not limited to, inspection of the soil erosion and sedimentation control practices once a week and within 24 hours of a

rainfall. A written report including photographs of the inspection and the maintenance of a log of written reports is requested. The inspections must start with the commencement of the construction schedule and continue until the site is completely stabilized and a Notice of Termination is filed with the M.D.E.Q. Copies of the reports must be forwarded monthly to BMC.

21. Dumpsters will NOT be provided by the owner for this category. Include use and disposal of dumpsters in this bid.

22. Final cleaning and/or brooming of surfaces must be performed prior to owner turnover.

23. Include an allowance of $3,000, for maintenance of concrete, asphalt, wood and/or stone paths to be used at Barton Malow's discretion. Any and all time tickets pertaining to this allowance are to be signed by Barton Malow and submitted on a daily basis. No time tickets will be accepted unendorsed. Allowance when billed shall be exclusive of mark-ups and fees. Include these costs in your base bid.

EXCLUDED FROM THIS CONTRACTOR'S WORK is:

1. **N/A**

SPECIAL CONSIDERATIONS:

1. This Bidder is required to submit unit prices identified in the Bidding Documents which pertain to their work. These prices must be separate from their base bid on the Bid Proposal Form as described in Section 002100 Instructions to Bidders.

2. All work under this scope shall comply with proper trade jurisdictions, even if it is necessary to assemble composite crews or subcontract to appropriate trades.

3. The special provisions outlined in **Section 00210 Description of the Work** form a part of this bid category work description and apply to this Bidder's scope of work.

4. Take special precautions when working near occupied spaces with regards to fumes, noise and pollution levels. Some work may be necessary to be performed after the school day is over at this contractor expense.

5. Any in-place temporary protection that requires any disassembly to perform work, etc. must be replaced by contractor installing new work. Temporary protection must be restored to condition intended.

6. Section **00410, Familial Disclosure Statement, must** be filled out and included with your Bid for your Bid to be accepted.

END OF SECTION 00220 – SITEWORK 2.1

SECTION 00220
WORK SCOPE

BID CATEGORY – Concrete 3.1

The work of this bid category includes but is not limited to providing all labor, equipment, materials, scaffolding, hoisting and incidentals to complete all concrete in accordance with the specifications, drawings and applicable codes. All work is to be performed as shown on the plans and specified in the following technical specification sections:

Section	Name
01731	Cutting and Patching
03300	Cast-In-Place Concrete
03542	Hydraulic-Cement-Based Underlayment
07920	Joint Sealants

In addition to the above, this bid category includes but is not limited to the Bidding Documents, the Bidding and Contract requirements and Division 1 General Requirements of the Project Manual and various other Technical Specifications interfacing with this work. The bidder is advised to review the work descriptions of the other categories so as to not misunderstand scope responsibilities.

THE SCOPE OF WORK IS TO INCLUDE, but is not limited to, the following items:

1. Reference sheets behind section 00210 Description of the Work for work scope designations to "General Architectural Demo Notes" #1-14, "Architectural Demo Notes" #1-30, and "Roofing Notes" #1-12.

2. Perform all layout necessary to complete this contractor's work. It is this contractor's responsibility to identify and locate site utilities prior to excavation of footings.

3. This contractor is responsible to maintain and keep all site utilities/systems in working order that are within the work limits. Site utilities should be identified and marked by this contractor to proactively prevent interruptions in service. Employ the service of an independent contractor (such as **Power Plus – 248-344-0200**) to identify and mark underground services. Provide as-built drawings to BMC for distribution to other trades. It is this contractors responsibility to review survey drawings and Barton Malow record drawings prior to excavation. It is also this contractors responsibility to walk site with the Barton Malow superintendent before start of work.

4. Interior concrete is the responsibility of this contractor. This work includes but is not limited to replacement of floor slabs shown, new interior footings, and repairs of existing concrete floors required to accept new finishes. Where new work is shown, include costs for backfill and compaction to meet specifications.

5. All mechanical housekeeping pads, including but not limited to boilers and pumps (reference mechanical details) are the responsibility of this contractor. Coordinate with 15.1 Mechanical for placement. Reference specification section 15050-3.7 Concrete Bases for specified requirements.

6. Patch floors where existing walls are shown to be removed or where underground piping or conduit are being modified. Backfill for such floor patches is also the responsibility of this contractor. Reference architectural demolition notes, partition types, door details, structural drawings, plumbing foundation demolition notes, plumbing demolition notes, electrical details, etc.

7. Furnish and install all reinforcement steel as detailed in this contractors work.

8. Provide 48-hour notice to the Construction Manager prior to the placement of backfill or concrete so the testing laboratory can be scheduled to test these materials. This contractor will be responsible for the cost of emergency testing services if the 48-hour notice is not given. The contractor's on-site foreman shall be present during testing and field reviews conducted by various inspection agencies.

9. Only wet cutting will be permitted on silica containing materials.

10. Dumpsters indicated to be provided by the Owner in the General Requirements and Supplementary Conditions WILL NOT be provided for this category.

11. Provide daily clean-up, according to Barton Malow standards, including daily removal of all materials and debris related to this category. If daily clean-up is not performed, the Construction Manager will provide his labor to complete the clean-up and the appropriate contractor will be back-charged.

12. Include an allowance of $2,000 to be used at Barton Malow's discretion. Any and all time tickets pertaining to this allowance are to be signed by Barton Malow and submitted on a daily basis. No time tickets will be accepted unendorsed. Allowance when billed shall be exclusive of mark-ups and fees. Include these costs in your base bid.

EXCLUDED FROM THIS CONTRACTOR'S WORK is:

1. **N/A**

SPECIAL CONSIDERATIONS:

1. The special provisions outlined in **Section 00210 Description of the Work** form a part of this bid category work description and apply to this Bidder's scope of work.

2. All work under this scope shall comply with proper trade jurisdictions, even if it is necessary to assemble composite crews or subcontract to appropriate trades.

3. This Bidder is required to submit alternate prices identified in the Bidding Documents which pertain to their work. These alternate prices must be separate from their base bid on the Bid Proposal Form as described in Section 00200 Instructions to Bidders.

4. Take special precautions when working near occupied spaces with regards to fumes, noise and pollution levels. Some work may be necessary to be performed after the school day is over at this contractor's expense.

5. Any in-place temporary protection that requires any disassembly to perform work, etc. must be replaced by contractor installing new work. Temporary protection must be restored to condition intended.

6. Section **00410, Familial Disclosure Statement, must** be filled out and included with your Bid for your Bid to be accepted.

END OF SECTION 00220 – CONCRETE 3.1

SECTION 00220
WORK SCOPE

BID CATEGORY – Masonry 4.1

The Work of this Bid Category includes but is not limited to providing all labor, equipment, materials, scaffolding, hoisting and incidentals to complete all in accordance with the Contract Documents and applicable codes. All Work is to be performed as shown on the plans and specified in the following technical Specification sections:

Section	Name
01731	Cutting and Patching
01732	Selective Demolition
04810	Unit Masonry Assemblies
07842	Fire-Resistive Joint Systems
07920	Joint Sealants
08311	Access Doors and Frames

In addition to the above, this Bid Category requires adherence to but not limited to the Bidding Documents, the Bidding and Contract requirements and Division 1 General Requirements of the Project Manual and coordination with various other technical Specifications interfacing with this Work. The Bidder is advised to review the Work descriptions of the other Bid Categories as set forth in Section 00210 of the Project Manual so as to not misunderstand scope responsibilities.

THE SCOPE OF WORK IS TO INCLUDE, but is not limited to, the following items:

1. Reference sheets behind section 00210 Description of the Work for work scope designations to "General Architectural Demo Notes" #1-14, "Architectural Demo Notes" #1-30, and "Roofing Notes" #1-12.
2. All masonry demolition is the responsibility of this contractor. 1.1 Demolition will NOT perform any block or brick demolition. Pay special attention to door details where CMU is to be removed down to foundation.
3. Perform all layout and engineering associated with this work necessary to perform a complete job using established building lines, control points, and elevations. It is this contractor's responsibility to field verify the accuracy of survey points provided, prior to job startup/mobilization.
4. Install ornamental piers complete. Coordinate installation of ornamental piers with 2.1 Site Construction contractor. Footings and foundations for piers AND flag pole installation are the responsibility of 2.1 Site Construction.
5. Tooth in any areas necessary pertaining to the tie in of the addition(s) to the existing building or for new and/or larger openings necessary in the existing building.
6. Patch existing masonry surfaces to match existing where affected by demolition and / or shown on demolition drawings.

7. Provide CMU and/or brick infill where existing windows, doors, louvers, etc. have been removed. Tooth in block/brick to match existing. Pay special attention to door details, weeps, SS flashing drip, new flashing, and other masonry accessories shown are the responsibility of this contractor.

8. Install metal fabrications provided by 5.1 Steel and 6.1 Carpentry contractors. Coordinate placement of steel plates with 5.1 Steel contractor. Coordinate delivery and placement of HM doors with 6.1 Carpentry contractor.

9. Temporary support of roof deck prior to removal of bearing wall and installation of new beam is this contractor's responsibility. Coordinate with 5.1 Steel contractor. Reference sheet S2.1.

10. Furnish and install all building damproofing shown on masonry walls.

11. Furnish and install building- insulation required for masonry work.

12. Coordinate louver opening size with 15.1 Mechanical, as louver sizes will vary.

13. Grouting of hollow metal frames is the responsibility of this contractor. Reference door details.

14. New CMU sill block shown on 16/A6.4 is the responsibility of this contractor.

15. Install all miscellaneous structural steel beams and lintels, plates, steel reinforcement miscellaneous steel supports and bond beams required to support masonry. Include all welding, bolting, anchorages etc.

16. 8' planking on all scaffolding shall be cleated and decking must have toe kicks per MIOSHA/OSHA/ANSI standards.

17. This contractor is responsible for all firestopping assemblies on existing and new CMU walls where new work is being performed called out on plans, per UL listing standards in the specifications. See code compliance sheets and Partition Type Details in the drawings for further clarification. Include fire rating at head of wall at existing remodel spaces.

18. Reference partition types; filling voids with grout is the responsibility of this contractor.

19. Reference structural details; grouting walls to foundation, grouting under bearing plates, and infill of beam pockets with masonry is this contractor's responsibility.

20. Reference building details; metal pan flashing is the responsibility of this contractor.

21. Provide structural glazed block base, and wall units in all walls where required to match existing conditions. Reference Partition type general note #11 on sheet A2.5.

22. This contractor is responsible to protect classroom control panels and electrical back boxes from mortar, grout, and masonry debris after installation.

23. Furnish and install all rebar (including horizontal, vertical, and positioning accessories) necessary for CMU walls.

24. Install hollow metal door and window frames and associated anchors in all NEW masonry walls.

25. Install sleeves furnished by other trades.

26. Furnish and install bond breaker strips.

27. Furnish and install sealant within exterior and interior masonry wall construction and when masonry abuts an existing and/or dissimilar surface.

28. Furnish and install all joint systems within masonry walls and where masonry walls meet existing surfaces.

29. Provide all necessary barricades, safety and warning devices until this work is safe and complete.

30. Provide hoisting, scaffolding, and lifting equipment necessary for the execution of this work.

31. Perform brick washing in accordance with specifications and protect adjacent materials to prevent damage to finishes from the cleaning process. **Clean block-walls to provide a smooth surface suitable for paint. Condition of interior block must be left in a condition suitable for painting.**

32. 15.1 - Mechanical will provide layout drawings for through wall penetrations of mechanical systems to 4.1 - Masonry at least two weeks prior to block installation in that unit. Any layout drawings not provided in this time frame may result in a back charge to the Mechanical contractor.

33. Cutting of walls for installation of electrical / technology boxes provided by others are this contractor's responsibility within masonry walls. The masonry, electrical and carpentry contractors will share the responsibility and any cost incurred for adjustment to ensure a square/plumb quality finished product.

34. Coordinate with the site Superintendent regarding a designated wash out area. It will be this contractor's responsibility to remove their spoils at the appropriate time.

35. Cutting and welding operations shall cease 2 hours prior to the close of construction each day to minimize the risk of undetected smoldering fire. Contractors performing such operations shall have within their immediate work area, ABC-type fire extinguisher(s). Only wet cutting will be permitted.

36. Only wet cutting will be permitted on this project.

37. Dumpsters indicated to be provided by the Owner in the General Requirements and Supplementary Conditions WILL NOT be provided for this category.

38. Final cleaning and/or brooming must be included in base bid.

39. Include $3,000 allowance to be used as directed by BMC. Any and all time tickets pertaining to this allowance are to be signed by Barton Malow and submitted on a daily basis. No time tickets will be accepted unendorsed. Allowance when billed shall be exclusive of mark-ups and fees. Include these costs in your base bid.

EXCLUDED FROM THIS CONTRACTOR'S WORK is:

1. **N/A**

SPECIAL CONSIDERATIONS:

1. All work under this scope shall comply with proper trade jurisdictions, even if it is necessary to assemble composite crews or subcontract to appropriate trades.

2. The special provisions outlined in **Section 00210 Description of the Work** form a part of this bid category work description and apply to this bidder's scope of work.

3. This Bidder is required to submit alternate prices identified in the Bidding Documents which pertain to their work. These alternate prices must be separate from their base bid on the Bid Proposal Form as described in Section 00200 Instructions to Bidders.

4. Take special precautions when working near occupied spaces with regards to fumes, noise and pollution levels. Some work may be necessary to be performed after the school day is over at this contractor expense.

5. Any in-place temporary protection that requires any disassembly to perform work, etc. must be replaced by contractor installing new work. Temporary protection must be restored to condition intended.

6. Section **00410, Familial Disclosure Statement, must** be filled out and included with your Bid for your Bid to be accepted.

END OF SECTION 00220 – MASONRY 4.1

SECTION 00220
WORK SCOPE

BID CATEGORY – Structural Steel 5.1

The Work of this Bid Category includes but is not limited to providing all labor, equipment, materials, scaffolding, hoisting and incidentals to complete all in accordance with the Contract Documents and applicable codes. All Work is to be performed as shown on the plans and specified in the following technical Specification sections:

Section	Name
01731	Cutting and Patching
01732	Selective Demolition
05500	Metal Fabrications
05521	Pipe and Tube Railings

In addition to the above, this Bid Category requires adherence to but not limited to the Bidding Documents, the Bidding and Contract requirements and Division 1 General Requirements of the Project Manual and coordination with various other technical Specifications interfacing with this Work. The Bidder is advised to review the Work descriptions of other Bid Categories as set forth in Section 00210 of the Project Manual so as to not misunderstand scope responsibilities.

THE SCOPE OF WORK IS TO INCLUDE, but is not limited to, the following items:

1. Reference sheets behind section 00210 Description of the Work for work scope designations to "General Architectural Demo Notes" #1-14, "Architectural Demo Notes" #1-30, and "Roofing Notes" #1-12.

2. Any additional steel demolition that is required but not shown on the drawings will be the responsibility of this contractor.

3. Perform all lay-out and supply all materials as shown and required by the drawings, specifications and job conditions as required to complete the work of this contract.

4. This contractor is responsible for all lintel sizes and coordination with all necessary contractors. **Field verify** existing lintel conditions with mechanical contractor & mason prior to fabricating lintels. Inform BMC of coordination issues and efforts. Be sure to review ALL drawings for new lintel sizes.

5. This contractor will cut all roof penetrations in steel decking as laid out by the mechanical, electrical and/or food service equipment contractor.

6. Steel (including but not limited to equipment rails, additional structural support of deck, etc.) required for new roof top mechanical units is the responsibility of this contractor. Coordinate with 15.1 Mechanical for requirements and placement.

7. All steel required for framing of new RTU's is the responsibility of this contractor.

8. Base plates and bolts required for installation of louvers is this contractor's responsibility. This contractor is responsible for epoxy anchors where specified and shown.

9. Continuous galvanized angle is the responsibility of this contractor. Refer to building details.

10. This contractor is responsible for hand and guard rail systems complete. This work includes, but is not limited to, coring of new pipe sleeves (when required), grouting new pipes in place, and kick plates. Steel handrails and guard rails should be left in a condition suitable for painting without further prep work, including touch ups on scratched or blemished spots after erection is complete. Wrap rails with covering until job is complete.

11. Reference sheet S1.4 and 10/S2.1; provide and install curved plates at L-4 lintels as shown.

12. Infill of existing steel deck where existing mechanical equipment has been remove is this contractor's responsibility (refer to sheets S1.1 and S1.3).

13. It is this contractor's responsibility to unload all steel required for job completion.

14. Any utility disturbed by this contractor shall be repaired and placed in service immediately and the cost associated to do so will be this contractor's responsibility.

15. Provide and maintain ladders necessary for this contractors work. It is this contractor's responsibility to relocate ladders if necessary.

16. This project will enforce the use of 100% fall protection for all exposures 6 feet or greater for all workers (including connecting, detailing, and decking).

17. Cutting and welding operations shall cease 2 hours prior to the close of construction each day to minimize the risk of undetected smoldering fire. Contractors performing such operations shall have within their immediate work area, ABC-type fire extinguisher(s).

18. Provide all necessary barricades, safety, and warning devices for this work. Including all welded metal fabrications with metal cables.

19. This contractor shall plan on timely installation and removal of debris from lay-down area and site.

20. Contractor is responsible for de-mudding of vehicles prior to leaving the construction site.

21. All stored materials must be kept on dunnage and off the ground.

22. Final cleaning of finish installations must be included within this bid.

23. Include a $1,000 allowance to be used for miscellaneous steel as directed by BMC. Any and all time tickets pertaining to this allowance are to be signed by Barton Malow and submitted on a daily basis. No time tickets will be accepted unendorsed. Allowance when billed shall be exclusive of mark-ups and fees. Include these costs in your base bid.

EXCLUDED FROM THIS CONTRACTOR'S WORK is:

1. **N/A**

SPECIAL CONSIDERATIONS:

1. All work under this scope shall comply with proper trade jurisdictions, even if it is necessary to assemble composite crews or subcontract to appropriate trades.

2. The special provisions outlined in **Section 00210 Description of the Work** form a part of this bid category work description and apply to this bidder's scope of work.

3. This Bidder is required to submit alternate prices identified in the Bidding Documents which pertain to their work. These alternate prices must be separate from their base bid on the Bid Proposal Form as described in Section 00200 Instructions to Bidders.

4. Take special precautions when working near occupied spaces with regards to fumes, noise and pollution levels. Some work may be necessary to be performed after the school day is over at this contractor expense.

5. Any in-place temporary protection that requires any disassembly to perform work, etc. must be replaced by contractor installing new work. Temporary protection must be restored to condition intended.

6. Section **00410, Familial Disclosure Statement, must** be filled out and included with your Bid for your Bid to be accepted.

END OF SECTION 00220 – STRUCTURAL STEEL 5.1

SECTION 00220
WORK SCOPE

BID CATEGORY – Carpentry 6.1

The Work of this Bid Category includes but is not limited to providing all labor, equipment, materials, scaffolding, hoisting and incidentals to complete all **carpentry, doors and hardware, drywall, ceilings and miscellaneous as noted** in accordance with the Contract Documents and applicable codes. All Work is to be performed as shown on the plans and specified in the following technical Specification sections:

Section	Name
01230	Alternates
01731	Cutting and Patching
06105	Miscellaneous Carpentry
07841	Through-Penetration Firestop Systems
07842	Fire-Resistive Joint Systems
07920	Joint Sealants
08110	Standard Steel Doors and Frames
08211	Flush Wood Doors
08311	Access Doors and Frames
08710	Door Hardware
09111	Non-Load Bearing Steel Framing
09250	Gypsum Board
09511	Acoustical Panel Ceilings
10101	Visual Display Surfaces
10155	Toilet Compartments
10505	Metal Lockers
10520	Fire-Protection Specialties
12355	Institutional Casework
12360	Laboratory Casework
14420	Wheelchair Lifts

In addition to the above, this Bid Category requires adherence to but not limited to the Bidding Documents, the Bidding and Contract requirements and Division 1 General Requirements of the Project Manual and coordination with various other technical Specifications interfacing with this Work. The Bidder is advised to review the Work descriptions of the other Bid Categories as set forth in Section 00210 of the Project Manual so as to not misunderstand scope responsibilities.

THE SCOPE OF WORK IS TO INCLUDE, but is not limited to, the following items:

1. Reference sheets behind section 00210 Description of the Work for work scope designations to "General Architectural Demo Notes" #1-14, "Architectural Demo Notes" #1-30, and "Roofing Notes" #1-12.
2. Furnish and install items listed in specification sections above.
3. Furnish and install **all** rough carpentry, finish carpentry, wood treatments, wood blocking, sleepers, nailers, curbs, framing, and plywood indicated on the drawings. Include all window blocking and roof blocking. Include casework/equipment blocking. Coordinate with appropriate supplier/installer.

4. Furnish and receive all wood, hollow metal and steel doors, frames and door hardware. Store doors and frames prior to installation including insulated panels and louvers in doors. Doors and frames are to be free of rust and debris upon installation. Contractor will be responsible for removing any rust that may appear on the steel doors and frames. Perform all trouble-shooting and correction of hardware problems after owner occupancy for the duration of the warranty period. Shake out and place material in respective unit upon delivery.
5. Furnish lite-kit sizes for wood and hollow metal doors to 8.1 Aluminum Doors, Windows and Glazing contractor.
6. If a demolished window is to be replaced by this contractor, this contractor is responsible to install and maintain temporary protection in this opening. Temporary protection shall be wood framed reinforced plywood.
7. Furnish and install all access panels in gypsum walls and/or ceilings as shown on plans. Install access panels provided by 15.1 Mechanical and 16.1 Electrical trades both shown and/or required for access to mechanical and electrical systems.
8. This contractor is responsible to increase wall support of all frames (door and window) at demolished doors and windows if existing framing is not adequate.
9. Lock cylinders for demolished doors that are to be replaced are to be salvaged, labeled, and turned over to the Owner.
10. Specification section 08710-1.4-D shall be superseded by the following: Keyway for all cylinders shall be provided per the Owner's schedule. Keying shall be by contractor for all doors, per the direction of the Owner. Contractor is to use a local licensed, bonded and insured locksmith.
    Note: The School district states to use the first 5 pins, drop the 6th and 7th. TSD will provide master and grand master key through Barton Malow. All interior doors are to be keyed with their respective key, as well as the grand master and master key. All exterior doors are to be keyed with the grand master and master. Each pass key is to be labeled and turned over to the district through Barton Malow along with the original master and grandmaster keys.
11. Furnish and install all institutional casework required for a complete installation, including science casework and epoxy resin countertops. All final adjustments will be the responsibility of this contractor. Field verify all casework dimensions, reference equipment general notes.
12. Removal, protection, storage and reinstallation of projection screens is the responsibility of this contractor.
13. Provide and coordinate the installation of all mechanical and electrical fixtures and devices, associated with casework, with the appropriate trades. Provide detailed rough-in drawings within twenty (20) calendar days of contract award.
14. Layout of piping to be reviewed by the casework contractor to avoid unnecessary cutting of casework. Piping layout on drawings is diagrammatic only.
15. Furnish and install gypsum ceiling and soffit assemblies complete. This includes steel studs and v-channel as shown on partition types.
16. Patching of gypsum ceilings as required and/or shown is the responsibility of this contractor. Coordinate with 16.1 Electrical for patching around new or old light fixtures. Refer to reflected ceiling notes.

17. Install hollow metal door and window frames and associated anchors in all existing or slightly modified masonry or stud walls.
18. Furnish and install access panels shown on drawings. Installation of access panels provided by 15.1 Mechanical and 16.1 Electrical is the responsibility of this contractor.
19. All plastic laminate and installation accessories shown on the drawings is the responsibility of this contractor. Reference building details.
20. The electrical and carpentry contractor will share the responsibility for a square/plumb installation of all electrical and technology boxes in gypsum wall assemblies. Any cost incurred to adjust boxes to ensure a quality finished product will be shared by these contractors
21. Furnish and maintain all necessary barricades, safety and warning devices for this work.
22. Furnish and install toilet compartments and provide all final adjustments. Field verify dimensions, before ordering, to ensure proper fit. It is the intent of the Architect, and the responsibility of this contractor, to reuse or cover/patch existing anchor holes.
23. Refer to details 6/A6.4 and 1/A6.4; this contractor is responsible to cut gyp. back as required for new deeper window frame AND to remove and reinstall ceiling tile and grid ceiling as required for window placement.
24. Protect existing surfaces in rooms, while performing this contractor's work. Provide protection of this contractors installed work until Owner turnover. If any adjacent surfaces are damaged it will be the sole responsibility of the contractor at fault to completely repair and replace all damaged construction to the satisfaction of the owner, construction manager and architect.
25. Furnish and install all acoustical lay-in assembly materials.
26. Furnish and install all VDB's shown on drawings. Reference equipment plans.
27. Furnish and install all metal lockers as shown on drawings. Field verify dimensions prior to submission of shop drawings. Locker numbers and combinations shall be submitted electronically with submission of closeout documents.
28. Furnish and install wheelchair lifts (aka portable stage lift). Reference sheet A1.3. Coordinate electrical requirements with 16.1 Electrical.
29. Refer to code compliance and partition type sheets. This contractor is responsible for all fire stopping assemblies at new and existing drywall assembled walls and where drywall creates a fire separation above ceiling. Ratings of assemblies shall meet UL #U905 standards. Include fire rating at head of wall for existing remodel spaces. Assemblies shall include gyp board, fire stop and sealant, fire safing insulation etc. as shown on partition types.
30. Furnish and install all joint systems and sealants where this work abuts existing and/or dissimilar surfaces. Caulk all products installed by this contractor. Refer to door details for sealant requirements at hollow metal doors and frames. Provide extruded polystyrene shim/backer where applicable.

31. Field verify all openings, provide and install all trim, spaces and blanks necessary to properly install a complete locker system.
32. This project will enforce the use of 100% fall protection for all exposures 6 feet or greater for all workers.
33. Furnish and maintain dust mats at all construction area entrances and exits on both sides of doors. Clean as needed or as directed by Barton Malow site superintendent.
34. Final cleaning must be included as part of this base bid.
35. Include a $4,000 allowance for miscellaneous items. Allowance to be used on a time and material basis as directed by BMC. Unused portions will be deducted from contract. Any and all time tickets pertaining to this allowance are to be signed by Barton Malow and submitted on a daily basis. No time tickets will be accepted unendorsed. Allowance when billed shall be exclusive of mark-ups and fees. Include these costs in your base bid.

EXCLUDED FROM THIS CONTRACTOR'S WORK is:

1. **N/A**

SPECIAL CONSIDERATIONS:

1. All work under this scope shall comply with proper trade jurisdictions, even if it is necessary to assemble composite crews or subcontract to appropriate trades.
2. The special provisions outlined in **Section 00210 Description of the Work** form a part of this bid category work description and apply to this bidder's scope of work.
3. This Bidder is required to submit alternate prices identified in the Bidding Documents which pertain to their work. These alternate prices must be separate from their base bid on the Bid Proposal Form as described in Section 00200 Instructions to Bidders.
4. Take special precautions when working near occupied spaces with regards to fumes, noise and pollution levels. Some work may be necessary to be performed after the school day is over at this contractor expense.
5. Any in-place temporary protection that requires any disassembly to perform work, etc. must be replaced by contractor installing new work. Temporary protection must be restored to condition intended.
6. Section **00410, Familial Disclosure Statement, must** be filled out and included with your Bid for your Bid to be accepted.

END OF SECTION 00220 – CARPENTRY 6.1

SECTION 00220
WORK SCOPE

BID CATEGORY – Roofing 7.1

The Work of this Bid Category includes but is not limited to providing all labor, equipment, materials, scaffolding, hoisting and incidentals to complete all in accordance with the Contract Documents and applicable codes. All Work is to be performed as shown on the plans and specified in the following technical Specification sections:

Section	Name
01731	Cutting and Patching
01732	Selective Demolition
07552	Modified Bituminous Membrane Roofing
07710	Manufactured Roof Specialties
07720	Roof Accessories
07841	Through-Penetration Firestop Systems
07842	Fire-Resistive Joint Systems
07920	Joint Sealants
08311	Access Doors and Frames

In addition to the above, this Bid Category requires adherence to but not limited to the Bidding Documents, the Bidding and Contract requirements and Division 1 General Requirements of the Project Manual and coordination with various other technical Specifications interfacing with this Work. The Bidder is advised to review the Work descriptions of the other Bid Categories as set forth in Section 00210 of the Project Manual so as to not misunderstand scope responsibilities.

THE SCOPE OF WORK IS TO INCLUDE, but is not limited to, the following items:

1. Reference sheets behind section 00210 Description of the Work for work scope designations to "General Architectural Demo Notes" #1-14, "Architectural Demo Notes" #1-30, and "Roofing Notes" #1-12.

2. Field verify existing conditions prior to construction.

3. Furnish and install roofing components as specified. Furnish and install any insulation and/or components as detailed or required for a positive draining roof system. Reference mechanical details (intake/relief hood detail).

4. Install and level all roof mounted curbs. Layout is done by 15.1 – Mechanical and/or 16.1 - Electrical trades if the curb is for their equipment.

5. Furnish and install flashing around curbs, pipe sleeves, roof sumps, roof hatches, and any penetrations and/or ladders as shown on plans. Coordinate with 15.1 Mechanical and/or 16.1 Electrical contractor(s) for proper adjustments.

6. Coordinate all penetrations necessary with the mechanical and electrical contractors. Cut roofing where required by other trades to include, but not limited to, the roof top units and condensing units. It is this contractor's responsibility to remobilize if necessary for additional penetrations needed.

7. Furnish and install all waterproof underlayment that will be covered by roofing, flashing, or siding.

8. Furnish metal flashing, which form part of the roof system, to masonry contractor and coordinate installation.

9. This project will enforce the use of 100% fall protection for all exposures 6 feet or greater for all workers.

10. Provide and maintain all necessary barricades, safety and warning devices for this work. Remove any fall protection anchors installed this trade prior to Owner turnover.

11. If this contractor chooses to have a roof monitor, it does not relieve the contractor from following MIOSHA and BMC tie-off rules.

12. Witness installation of exhaust fans and all other roof mounted equipment and provide instruction when necessary to ensure that the roofing system is not compromised. Provide written report immediately following installation stating the condition of the roof prior to and subsequent installation of the new equipment.

13. Provide protection of existing roof systems during work by this contractor.

14. Do not throw materials off of the roof. All waste generated by the work in this category shall be removed off site.

15. Final cleaning of the finished roof system, prior to manufacturer's inspection, is this contractors responsibility.

EXCLUDED FROM THIS CONTRACTOR'S WORK is:

1. **N/A**

SPECIAL CONSIDERATIONS:

1. All work under this scope shall comply with proper trade jurisdictions, even if it is necessary to assemble composite crews or subcontract to appropriate trades.

2. The special provisions outlined in **Section 00210 Description of the Work** form a part of this bid category work description and apply to this bidder's scope of work.

3. This Bidder is required to submit alternate prices identified in the Bidding Documents which pertain to their work. These alternate prices must be separate from their base bid on the Bid Proposal Form as described in Section 00200 Instructions to Bidders.

4. Take special precautions when working near occupied spaces with regards to fumes, noise and pollution levels. Some work may be necessary to be performed after the school day is over at this contractor expense.

5. Any in-place temporary protection that requires any disassembly to perform work, etc. must be replaced by contractor installing new work. Temporary protection must be restored to condition intended.

6. Section **00410, Familial Disclosure Statement, must** be filled out and included with your Bid for your Bid to be accepted.

END OF SECTION 00220 - ROOFING 7.1

SECTION 00220
WORK SCOPE

BID CATEGORY – Aluminum Doors, Windows and Glazing 8.1

The Work of this Bid Category includes but is not limited to providing all labor, equipment, materials, scaffolding, hoisting and incidentals to complete all in accordance with the Contract Documents and applicable codes. All Work is to be performed as shown on the plans and specified in the following technical Specification sections:

Section	Name
01230	Alternates
01731	Cutting and Patching
07920	Joint Sealants
08411	Aluminum-Framed Entrances & Storefronts
08520	Aluminum Windows
08710	Door Hardware
08800	Glazing

In addition to the above, this Bid Category requires adherence to but not limited to the Bidding Documents, the Bidding and Contract requirements and Division 1 General Requirements of the Project Manual and coordination with various other technical Specifications interfacing with this Work. The Bidder is advised to review the Work descriptions of the other Bid Categories as set forth in Section 00210 of the Project Manual so as to not misunderstand scope responsibilities.

THE SCOPE OF WORK IS TO INCLUDE, but is not limited to, the following items:

1. Reference sheets behind section 00210 Description of the Work for work scope designations to "General Architectural Demo Notes" #1-14, "Architectural Demo Notes" #1-30, and "Roofing Notes" #1-12.

2. Establish hold dimensions for all openings and provide written documentation required for hold open dimensions to 4.1 – Masonry and to the Construction Manger to distribute as necessary at least 2 weeks prior to block installation. Any layout drawings not provided in this time frame may result in a back charge to the 8.1 – Aluminum Door, Window and Glazing Panels contractor.

3. Furnish and install all joint systems and sealants where this work abuts existing surfaces as shown. Caulk all products installed by this contractor. Refer to door details for sealant requirements at aluminum. Provide extruded polystyrene shim/backer where applicable.

4. Aluminum thresholds and anchors required are the responsibility of this contractor. Refer to door details.

5. Any cutting back of flooring to receive aluminum frames will be the responsibility of this contractor.

6. Refer to details 6/A6.4 and 1/A6.4; 6.1 Carpentry is responsible to cut gyp. back as required for new deeper window frame AND to remove and reinstall ceiling tile and grid ceiling as required for window placement. This contractor is responsible for coordinating with 6.1 Carpentry and installing aluminum clip angle and aluminum plate.

7. **ALL** break metal, aluminum plates, aluminum sills and aluminum trim shown on drawings is the responsibility of this contractor. Refer to door details.

8. Provide and install all glass and glazing as shown on the drawings. This includes but is not limited to safety glass, fire rated glass, insulated glass, tempered glass, spandrel glass, and insulated metal panels.

9. Light-kit sizes for wood and hollow metal doors will be furnished by 6.1 Carpentry to aid in placing glass order. However it is ultimately the responsibility of this contractor to ensure glass sizes fit all door and window types. Field verification may be necessary and should be coordinated in enough time to ensure project schedule is met.

10. If a demolished window is to be replaced by this contractor, this contractor is responsible to install and maintain temporary protection in this opening. Temporary protection shall be wood framed reinforced visqueen.

11. Furnish and install aluminum framed entrances and storefronts, FRP doors, aluminum windows, screens, window hardware, and glazing and trim metal within or around these systems. This should also include glazing in doors, borrowed lite windows, insulated panels and louvers/grilles in doors that are installed by this contractor and other glazed openings.

12. Furnish and install all hardware for the above specified assemblies, including door hardware. Perform all adjustments necessary for hardware to operate satisfactorily.

13. Specification section 08710-1.4-D shall be superseded by the following: Keyway for all cylinders shall be provided per the Owner's schedule. Keying shall be by the contractor for all doors, per the direction of the Owner. Contractor is to use a local licensed, bonded and insured locksmith.
    a. Note: The School district states to use the first 5 pins, drop the 6th and 7th. TSD will provide the master and grand master key through Barton Malow. All interior doors are to be keyed with their respective key, as well as the grand master and master key. All exterior doors are to be keyed with the grand master and master. Each pass key is to be labeled and turned over to the district through Barton Malow along with the original master and grandmaster keys.

14. It is this contractor's responsibility to coordinate with 6.1 – Carpentry to obtain fire-lite glazing sizes in all interior doors, side lites, and transoms. Installation must be coordinated with 6.1 – Carpentry to meet project schedule.

15. Joint sealants must be installed on the perimeter of this contractors installed assemblies. Architectural joint sealants and/or weather sealant must be installed by this contractor on the exterior and interior of each window and storefront system.

16. Furnish and install all joint sealants where the work of this contractor meets adjacent surfaces.

17. Work must be furnished and installed per the project schedule.

18. Dispose of all unusable material in dumpster daily. Dumpsters will be provided by BMC.

19. Provide daily clean-up, according to Barton Malow standards, including daily removal of all materials and debris related to this category. If daily clean-up is not performed, the Construction Manager will provide his labor to complete the clean-up and the appropriate contractor will be back-charged.

20. Final cleaning must be included in this base bid and performance of will be directed by BMC when appropriate and logical.

21. Provide alternate pricing for alternate A-1 as listed on Bid Proposal Form.

EXCLUDED FROM THIS CONTRACTOR'S WORK is:

1. **N/A**

SPECIAL CONSIDERATIONS:

1. All work under this scope shall comply with proper trade jurisdictions, even if it is necessary to assemble composite crews or subcontract to appropriate trades.

2. The special provisions outlined in **Section 00210 Description of the Work** form a part of this bid category work description and apply to this bidder's scope of work.

3. This Bidder is required to submit alternate prices identified in the Bidding Documents which pertain to their work. These alternate prices must be separate from their base bid on the Bid Proposal Form as described in Section 00200 Instructions to Bidders.

4. Take special precautions when working near occupied spaces with regards to fumes, noise and pollution levels. Some work may be necessary to be performed after the school day is over at this contractor expense.

5. Any in-place temporary protection that requires any disassembly to perform work, etc. must be replaced by contractor installing new work. Temporary protection must be restored to condition intended.

6. Section **00410, Familial Disclosure Statement, must** be filled out and included with your Bid for your Bid to be accepted.

END OF SECTION 00220 – ALUMINUM DOORS, WINDOWS AND GLAZING 8.1

SECTION 00220
WORK SCOPE

BID CATEGORY – Painting 9.1

The Work of this Bid Category includes but is not limited to providing all labor, equipment, materials, scaffolding, hoisting and incidentals to complete all in accordance with the Contract Documents and applicable codes. All Work is to be performed as shown on the plans and specified in the following technical Specification sections:

Section	Name
01731	Cutting and Patching
07920	Joint Sealants
09911	Exterior Painting
09912	Interior Painting

In addition to the above, this Bid Category requires adherence to but not limited to the Bidding Documents, the Bidding and Contract requirements and Division 1 General Requirements of the Project Manual and coordination with various other technical Specifications interfacing with this Work. The Bidder is advised to review the Work descriptions of the other Bid Categories as set forth in Section 00210 of the Project Manual so as to not misunderstand scope responsibilities.

THE SCOPE OF WORK IS TO INCLUDE, but is not limited to, the following items:

1. Reference sheets behind section 00210 Description of the Work for work scope designations to "General Architectural Demo Notes" #1-14, "Architectural Demo Notes" #1-30, and "Roofing Notes" #1-12.

2. Furnish and install all items listed or described in assigned Specification Sections and as indicated on the drawings and/or listed on the color plan layout.

3. Clean and prepare all walls, hollow metal doors and frames, and surfaces for finishing, including all required caulking, patching, sanding and minor repairs. Joint sealer is to be used at all interior finishes or all dissimilar metals and/or surfaces. If walls need more than minor prep notify job superintendent.

4. This contractor is responsible for removing or covering all cover plates, trim pieces and other pre-finished surfaces necessary for the performance of this work and replacing same at the conclusion of this Contractor's work. Cover and protect new work to avoid damage.

5. Provide finish painting for walls, ceilings, soffits and underside of deck where ceiling is exposed.

6. Provide finish painting of all hollow metal doors and frames as shown on drawings. Install joint sealant at perimeter of frames prior to painting.

7. Provide minor prep and paint existing wall surfaces where existing casework, shelving, toilet partitions and accessories are to be removed.

8. Provide finish painting of exposed pipes, conduit and ducts, hangers and exposed steel and ironwork as indicated on drawings. This includes hand railings and stringers.

9. If any adjacent surfaces are damaged it will be the sole responsibility of the contractor at fault to completely repair and replace all damaged construction to the satisfaction of the owner, construction manager and architect.

10. Final cleaning may not be excluded from this contract.

11. Provide an allowance of $3,000.00 in the base bid to cover the cost of touch-up painting needed following owner move in, or as directed by BMC. Any and all time tickets pertaining to this allowance are to be signed by Barton Malow and submitted on a daily basis. No time tickets will be accepted unendorsed. Allowance when billed shall be exclusive of mark-ups and fees. Include these costs in your base bid.

EXCLUDED FROM THIS CONTRACTOR'S WORK is:

1. **N/A**

SPECIAL CONSIDERATIONS:

1. All work under this scope shall comply with proper trade jurisdictions, even if it is necessary to assemble composite crews or subcontract to appropriate trades.

2. The special provisions outlined in **Section 00210 Description of the Work** form a part of this bid category work description and apply to this bidder's scope of work.

3. This Bidder is required to submit alternate prices identified in the Bidding Documents which pertain to their work. These alternate prices must be separate from their base bid on the Bid Proposal Form as described in Section 00200 Instructions to Bidders.

4. Take special precautions when working near occupied spaces with regards to fumes, noise and pollution levels. Some work may be necessary to be performed after the school day is over at this contractor expense.

5. Any in-place temporary protection that requires any disassembly to perform work, etc. must be replaced by contractor installing new work. Temporary protection must be restored to condition intended.

6. Section **00410, Familial Disclosure Statement**, **must** be filled out and included with your Bid for your Bid to be accepted.

END OF SECTION 00220 - PAINTING 9.1

SECTION 00220
WORK SCOPE

BID CATEGORY –Ceramic Tile 9.2

The Work of this Bid Category includes but is not limited to providing all labor, equipment, materials, scaffolding, hoisting and incidentals to complete all in accordance with the Contract Documents and applicable codes. All Work is to be performed as shown on the plans and specified in the following technical Specification sections:

Section	Name
01731	Cutting and Patching
03542	Hydraulic-Cement-Based Underlayment
09310	Ceramic Tile

In addition to the above, this Bid Category requires adherence to but not limited to the Bidding Documents, the Bidding and Contract requirements and Division 1 General Requirements of the Project Manual and coordination with various other technical Specifications interfacing with this Work. The Bidder is advised to review the Work descriptions of the other Bid Categories as set forth in Section 00210 of the Project Manual so as to not misunderstand scope responsibilities.

THE SCOPE OF WORK IS TO INCLUDE, but is not limited to, the following items:

1. Reference sheets behind section 00210 Description of the Work for work scope designations to "General Architectural Demo Notes" #1-14, "Architectural Demo Notes" #1-30, and "Roofing Notes" #1-12.

2. Perform all layout as required to complete the work of this contract.

3. Control dust created by the execution of this contract.

4. Base bid shall include all necessary floor/wall prep including, but not limited to scarification, wall leveling, and insuring a substrate that is plumb and level. Coordinate all required depressions in new concrete with flat work contractor.

5. Furnish and install all ceramic tile flooring, ceramic tile base, beveled thresholds and all other accessory items required for a complete flooring installation. Thresholds where ceramic tile meets any other surface are the responsibility of this contractor.

6. Provide bull nose tile pieces at edges and corners of ceramic tile.

7. Furnish and install all sealant joints where the work in this category abuts adjacent surfaces.

8. It is this contractor's responsibility to cover, seal and protect new work in place to avoid damage until building is turned over to Owner. This protection must be masonite, a minimum of 3/16" thickness.

9. Protect adjacent surfaces and finishes during installation of new work by this contractor. If any adjacent surfaces are damaged it will be the sole responsibility of the contractor at fault to

completely repair and replace all damaged construction to the satisfaction of the owner, construction manager and architect.

10. Final cleaning of this contractor's installed material must be included in base bid.

EXCLUDED FROM THIS CONTRACTOR'S WORK is:

1. **N/A**

SPECIAL CONSIDERATIONS:

1. All work under this scope shall comply with proper trade jurisdictions, even if it is necessary to assemble composite crews or subcontract to appropriate trades.

2. The special provisions outlined in **Section 00210 Description of the Work** form a part of this bid category work description and apply to this bidder's scope of work.

3. This Bidder is required to submit alternate prices identified in the Bidding Documents which pertain to their work. These alternate prices must be separate from their base bid on the Bid Proposal Form as described in Section 00200 Instructions to Bidders.

4. Take special precautions when working near occupied spaces with regards to fumes, noise and pollution levels. Some work may be necessary to be performed after the school day is over at this contractor expense.

5. Any in-place temporary protection that requires any disassembly to perform work, etc. must be replaced by contractor installing new work. Temporary protection must be restored to condition intended.

6. Section **00410, Familial Disclosure Statement, must** be filled out and included with your Bid for your Bid to be accepted.

END OF SECTION 00220 – CERAMIC TILE 9.2

SECTION 00220
WORK SCOPE

BID CATEGORY – Carpet, Resilient Tile and Base 9.3

The Work of this Bid Category includes but is not limited to providing all labor, equipment, materials, scaffolding, hoisting and incidentals to complete all in accordance with the Contract Documents and applicable codes. All Work is to be performed as shown on the plans and specified in the following technical Specification sections:

Section	Name
01731	Cutting and Patching
09651	Resilient Floor Tile
09653	Resilient Wall Base and Accessories
09681	Carpet Tile

In addition to the above, this Bid Category requires adherence to but not limited to the Bidding Documents, the Bidding and Contract requirements and Division 1 General Requirements of the Project Manual and coordination with various other technical Specifications interfacing with this Work. The Bidder is advised to review the Work descriptions of the other Bid Categories as set forth in Section 00210 of the Project Manual so as to not misunderstand scope responsibilities.

THE SCOPE OF WORK IS TO INCLUDE, but is not limited to, the following items:

1. Reference sheets behind section 00210 Description of the Work for work scope designations to "General Architectural Demo Notes" #1-14, "Architectural Demo Notes" #1-30, and "Roofing Notes" #1-12.

2. Perform all layouts as required to complete the work of this contract.

3. Control dust created and protect adjacent surfaces while installing the new work of this contract.

4. If any adjacent surfaces are damaged it will be the sole responsibility of the contractor at fault to completely repair and replace all damaged construction to the satisfaction of the owner, construction manager and architect.

5. Base bid shall include all necessary floor and wall prep to complete job. Some excessive floor prep shall be included in base bid.

6. Furnish and install all resilient tile flooring, rubber base, and all other accessory items required for a complete flooring installation.

7. Furnish and install all sills, metal thresholds, doorsills and required transitions at all dissimilar floor materials.

8. Furnish and install rubber base at casework.

9. Furnish all carpet and VCT out of one dye lot to provide color unity.

10. Contractor is responsible to incur all costs for moisture testing and sealer, as required by flooring manufacturer's recommendation prior to installation of any flooring. Provide Barton Malow with written documentation one week prior to floor installation.

11. Provide and maintain a minimum of 3 ft. width of adhesive floor protection as pathways on newly installed flooring surfaces provided by this contractor.

12. Clean existing walls of adhesive prior to installing new base material.

13. Final cleaning of this contractor's installed material must be included in base bid.

14. Include a $4,000 allowance to be used as directed by BMC. Any and all time tickets pertaining to this allowance are to be signed by Barton Malow and submitted on a daily basis. No time tickets will be accepted unendorsed. Allowance when billed shall be exclusive of mark-ups and fees. Include these costs in your base bid.

EXCLUDED FROM THIS CONTRACTOR'S WORK is:

1. **N/A**

SPECIAL CONSIDERATIONS:

1. All work under this scope shall comply with proper trade jurisdictions, even if it is necessary to assemble composite crews or subcontract to appropriate trades.

2. The special provisions outlined in **Section 00210 Description of the Work** form a part of this bid category work description and apply to this bidder's scope of work.

3. This Bidder is required to submit alternate prices identified in the Bidding Documents which pertain to their work. These alternate prices must be separate from their base bid on the Bid Proposal Form as described in Section 00200 Instructions to Bidders.

4. Take special precautions when working near occupied spaces with regards to fumes, noise and pollution levels. Some work may be necessary to be performed after the school day is over at this contractor expense.

5. Any in-place temporary protection that requires any disassembly to perform work, etc. must be replaced by contractor installing new work. Temporary protection must be restored to condition intended.

6. Section **00410, Familial Disclosure Statement, must** be filled out and included with your Bid for your Bid to be accepted.

END OF SECTION 00220 – CARPET, RESILIENT TILE AND BASE 9.3

SECTION 00220
WORK SCOPE

BID CATEGORY – Food Service Equipment 11.1

The Work of this Bid Category includes but is not limited to providing all labor, equipment, materials, scaffolding, hoisting and incidentals to complete all in accordance with the Contract Documents and applicable codes. All Work is to be performed as shown on the plans and specified in the following technical Specification sections:

Section	Name
01731	Cutting and Patching
01732	Selective Demolition
11400	Food Service Equipment

In addition to the above, this Bid Category requires adherence to but not limited to the Bidding Documents, the Bidding and Contract requirements and Division 1 General Requirements of the Project Manual and coordination with various other technical Specifications interfacing with this Work. The Bidder is advised to review the Work descriptions of the other Bid Categories as set forth in Section 00210 of the Project Manual so as to not misunderstand scope responsibilities.

THE SCOPE OF WORK IS TO INCLUDE, but is not limited to, the following items:

1. Reference sheets behind section 00210 Description of the Work for work scope designations to "General Architectural Demo Notes" #1-14, "Architectural Demo Notes" #1-30, and "Roofing Notes" #1-12.

2. Any demolition that is required but not shown on the drawings will be the responsibility of this contractor. Field verify existing conditions prior to commencement of work.

3. Perform all layout as required to complete the work of this contract.

4. This contractor shall be responsible for receiving, off loading, hoisting into/onto building, including the safe and secure storage of materials related to this work.

5. Furnish and install all food service equipment indicated on drawings and specified in the specifications.

6. This contractor shall field veriry all dimensions and furnish dimensional layout drawings and coordinate required roof openings and structural supports for the hood and any other rooftop equipment.

7. Furnish and install all required ductwork and fittings associated with the hood and exhaust.

8. This contractor shall furnish and install roof curbs as it relates to kitchen equipment and coordinate the installation with 7.1 Roofing.

9. Provide competent field supervision to assist other trades in making final connections.

10. Cutting of all holes through tops, backsplashes, shelves and cabinets so other contractors can make connection to outlets, fixtures, etc is this contractor's responsibility.

11. Furnish and install all required hanger channels, rods, and nuts and associated welding required for a complete installation of hood.
12. Coordinate with 15.1 Mechanical and 16.1 Electrical for rough-in requirements throughout the shop drawing process, fabrication and final installation of all new food service equipment.

13. Field verify existing and new electrical provisions are adequate for installation of new food service equipment.

14. Equipment manuals must be submitted to Barton Malow in a collated binder. Barton Malow will not be responsible for locating manuals from shipments.

15. Coordinate BOTH preliminary and final kitchen inspections with the Oakland County Health Department.

16. Furnish and install all items/services not specified or shown on the drawings, but required by governing ordinances.

17. Provide final adjustments and cleaning of equipment.

18. Cover and protect new work to avoid damage.

EXCLUDED FROM THIS CONTRACTOR'S WORK is:

1. **N/A**

SPECIAL CONSIDERATIONS:

1. This Bidder is required to submit unit prices identified in the Bidding Documents which pertain to their work. These prices must be separate from their base bid on the Bid Proposal Form as described in Section 00210 Instructions to Bidders.

2. All work under this scope shall comply with proper trade jurisdictions, even if it is necessary to assemble composite crews or subcontract to appropriate trades.

3. The special provisions outlined in **Section 00210 Description of the Work** form a part of this bid category work description and apply to this Bidder's scope of work.

4. Take special precautions when working near occupied spaces with regards to fumes, noise and pollution levels. Some work may be necessary to be performed after the school day is over at this contractor expense.

5. Any in-place temporary protection that requires any disassembly to perform work, etc. must be replaced by contractor installing new work. Temporary protection must be restored to condition intended.

6. Section **00410, Familial Disclosure Statement, must** be filled out and included with your Bid for your Bid to be accepted.

END OF SECTION 00220 – FOOD SERVICE EQUIPMENT 11.1

SECTION 00220
WORK SCOPE

BID CATEGORY - Mechanical 15.1

The Work of this Bid Category includes but is not limited to providing all labor, equipment, materials, scaffolding, hoisting and incidentals to complete all **mechanical, plumbing, fire protection, and other specified items** in accordance with the Contract Documents and applicable codes. All Work is to be performed as shown on the plans and specified in the following technical Specification sections:

Section	Name
01731	Cutting and Patching
07841	Through-Penetration Firestop Systems
07842	Fire-Resistive Joint Systems
07920	Joint Sealants
08311	Access Doors and Frames
10200	Louvers and Vents
10801	Toilet and Bath Accessories
10520	Fire-Protection Specialtie
All 15000	Mechanical **(INCLUDING TA&B)**

In addition to the above, this Bid Category requires adherence to but not limited to the Bidding Documents, the Bidding and Contract requirements and Division 1 General Requirements of the Project Manual and coordination with various other technical Specifications interfacing with this Work. The Bidder is advised to review the Work descriptions of the other Bid Categories as set forth in Section 00210 of the Project Manual so as to not misunderstand scope responsibilities.

THE SCOPE OF WORK IS TO INCLUDE, but is not limited to, the following items:

1. Reference sheets behind section 00210 Description of the Work for work scope designations to "General Architectural Demo Notes" #1-14, "Architectural Demo Notes" #1-30, and "Roofing Notes" #1-12.

2. Removal and reinstallation of fin tube as required for masonry work around new window openings is the responsibility of this contractor. Reference sheet A1.4.

3. Any mechanical demolition that is required but not shown on the drawings will be the responsibility of this contractor. Reference specification section 15050-3.1 Mechanical Demolition for specified demolition procedures of mechanical items.

4. Refer to Enlarged boiler room demolition notes; the following numbers are the responsibility of this contractor: #1, #2, #5 through #7. 1.1 Demolition will perform bulk demolition. This contractor is responsible for removing water make-up piping including valves, backflow preventer, fittings, etc. and retain backflow preventer for reinstallation and providing temporary cap at compressed air distribution main and providing permanent caps for all open piping. Coordinate with 1.1 Demolition for successful mechanical demolition.

5. Include mechanical, plumbing, fire protection and HVAC demolition as shown on plans. Salvaged items, cutting and capping lines is this contractor's responsibility. Capping lines in building units

that will be connected to future lines, in adjacent units at different times, is the responsibility of this contractor.

6. **Provide on-site supervision by this trade for all subcontractors of this trade.** The contractor's field superintendent shall be present during testing and field reviews conducted by inspection agencies.

7. Furnish all labor, tools, equipment, material and services necessary to install all mechanical systems complete.

8. Any items required for installation of pipe anchors, including but not limited to bolts, plates, and rods, are this contractor's responsibility.

9. Reference specification section 15732-2.9, 15.2 Temperature and Lighting Controls will factory install controls for Packaged, Outdoor, Central-Station Air-Handling Units.

10. This contractor shall field verify all dimensions and furnish dimensional layout drawings and coordinated required roof openings and structural supports for the hood and any other rooftop equipment, per the sequencing of the bid schedule.

11. Reference specification section 15815 Metal Ducts, CAD generated shop drawings ARE required to be submitted prior to fabrication and installation.

12. This contractor is to include fire suppression testing when new water main is installed supplying new and/or existing fire suppression system.

13. Furnish and install all required ductwork and fittings with the hood and exhaust.

14. Coordinate location and installation of new roof top equipment with 7.1 Roofing. This contractor is responsible to coordinate with 1.1 Demolition for existing roof top mechanical equipment that is to be demolished.

15. Refer to sheet FS1.1; it is this contractors responsibility to assemble and install all connecting piping required for food service equipment.

16. It is this contractors responsibility to install the manual activated gas shut-off valve, provided by 11.1 Food Service Contractor.

17. Division 15 notes shown on sheet FS1.1 are the responsibility of this contractor.

18. Troy School District will furnish and install soap dispensers, paper towel holders and toilet paper holders and sanitary napkin disposal. Furnish other toilet and bath accessories as specified.

19. Furnish and install all louvers and vents (including punched metal grilles) complete, including blank-off panels and screens if shown on drawings. Layout openings for 4.1 Masonry to cut openings, at least 2 weeks prior to block installation. Coordination between 4.1 Masonry and 15.1 Mechanical MUST take place throughout new louver installation. Any layout not provided in this time frame may result in a back charge to the 15.1 – Mechanical contractor.

20. 15.1 - Mechanical will provide layout drawings for through wall penetrations of mechanical systems to 4.1 - Masonry at least two weeks prior to block installation in that unit. It is this contractor's responsibility to review CMU openings and provide documentation of a sign off sheet by both parties. Once this sheet is sent to BMC, 15.1 – Mechanical will assume all responsibility for openings.
21. Removal and replacement of existing diffusers and any other mechanical equipment necessary for the ceiling grid and tile replacement is the responsibility of this contractor.
22. The manufacturer for Variable Frequency Drives listed in Specification Section 15055 – Motors shall be ABB Drives, Inc. ONLY.
23. Provide VFD's for 16.1 – Electrical contractor installation and terminations.
24. Furnish and install sleeves required for this contractor's work to 3.1 Concrete or 2.1 Sitework contractor where applicable.
25. Include labor to readjust any such penetrations just prior to any activity that will permanently lock such rough-ins in place, i.e., roof sump pans.
26. Concrete pads shown on the drawings will be the responsibility of 3.1 Concrete. This contractor is responsible to provide all concrete equipment pads required for mechanical equipment but not shown on the drawings.
27. Furnish equipment roof curbs to 7.1 Roofing. Layout in field of these roof curbs to be completed by this contractor. This contractor will coordinate with 7.1 Roofing before any penetrations are made in the roofing system.
28. If installation of gas shut off valves require the block wall to be cut, this work will be the responsibility of this contractor. Gas valve shut off boxes shall be labeled per requirements of the 1999 Michigan School rules.
    a. The rule 10-3.2.3.1 says, The school or designated representative shall ensure that any room which is used for instruction and which has 3 or more gas outlets is provided with a master gas valve which is conveniently located outside the door of the room and which is clearly marked so that the valve may be closed without having to enter the room.
29. Gas shut off valve boxes that are shown to have latch and key lock (refer to mechanical details) shall be retro-fitted to have magnets with pull handles. Latch and key locks to be turned over to the Owner.
30. Pay special attention to chemical waste piping. It is this contractors responsibility to install specified chemical waste piping per specification 15221 Chemical-Waste Piping. This contractor is also responsible for installation of neutralization tank complete.
31. Excavation for, providing and installation of acid waste tank is this contractors responsibility (refer to sheet C1.01).
32. Furnish and install all plumbing fixtures, including emergency eye washes, complete. Coordinate faucet, gas turret, and emergency eye wash holes with 6.1 Carpentry for installation in countertops.

33. Furnish all new mechanical equipment, systems, and components as indicated on the drawings as required for complete systems.

34. Coordinate delivery, receive, unload, store and protect all mechanical equipment. Maintain insurance for equipment in transit, while stored on or off site until equipment is installed.

35. Provide all duct and pipe insulation AND labeling as shown and specified.

36. Furnish and layout piping boots in field for installation by roofing contractor.

37. Furnish and install fire dampers where ductwork penetrates rated wall assemblies. Ensure engineers drawings comply with life safety codes for rated walls.

38. Duct detectors are to be supplied by 16.1 Electrical for placement by 15.1 Mechanical. 15.2 Temperature and Lighting Controls to interlock duct smoke detectors with motor controls for shutdown upon activation.

39. It is this contractor's responsibility to install control valves, dampers, motors, wells, and accessories. Instrument wells and dampers to be furnished by 15.2 – Temperature and Lighting Controls contractor.

40. This contractor shall factory install all DDC controls per mechanical schedules and specifications.

41. Provide all trouble shooting and diagnosis of malfunctioning mechanical systems.

42. Test all systems to assure complete installation and have balancing contractor perform adjusting and balancing. Testing, Adjusting, and Balancing are required to be furnished and installed by 15.1 Mechanical.

43. Correct findings from balancing reports immediately following receipt of reports. Repeat visits, by the balancing contractor (under contract by 15.1 Mechanical) may be required in order to obtain a complete balanced system.

44. Install temporary building enclosure assemblies where openings exist for existing and new mechanical installations. Assemblies shall be wood framed reinforced plywood.

45. It is this contractor's responsibility to modify and/or relocate sprinkler head drops in new ceilings as required.

46. All ductwork shall be kept clean and protected throughout construction. Install necessary coverage at existing branches and/or install temporary fillers to be changed out prior to testing, adjusting and balancing. Provide final cleaning, dusting and washing as needed of all materials, equipment, fixtures and systems installed and/or supplied under this work category. Coordinate the time of implementation with the Construction Manager.

47. Install weather and joint sealants for newly installed equipment and/or louvers. Reference building details. At floors, use backer rod to cover shims and seal.

48. Caulk all products installed by this contractor where required for work of this category.

49. Furnish and install all fire stopping necessary to seal penetrations related to mechanical system installations. Use UL approved products. Maintain indicated fire rating of walls, partitions, ceilings and floors at penetrations.

50. Provide all necessary barricades, safety and warning devices for this work.

51. Furnish access panels and layout locations to 6.1 - Carpentry and/or 4.1 -Masonry contractor. These panels may not be shown on drawings but are necessary for the end user to maintain and access this system.

52. Obtain and pay for all local, state and municipal permit and/or fees required for the execution of the work. On Plumbing Permit Application check Box 24, Certification Fee and include $10.00. **On Mechanical Permit Application check Box 36, Certificate Fee, and include $10.00. These certificates will be turned over to the construction manager with close out documents.**

53. Contractor of this work category shall locate and layout all elevations and locations of pipe or ductwork penetrations required by this category for shown locations. Penetrations required, but not shown, by this work category shall be approved by the Architect prior to installation. A qualified masonry contractor must perform penetrations through masonry that will be exposed to view. Costs for all penetrations required to complete the work of this category will be the responsibility of the Mechanical Contractor.

54. Cutting and welding operations shall cease 2 hours prior to the close of construction each day to minimize the risk of undetected smoldering fire. Contractors performing such operations shall have within their immediate work area, ABC-type fire extinguishers.

55. A walk through must be taken with the Construction Manager, Owner's Representative, Building Head Custodian prior to ceiling tile installation to locate all above ceiling valves. All valves must have location labeled below ceiling level. Documentation of this walk through must be given to Construction Manager in writing the day after the walk through takes place.

56. Complete as-built drawings on reproducibles as specified. Refer to Section 01330-5.03-E for costs associated with this item.

57. Dispose of all unusable material in dumpster daily. Dumpsters will be provided by the Owner for this category. It is the responsibility of each contractor to dispose of their own spoils off site.
58. Perform all activities defined in examination section of 15950 and furnish written report of findings.

59. Review all mechanical and electrical specification sections for balancing requirements and include all costs associated to comply with same.

60. Provide all labor, tools, equipment, material and services necessary to complete all adjusting and balancing specified. Provide (4) copies of Final Certified Balance Reports to BMC.

61. Include a follow up site inspection to verify that any non-compliance items identified in the Final Report have been corrected. Furnish amendment to Final Report documenting findings.

62. All work to be completed in accordance with project schedule.

63. Provide final adjustments and cleaning of equipment and provide Owner training with demonstrations to operate equipment.

64. Provide alternate pricing for alternate A-1 as listed on Bid Proposal Form.

EXCLUDED FROM THIS CONTRACTOR'S WORK is:

1. N/A

SPECIAL CONSIDERATIONS:

1. All work under this scope shall comply with proper trade jurisdictions, even if it is necessary to assemble composite crews or subcontract to appropriate trades.

2. The special provisions outlined in **Section 00210 Description of the Work** form a part of this bid category work description and apply to this bidder's scope of work.

3. This Bidder is required to submit alternate prices identified in the Bidding Documents which pertain to their work. These alternate prices must be separate from their base bid on the Bid Proposal Form as described in Section 00200 Instructions to Bidders.

4. Take special precautions when working near occupied spaces with regards to fumes, noise and pollution levels. Some work may be necessary to be performed after the school day is over at this contractor expense.

5. Any in-place temporary protection that requires any disassembly to perform work, etc. must be replaced by contractor installing new work. Temporary protection must be restored to condition intended.

6. Section **00410, Familial Disclosure Statement, must** be filled out and included with your Bid for your Bid to be accepted.

END OF SECTION 00220 - MECHANICAL 15.1

SECTION 00220
WORK SCOPE

BID CATEGORY – Temperature and Lighting Controls 15.2

The Work of this Bid Category includes but is not limited to providing all labor, equipment, materials, scaffolding, hoisting and incidentals to complete all **temperature and lighting controls and sequence of operations as indicated in specifications, plans and by coordination with Owner** in accordance with the Contract Documents and applicable codes. All Work is to be performed as shown on the plans and specified in the following technical Specification sections:

Section	Name
01721	Cutting and Patching
01732	Selective Demolition
07841	Through-Penetration Firestop Systems
07842	Fire-Resistive Joint Systems
07920	Joint Sealants
13845	Lighting Controls
15900	HVAC Instrumentation and Controls
All 15000	For Reference

In addition to the above, this Bid Category requires adherence to but not limited to the Bidding Documents, the Bidding and Contract requirements and Division 1 General Requirements of the Project Manual and coordination with various other technical Specifications interfacing with this Work. The Bidder is advised to review the Work descriptions of the other Bid Categories as set forth in Section 00210 of the Project Manual so as to not misunderstand scope responsibilities.

THE SCOPE OF WORK IS TO INCLUDE, but is not limited to, the following items:

1. Reference sheets behind section 00210 Description of the Work for work scope designations to "General Architectural Demo Notes" #1-14, "Architectural Demo Notes" #1-30, and "Roofing Notes" #1-12.

2. It shall be the responsibility of this contractor to thoroughly review the mechanical and electrical drawings divisions 15 and 16 specifications in their entirety, to coordinate components to be furnished and or installed to result in fully functioning systems.

3. Furnish hydronic instrument wells and dampers. These items will be installed by 15.1 Mechanical contractor.

4. Control valves are to be furnished by this contractor for installation by 15.1 Mechanical contractor.

5. This contractor to interlock duct smoke detectors with motor controls for shutdown upon activation. Duct detectors are to be supplied by 16.1 Electrical for placement by 15.1 Mechanical.

6. Provide lighting control panels (LCP) as specified in section 13845. The LCP's shall be mounted and placed by this contractor. Field verify placement in field, contact BMC with mounting discrepancies.

7. Provide back boxes for low voltage switches, to be installed by 16.1 Electrical contractor.

8. Provide and install low voltage lighting control devices directly connected to LCP as specified under section 13845, and shown on electrical drawings.

9. Reference specification section 15732-2.9, this contractor is responsible to factory install controls for Packaged, Outdoor, Central-Station Air-Handling Units. Coordinate with 15.1 Mechanical.

10. Provide all labor, tools, equipment, material and services necessary to install complete controls as indicated. Including but not limited to penetrations in floors and walls required for the installation of this work.

11. Provide input to trouble shoot and diagnose malfunctioning mechanical systems and sequence of operation of mechanical systems.

12. All work to be completed in accordance with the project schedule and so not to disturb any finished and rated material or surface.

13. Provide and install all low voltage wiring devices and LCP's with regard to specification section 13845.

14. Cover and protect work as required or conditions warrant.

15. Obtain and pay for all local, state and municipal permit and/or fees required for the execution of the work.

16. Provide Owner with operational instruction as necessary to enable them to operate and maintain new systems controls. Provide signed documentation of instruction session, including date and attendees to BMC within 24hrs of each session. This is a required component for closeout.

17. Complete as-built drawings on reproducibles as specified. Refer to section 01330-5.03-E for costs associated with this item.

18. Broom clean areas at the end of each day's work.

19. Dispose of all unusable material in dumpster daily. Dumpsters will be provided by BMC. It is the responsibility of each contractor to dispose of their own spoils off site.

20. Final cleaning of installed end user devices must be performed.

EXCLUDED FROM THIS CONTRACTOR'S WORK is:

N/A

SPECIAL CONSIDERATIONS:

1. All work under this scope shall comply with proper trade jurisdictions, even if it is necessary to assemble composite crews or subcontract to appropriate trades.

2. The special provisions outlined in **Section 00210 Description of the Work** form a part of this bid category work description and apply to this bidder's scope of work.

3. This Bidder is required to submit alternate prices identified in the Bidding Documents which pertain to their work. These alternate prices must be separate from their base bid on the Bid Proposal Form as described in Section 00200 Instructions to Bidders.

4. Take special precautions when working near occupied spaces with regards to fumes, noise and pollution levels. Some work may be necessary to be performed after the school day is over at this contractor expense.

5. Any in-place temporary protection that requires any disassembly to perform work, etc. must be replaced by contractor installing new work. Temporary protection must be restored to condition intended.

6. Section **00410, Familial Disclosure Statement, must** be filled out and included with your Bid for your Bid to be accepted.

END OF SECTION 00220 – TEMPERATURE AND LIGHTING CONTROLS 15.2

SECTION 00220
WORK SCOPE

BID CATEGORY – Electrical 16.1

The Work of this Bid Category includes but is not limited to providing all labor, equipment, materials, scaffolding, hoisting and incidentals to complete all **fire alarm, lighting protection, selective demolition and electrical systems and items specified** in accordance with the Contract Documents and applicable codes. All Work is to be performed as shown on the plans and specified in the following technical Specification sections:

Section	Name
01731	Cutting and Patching
07841	Through-Penetration Firestop Systems
07842	Fire-Resistive Joint Systems
07920	Joint Sealants
08311	Access Doors and Frames
13845	Lighting Controls
13851	Fire Alarm
14420	Wheelchair Lifts (for reference)
15900	HVAC Instrumentation and controls
All 16000	Electrical

In addition to the above, this Bid Category requires adherence to but not limited to the Bidding Documents, the Bidding and Contract requirements and Division 1 General Requirements of the Project Manual and coordination with various other technical Specifications interfacing with this Work. The Bidder is advised to review the Work descriptions of the other Bid Categories as set forth in Section 00210 of the Project Manual so as to not misunderstand scope responsibilities.

THE SCOPE OF WORK IS TO INCLUDE, but is not limited to, the following items:

1. Reference sheets behind section 00210 Description of the Work for work scope designations to "General Architectural Demo Notes" #1-14, "Architectural Demo Notes" #1-30, and "Roofing Notes" #1-12.

2. Any electrical demolition that is required but not shown on the drawings will be the responsibility of this contractor. All work required in the General Electrical Demolition Notes and Electrical Demolition Notes are the responsibility of this contractor.

3. This contractor will disconnect and remove all existing electrical items and reinstall where necessary, as shown and required. Disconnect power to mechanical equipment to be removed by others. This contractor will connect all new electrical systems to existing systems and provide all new work on existing systems, as required. This contractor is responsible for protection of all existing electrical equipment and systems to remain.

4. Removal of existing incinerator is the responsibility of 1.1 Demolition. Aid 1.1 Demolition contractor if electrical disconnection is required.

5. Provide power to all mechanical equipment consistent with mechanical schedules and specifications from nearest panel unless noted otherwise. Reference all mechanical and electrical schedules.

6. Furnish electrical sleeves and provide layout, as necessary for your work, to be installed by 3.1 Concrete.

7. Concrete pads shown on the drawings will be the responsibility of 3.1 Concrete. This contractor is responsible to provide all concrete equipment pads required for electrical equipment but not shown on the drawings

8. Employ services of a registered surveyor to perform layout of all electrical work.

9. It is this contractor's responsibility to provide any and all electrical testing and inspections as listed in the electrical specifications. Electrical testing reports listed in specification section 16080 Electrical Testing are to be submitted with close out documents.

10. Coordinate with 6.1 Carpentry for removal and securing of lights at ceilings that are to be demolished.

11. Furnish required access panels for work of this trade to 6.1 Carpentry for installation.

12. This contractor to provide duct smoke detectors for placement by 15.1 Mechanical. 15.2 Temperature and Lighting Controls to interlock duct smoke detectors with motor controls for shutdown upon activation.

13. Employ services of a reputable company to locate existing underground technology and power to eliminate damage to existing services for installation of new work.

14. Division 16 notes shown on sheet FS1.1 are the responsibility of this contractor.

15. Notes on FS1.1 that show requirements by E.C. are the responsibility of this contractor.

16. Reference specification section 14420 Wheelchair lifts. Electrical provisions for new wheelchair lift are the responsibility of this contractor. Coordinate with 6.1 Carpentry during submittal process.

17. Complete demolition, cutting, capping, temporary service connections and/or return to service as indicated on the electrical demolition plans and notes. Turn over salvaged items as directed. Maintain and/or provide safe electrical systems while in a temporary status.

18. Maintain existing fire alarm system until all new components, panels and systems are installed and tested. Existing fire alarms to be removed at appropriate time.

19. Submit fire alarm shop drawings to governing agencies for approval 3 weeks after award of 16.1 Electrical contract. Since this contractor is specialized and working under performance specifications, added devices in new areas from State review will NOT be compensated for.

20. Furnish and install all labor and material to install all electrical site elements complete. Concrete pole bases are this contractor's responsibility. This contractor is responsible for the re-seeding of disturbed green belt areas due to this contractor's work.

21. Furnish all access panels required to service the electrical systems but which are not shown on the drawings to 6.1 Carpentry for installation.

22. Protect all thru-wall, floor and ceiling penetrations against damage. Include cost to re-adjust such rough-ins just prior to secured in-place. Coordinate this adjustment with the appropriate contractor.

23. Install blank covers at all abandoned boxes.

24. The masonry, electrical and carpentry contractor will share the responsibility for a square / plumb installation of all electrical and technology boxes, any cost incurred to adjust boxes to ensure a quality finished product will be shared by these contractors.

25. Install back boxes for the low voltage switches, to be provided by 15.2 Temperature and Lighting Controls.

26. Install VFD's provided by 15.1 Mechanical.

27. Supply power to all mechanical fire/smoke dampers, and any other dampers requiring power.

28. Coordinate delivery, receive, unload, store and protect all electrical equipment. Maintain insurance for equipment in transit, while stored on or off site until equipment in installed.

29. Coordinate electrical device locations with architectural elements, i.e. tack boards, casework and marker boards prior to installation of electrical boxes to avoid installation conflicts.

30. The contractor's field superintendent must be present during testing and field reviews conducted by inspection agencies.

31. All contactors must be labeled on the front of the box as to what they control. If located above ceilings the location must be noted below ceiling level.

32. A walk through with the Construction Manager, Owner Representative, and building head custodian must be done and documented prior to completion of the project to show the location of all above ceiling control devices.

33. All panel boxes must be labeled with permanent room numbers.

34. Provide and maintain all necessary barricades, safety and warning devices until work is safe and complete.

35. Provide and install all fire stopping and joint sealants necessary to seal penetrations related to electrical system installations. Use UL approved products. Maintain indicated fire rating of walls, partitions, ceilings and floors at penetrations.

36. Obtain and pay for all necessary state and local permits, fees and insurance to perform this work. **On Electrical Permit Application check box 30 Certificate Fee and include $10.00.** This certificate will be turned over to the construction manager with close out documents.

37. The manufacturer for occupancy sensors listed in Specification Section 16145 Lighting Control Devices shall be Leviton ONLY.

38. Provide and install all lighting and associated wiring indicated on the drawings and specified in Section 16145.

39. Complete as-built drawings on reproducibles as specified, Refer to Section 01330-5.03-E for costs associated with this item.

40. With regard to Specification Section 13845, install all light control contactors and LCP's provided by 15.2 (Lighting and Temperature Controls) contractor. All branch circuit relay switching and rough-ins for low voltage switches is the responsibility of this contractor.

41. Install only temperature sensors as specified in 15900. Include rough-in of temperature sensor device in this contractors work.

42. Provide and install all conduit rough-ins for wall mounted thermostats, sensors and lighting control switches as shown on mechanical and electrical drawings. Minimally, each rough-in should consist of a single gang switch box with ½" EMT turning out above finished ceiling on the same side of the wall as the equipment, which is served by the thermostat, sensor or switch. Coordinate this work with 15.3 – Temperature and Lighting Controls contractor as certain sensors or lighting control switches may require alternate rough-on requirements that are to be included in your base bid.

43. It is this contractor's responsibility to ensure that all occupancy sensors or power packs have auxiliary contacts needed for BMS systems, per details.

44. Dispose of all unusable material in dumpster daily. Dumpsters will be provided by BMC. It is the responsibility of each contractor to dispose of their own spoils off site.

45. Provide alternate pricing for alternates E-1 and E-2as listed on Bid Proposal Form.

46. Include an allowance of $10,000 to be used for low voltage remediation, to be used at Barton Malow's discretion. Any and all time tickets pertaining to this allowance are to be signed by Barton Malow and submitted on a daily basis. No time tickets will be accepted unendorsed. Allowance when billed shall be exclusive of mark-ups and fees. Include these costs in your base bid.

EXCLUDED FROM THIS CONTRACTOR'S WORK is:

1. **N/A**

SPECIAL CONSIDERATIONS:

1. All work under this scope shall comply with proper trade jurisdictions, even if it is necessary to assemble composite crews or subcontract to appropriate trades.

2. The special provisions outlined in **Section 00210 Description of the Work** form a part of this bid category work description and apply to this bidder's scope of work.

3. This Bidder is required to submit alternate prices identified in the Bidding Documents which pertain to their work. These alternate prices must be separate from their base bid on the Bid Proposal Form as described in Section 00200 Instructions to Bidders.

4. Take special precautions when working near occupied spaces with regards to fumes, noise and pollution levels. Some work may be necessary to be performed after the school day is over at this contractor expense.

5. Any in-place temporary protection that requires any disassembly to perform work, etc. must be replaced by contractor installing new work. Temporary protection must be restored to condition intended.

6. Section **00410, Familial Disclosure Statement, must** be filled out and included with your Bid for your Bid to be accepted.

END OF SECTION 00220 - ELECTRICAL 16.1

SECTION 00230
SCHEDULE AND PHASING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 MILESTONE SCHEDULE

A. The following are the milestone schedule dates for the listed work and will become a part of the Contract Documents. Each contractor is responsible to review the supplementary General Conditions for additional requirements. The master construction schedule will be developed after award of the Agreement with Contractor input.

MILESTONE ACTIVITIES	SCHEDULED START	SCHEDULED COMPLETION
Last pre-bid RFI taken	July 19, 2007	-
Receive Bids	July 31, 2007	-
Issuance of Contracts (tentatively)	August 22, 2007	-
Submittal Due Date	September 5, 2007	-
Begin Construction	September 24, 2007	-
Owner Turn Over	Spring 2008	-

Close coordination will be required between all construction trades in order that individual areas of renovation and new construction can be completed within the scheduled time. Consult the proposed construction sequence and renovation sequence schedules and key plans found in Part 2 for start and completion dates of individual Work areas.

B. It is expressly agreed that time is of the essence for the completion of Work under the Agreement and **Contractor** agrees to perform the Work within the allotted time and in the manner specified. **Contractor** shall be liable for any and all damages and expenses suffered by the Owner or Barton Malow Company arising or resulting from the failure of **Contractor** to perform the Work in accordance with the construction schedule.

1.03 CONSTRUCTION SCHEDULE DEVELOPMENT PROCESS

A. **Contractor** agrees to commence Work in the field within five (5) Days after being notified to do so by the Barton Malow Company. **Contractor** shall diligently perform and fully complete all Work to the satisfaction of Barton Malow Company and Owner.

Work shall begin at such points as Barton Malow Company may designate and shall be carried to completion with the utmost speed.

B. **Contractor** shall submit to Barton Malow Company **within fifteen (15) Days of award of the Agreement a Bar Chart/CPM construction schedule using all necessary scheduling information using Barton Malow Company specified coding** of all activities contained in the **Contractor's** scope of Work. This schedule shall include activity descriptions and durations in working days, for shop drawings, fabrication, delivery and installation of products, materials and equipment. This schedule shall identify precedent relationships between **Contractor's** activities and those of other **contractors**, the dollar value, necessary manpower loadings, and precedent activities for other **contractors**. The activities on the schedule must be at a level of detail approved by Barton Malow Company and should agree with the terminology and building sequencing established by Barton Malow Company.

C. Barton Malow Company will compile all **Contractors'** schedules and develop a project master construction schedule. Once the individual **Contractors** schedules are agreed upon by Barton Malow Company, this project master construction schedule will become the project plan for construction.

D. Special requirements and/or sequencing issues should be brought to the attention of Barton Malow Company. It is intended the milestones remain in effect and all Bidders agree to accept the milestone dates. Barton Malow Company reserves the right to revise the project master construction schedule as deemed necessary.

E. Barton Malow Company shall periodically update the project master construction schedule and display it at the Project site. Contractor shall familiarize itself with the project master construction schedule and how it will affect or modify its operations, including coordination with the activities of other **contractors**. Reasonable changes in sequencing, durations and phasing are to be expected with each master schedule update. These changes will be made by **Contractor** at no additional cost.

F. If it is apparent **Contractor** is unable to perform its Work in the sequence indicated or the time allotted, **Contractor** must notify Barton Malow Company within five (5) Days after initial publication of the project master construction schedule. **Contractors** schedule of activities may be re-sequenced, and the schedule may be adjusted, provided all Work is completed within the stated milestone dates and provided Barton Malow Company and affected **contractors** are notified of the change within five (5) calendar days of receipt of the schedule and the change does not otherwise negatively impact the other scheduled work; otherwise, the project master construction schedule shall be deemed accepted by all parties and becomes a contractual requirement for each **Contractor**.

G. If **Contractor** delays progress for any reason other than those delays specifically excused under the Contract Documents, Contractor will take all necessary steps to expedite its Work to maintain milestone target dates at no expense or additional cost to Owner or Barton Malow Company.

H. If **Contractor** is behind schedule and is so notified by Barton Malow Company, **Contractor** shall be required to accelerate the Work at its own expense. **Contractor** shall furnish to Barton Malow Company a short interval schedule of its Work showing location, number of men and crew required to get back on the agreed upon master construction schedule. If **Contractor** fails to maintain and meet the short interval schedule, **Barton Malow Company** reserves the right to take whatever steps it deems necessary in its sole discretion to recover the schedule at the **Contractor**'s expense. The **Contractor** shall employ such means as overtime work, multiple work shifts, and additional equipment, all without additional compensation, and shall continue to do so until the progress of the Work, in the opinion of Barton Malow Company, is in conformance with the master project construction schedule.

I. **Contractor** agrees that it shall have no claim against the Owner, Architect, or Barton Malow Company for an increase in the contract price nor for a payment or allowance of any kind for damage, loss, or expense arising or resulting from delays, regardless of whether the delay is the basis for an extension of time. This provision includes claims for damage, loss, or expense arising or resulting from interruptions to, or necessary suspension of, **Contractor**'s Work to enable other **contractors** to perform their work.

END OF SECTION 00230

SECTION 00400
BID PROPOSAL FORM
(Submit in Triplicate)

DATE: _____

TO: **Troy School District**
4400 Livernois Road
Troy, MI. 48098

PROJECT: **International Academy East**
Bid Package No. 9444

Attn: **Barton Malow Company**
1301 Boyd
Troy, MI 48083
Call 248-823-4631, with any questions

Architect: **Kingscott Associates, Inc.**

FROM:

Name of Bidder: _____

Business Address: _____

_____

Phone Number: _____

Fax Number: _____

Bid Proposal for Category(ies): _____

Bidder, in compliance with the **Advertisement to Bid** for construction contemplated for **Bid Package No. 9444 International Academy East** having carefully examined the Bidding Documents and the site of the proposed Project and the conditions affecting the proposed Work in the Bid Category(ies) including the condition of the Project site, any surface or subsurface obstruction, the actual levels, all excavating, filling in, removal and demolition, measurements and quantities involved in the Work, the availability of labor, materials and equipment, and the weather conditions that may possibly may be experienced in the Project vicinity, proposes to furnish all labor, materials, tools, equipment, machinery, equipment rental, transportation, superintendence, and services as are necessary to perform all Work in the Bid Category(ies) stated in accordance with the Contract Documents for the Base Bid and Alternate amounts stated below.

If identified as one of the apparent lowest responsive, responsible bidder(s) for a Bid Category Bidder agrees to meet immediately with the Barton Malow Company and shall submit post bid information as described in Section 00200 Instructions to Bidders.

Bidder, if awarded a contract, agrees to: (1) execute the Agreement within fifteen (15) days of receiving notice of the award; (2) provide performance/payment bonds and insurance certificates in full compliance with the Contract Documents, (3) submit the Project Safety Program as described in Section 00200 Instructions to Bidders; (4) commence Work upon execution of the Agreement or at such other time as directed in the notice of award, and (5) to complete its Work in accordance with the Contract Documents and within the milestone activity dates and durations set

forth in the Bidding Documents and subsequent construction project master schedule established by Barton Malow Company.

In the event Bidder defaults in complying with any portion of this paragraph, Bidder specifically agrees that the entire bid security amount shall become the property of **Troy School District** as liquidated damages constituting the reasonable estimate of the damages that Troy School District would incur for delays and additional expenses in the event of such default, and not as a penalty.

BASE BID: Bidder agrees to perform all Work for Bid Category(ies) as described in the Contract Documents, for the Base Bid(s) stated below. The Base Bid(s) shall include the cost of Performance and Payment Bonds. For each Bid Category to be bid, include the Base Bid, written and in figures, the cost of the Performance Bond and Payment Bond which is included in the Base Bid, written and in figures, and the Bid Category and description. The cost of the Performance Bond and Payment Bond shall be treated as a deduct Alternate should the Owner and Barton Malow Company decide to waive the requirement for the successful Bidder providing same.

(Show amounts in both words and figures. In case of discrepancy, amount shown in words will govern).

BASE BID MUST INCLUDE BID AMOUNTS FOR ALL OF BP#9444 WORK. BIDS THAT DO NOT INCLUDE A PRICE FOR ALL WORK WILL NOT BE ACCEPTED.

BID CATEGORY	WRITTEN DESCRIPTION/AMOUNT(S)	BID AMOUNT IN FIGURES
1. Bid Category No. _____		
Base Bid (including bond)	_____ DOLLARS	$ _____
Amount included for bond	_____ DOLLARS	$ _____

COMBINED BID: Bidder agrees to perform all Work necessary to complete the Work in Bid Categories _____, _____, _____, in full accordance with the Contract Documents, for the lump sum of:

COMBINED BID AMOUNT	WRITTEN DESCRIPTION AMOUNT(S)	BID AMOUNT IN FIGURES
Base Bid (including bond)	_____ DOLLARS	$ _____
Amount included for bond	_____ DOLLARS	$ _____

ALTERNATES: The following Alternate(s) to Base Bid(s) are required to be offered by the respective bidders. **Further description of these alternates can be found in Kingscott Specification Section 01230 Alternate.** In the event the Alternate is accepted, Bidder agrees to perform all Work necessary to complete the Work as modified by the Alternate in full accordance with the Contract Documents, for the following add or deduct from the Base Bid as indicated: (Show amount(s) in both words and figures for Alternates. In case of discrepancy, amount shown in words will govern.)

ALTERNATES:

A-1 Exterior Window Replacement (see specification section 01230 and drawings). Demolition of existing windows by 1.1 Demolition; temporary protection of windows and providing new by 8.1 Aluminum Doors, Windows and Glazing; remove and reinstall down spot as required for window replacement by 15.1 Mechanical.

BID CATEGORY	WRITTEN DESCRIPTION OF ALTERNATE AMOUNT(S)	ADD	DEDUCT
1.1, 8.1, 15.1		$	$

For the amount of: _____ DOLLARS

E-1 Approved equal by Philips of Sylvania for new linear fluorescent lamps (see general lighting note #8).

BID CATEGORY	WRITTEN DESCRIPTION OF ALTERNATE AMOUNT(S)	ADD	DEDUCT
16.1		$	$

For the amount of: _____ DOLLARS

E-2 Approved equal by Advance for new ballasts (see general lighting note #8).

BID CATEGORY	WRITTEN DESCRIPTION OF ALTERNATE AMOUNT(S)	ADD	DEDUCT
16.1		$	$

For the amount of: _____ DOLLARS

VOLUNTARY ALTERNATES: The following Voluntary Alternates are offered by the Bidder. Bidder agrees that the amounts indicated below shall be added to or deducted from the Base Bid, as indicated, for each voluntary Alternate that is accepted.

(Show amount(s) in both words and figures for voluntary alternates. In case of discrepancy, amount shown in words will govern.)

BID CATEGORY	WRITTEN DESCRIPTION OF VOLUNTARY ALTERNATE AMOUNT(S)	ADD	DEDUCT
1.		$	$
	For the amount of: _____ DOLLARS		
2.		$	$
	For the amount of: _____ DOLLARS		
3.		$	$
	For the amount of: _____ DOLLARS		

UNIT PRICES: The following Unit Prices to Base Bid Categories are required to be offered by the respective Bidders. Bidder agrees that the following amounts will be used in determining contract changes from the Base Bid for authorized Changes in the Work. Bidder shall not include these unit costs in the Base Bid amount(s). **[All unit prices shall include Bidder's mark-up for overhead and profit.]**

	BID CATEGORY CODE	DESCRIPTION OF UNIT PRICE	UNIT PRICE ADD	UNIT PRICE DEDUCT
1.	2.1	Undercuts sq. ft. (geofiber, 1ft. 3 in. crushed concrete, appropriate limestone sub base)	$	$
2.	2.1	21 AA Limestone cu. yd.	$	$
3.	2.1	Topsoil cu. yd.	$	$
4.	2.1	Sand cu. yd.	$	$
5.	2.1	Sidewalk lineal ft. (5 x 5)	$	$
6.	2.1	Asphalt	$	$
7.	3.1	Concrete 3000 PSI cu. yd.	$	$
8.	6.1	Drywall patch ready for paint sq. ft.	$	$
9.	6.1	Replace 2 x 2 ceiling tile (only)	$	$
10.	6.1	Replace 2 x 4 ceiling tile (only)	$	$
11.	6.1	Replace ceiling grid 2 x 2 (only)	$	$
12.	6.1	Replace ceiling grid 2 x 4 (only)	$	$
13.	9.1	Painting sq. ft.	$	$
14.	9.3	Rubber base installation	$	$
15.	9.2 / 9.3	Floor prep per hour	$	$

All applicable taxes and bond costs are included in the above Base Bid and all listed Alternates and Unit Prices.

Bid Security in the form of a bid bond from a qualified surety ( ), certified check ( ), or cashier's check ( ), (check one) accompanies this proposal in the amount of five (5) percent of the Base Bid amount(s). Bidder agrees that this Bid Proposal shall be irrevocable for a period of **ninety (90)** days after the day and time designated for receipt of the Bid Proposal in Section 00100 of the Project Manual.

As of the date of submission of the Bid Proposal, Bidder's worker's compensation Experience Modification Rate (EMR) for the state in which the Work is to be performed is _____._____. Bidder has attached to the Bid Proposal form the following (3) forms:

1.) OSHA Form 300 indicating recordable incidence rates for the last calendar year per 200,000 man-hours for the following categories:

1) Total Cases _____
2) Lost Workday Cases _____
3) Non-fatal Cases Without Lost Workdays _____
4) Employee Hours Worked Last Year _____
5) Fatalities in the last year (if yes describe below)

_____
_____
_____

2.) Affidavit of Bidder (Familial Relationship Disclosure) Form located in section 00410

Has Bidder been cited by state of federal OSHA for any serious or willful violation? If yes, please describe:

_____
_____
_____

Bidder understands that **Troy School District** reserves the right to reject any or all Bid Proposals and to waive any informalities or irregularities therein.

Bidder acknowledges receipt of the following Addenda (identify no. and date of each): _____

_____

Bidder acknowledges receipt of the pre-bid conference minutes dated _____

_____

If awarded a contract, Bidder's surety will be _____.

Check

☐ I have included a fully executed and notarized copy of the familial disclosure form set forth in Section 00410 of this Project Manual with my Bid Proposal.

Bidder accepts the provisions of the Bidding and Contract Documents and certifies that this Bid Proposal is submitted in good faith and without collusion with any other person or entity submitting a Bid Proposal for the Work. If Bidder is required to be licensed in the state where the work is performed add "Bidder certifies that it meets all licensing requirements of the state in which work is to be performed, its current license number and classification are as follows:_____". Bidder hereby affixes its authorized signature(s) representing (check one):

_____ An individual doing business as _____
_____ A partnership
_____ A limited liability company, organized in _____ (enter state)
_____ A corporation, organized in _____ (enter state)
_____ Joint venture formed between _____ and _____
(Signature from authorized representatives of each partner are required)

Signature(s): _____ Title: _____

_____ Title: _____

Name of firm: _____

Business address: _____

_____

Telephone no.: ( ) _____

END OF SECTION 00400

SECTION 00410
FAMILIAL RELATIONSHIP DISCLOSURE FORM
AFFIDAVIT OF BIDDER

All Bidders must complete the following familial disclosure form in compliance with MCL 380.1267 and attach this information to the Bid Proposal.

The undersigned, the owner or authorized officer of _____ (the "Bidder"), pursuant to the familial disclosure requirement provided in the Advertisement for Bid, Section 00100 of the Project Manual, hereby represents and warrants, except as provided below, that no familial relationships exist between the Owner(s) or any employee of _____ and any member of the Board of Education of the School District or the Superintendent of the School District.

List and describe any Familial Relationships:

_____

_____

_____

BIDDER:

_____

By: _____

Its: _____

STATE OF MICHIGAN

COUNTY OF _____

Subscribed and sworn to before me on the _____ day of _____ 2005, by

_____.

_____
Notary Public

_____ County, Michigan

My Commission Expires _____

Acting in County of _____

END OF SECTION 00410

SECTION 00500
AGREEMENT FORM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

B. Specific attention is directed to the requirements described in Section 00700 General Conditions of the Contract and Section 00800 Supplementary General Conditions.

1.02 AGREEMENT FORM

A. The form of Agreement that will be used for Work under this Bid Package shall be **AIA 101/CMa** Document - 1992 Edition.

1. The above Agreement Form is **behind this section.**
2. Comments:
   - Refer to section 00880 Regulatory Requirements for tax requirements.
   - Refer to Section 01290 Payment procedures for payment process

END OF SECTION 00500

SECTION 00610
BONDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

B. Specific attention is directed to the requirements described in Section 00200 Instructions to Bidders regarding preparing a Bid Security to be delivered at time of bid.

PART 2 - BOND REQUIREMENTS

2.01 PERFORMANCE BONDS AND PAYMENT BONDS

A. Troy School District will, require Contractor to furnish a Performance Bond and a Payment Bond, in amounts equal to the Agreement price, by a qualified surety naming both the Owner and Barton Malow as Obligees. All sureties providing bonds on this Project must be listed in the Department of Treasury's Circular 570, entitled "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" with the bond amounts less than or equal to the underwriting limitation indicated in the Circular, and/or must have an A.M. Best rating of A - or better. Bonds shall be duly executed by the Contractor, as principal, and by a surety that is licensed in the state in which the Work is to be performed.

B. The Contractor shall deliver the required bonds to Barton Malow Company prior to execution of the Agreement. If the Work is to be commenced prior thereto in response to a letter of intent, the Bidder, at a minimum, shall submit evidence to the satisfaction of Barton Malow Company that such bonds will be furnished prior to commencement of on site Work. In no event may the Contractor commence on-site Work without the required bonds properly issued and delivered.

C. Performance Bond and Payment Bond form AIA Document A312 (1984 Edition) must be used for this Project.

D. The Bidder's proposed surety must be acceptable to the Owner and Barton Malow Company. If, at any time, after acceptance of the **Contractor's** bonds, the surety fails to meet the criteria stated in Paragraph 2.01A. above, the **Contractor** must, as a precondition to continuing Work and receiving further payments, replace the bonds with bonds from a surety that meets the stated criteria.

E. The Performance and Payment Bond penal sums (i.e. the Agreement price) must be listed as a separate line item in the schedule of values described in Section 01290 Payment Procedures in the Project Manual.

F. In the event of a Change Order to the Agreement that increases the Agreement price, the penal sum of any required Performance and Payment Bonds shall also be increased so that each penal sum equals the adjusted Agreement price, or such other percentage of the Agreement price listed in the Project Manual - Section 00200 –Instructions to Bidders. Barton Malow Company or Owner shall have the right to request submission of bond riders, issued by the original qualified surety, evidencing that such increase to the penal sum of the bonds has been accomplished. Notwithstanding the foregoing, in the next pay application after the Agreement price has been increased by twenty-five percent (25%) or more, as a condition precedent to payment, Contractor shall deliver a bond rider issued by the original qualified surety evidencing that the appropriate increase in penal sums has been accomplished. See Project Manual Section 01290 – Payment Procedures.

END OF SECTION 00610

SECTION 00620
INSURANCE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

B. A sample of the Certificate of Insurance (ACORD) form is in Section 01600 Forms.

1.02 STANDARD INSURANCE REQUIREMENTS

1. Barton Malow Company Contractor Insurance Requirements for Agency Work, PRO 15.14, shall govern this Project. A copy of these Insurance Requirements is attached in this Section, immediately following this page.

BARTON MALOW COMPANY
CONTRACTOR
INSURANCE REQUIREMENTS

For agency work

1. As a condition of performing work under the Agreement, Contractor will keep in force, at all times during performance of the Work, policies of insurance covering all Basic Insurance Requirements and any applicable Supplemental Insurance Requirements. The requirements identified below are minimum requirements. If the Agreement or other Contract Documents impose additional or higher standards, Contractor shall meet those as well. Where a Controlled Insurance Program ("CIP") is specified in the Contract Documents, these insurance requirements shall not apply to coverages supplied by the CIP, but shall apply to coverages which Contractor is required to carry outside the scope of the CIP.
2. Basic Insurance Requirements
   2.1. Workers' Compensation covering Contractor's statutory obligations in the State(s) in which the Work is to be performed or Federal statutory obligations, if applicable to the Project, and Employers' Liability insurance with limits of liability of $1,000,000 per accident. Where applicable, a US Longshore and Harborworker's Compensation Act endorsement must be included.
      2.1.1. If Contractor employs the services of leased employees for the Work or for a portion of the Work, it will be required to submit evidence, to the satisfaction of Barton Malow Company, that such leased employees are fully covered by the minimum limits of Workers' Compensation and Employers' Liability Insurance. Such evidence shall include, but not be limited to, submission of the applicable leasing agreement.
   2.2. Automobile Liability insurance with the limit of $1,000,000 per accident covering Contractor's owned, non-owned and hired automobiles.
   2.3. Commercial General Liability insurance written on the 1988 ISO OCCURRENCE policy form or subsequent versions with limits of liability as follows:

General Aggregate	$2,000,000
Products-Completed Operations Aggregate	$2,000,000
Personal/Advertising Injury	$2,000,000
Each Occurrence	$2,000,000

   This coverage shall include coverage for premises-operations, independent contractors' protective, products and completed operations, personal injury and broad form property damage (including coverage for explosion, collapse, and underground hazards), and Contractual Liability protection with respect to Contractor's indemnification obligations under the Contract Documents. Products-completed operations coverage must be maintained for at least two years after final completion of the Project.
3. Supplemental Insurance Requirements
   3.1. Watercraft Protection and Indemnity Liability insurance if any of the Work is on or over navigable waterways or involves use of any vessel. Limits are to be approved by Barton Malow Company in writing.
   3.2. Aircraft Liability insurance if any aircraft is used in performance of the Work. Limits are to be approved by Barton Malow Company in writing.
   3.3. Railroad Protective Liability insurance if any of the Work is on or within 50 feet of any railroad or affects railroad property, including but not limited to tracks, bridges, tunnels, and switches. Limits are to be approved by Barton Malow Company in writing.
   3.4. Professional Liability insurance, if Professional Services are provided, with limits of liability as follows:

Each Claim	$5,000,000
Aggregate	$5,000,000

   Contractor shall keep such Professional Liability insurance in force during the Agreement, and for three years after final completion of the Project.
   3.5. Pollution Liability insurance, which must be on an occurrence basis, if Environmental Services are provided. "Environmental Services" means any abatement, removal, remediation, transporting, or disposal of a Hazardous Material, or any assessments or consulting relating to same. Limits of liability for Pollution Liability insurance shall be as follows:

Each Occurrence	$5,000,000
Aggregate	$5,000,000

4. General Provisions.
   4.1. Every policy must be written by an insurance company licensed in the state where work is being done and is reasonably acceptable to Barton Malow Company and Owner.
   4.2 Limits for Employer's Liability, Commercial General Liability and Automobile Liability may be attained by a combination of an underlying policy with an umbrella or excess liability policy.
   4.3. "Barton Malow Company," Owner, and all other entities as required in the Contract Documents shall be endorsed as additional insureds on Contractor's liability insurance (including general liability, excess liability, automobile liability and pollution liability, where applicable) with respect to liability arising out of activities performed by

or on behalf of Contractor, including Barton Malow Company's general supervision of Contractor, products and completed operations of Contractor, and automobiles owned, leased, hired or borrowed by Contractor. The coverage provided by the additional insured endorsement shall be at least as broad as the Insurance Service Office, Inc.'s Additional Insured, Form B CG 20 10 11 85 or CG 20 26 11 85. Forms that do not provide additional insured status for completed operations will not be accepted.

4.4. Contractor will furnish, before any work is started, certificates of insurance showing the required coverages. Receipt by Barton Malow Company of a non-conforming certificate of insurance without objection, or Barton Malow Company's failure to collect a certificate of insurance, shall not waive or alter Contractor's duty to comply with the insurance requirements. Modifications to these insurance requirements will not be effective unless made in a writing executed by an authorized representative of Barton Malow Company. Upon written request by Barton Malow Company, Contractor will provide copies of its insurance policies.

4.5. Evidence of the required insurance is to be provided to Barton Malow Company on ACORD Certificate Form 25-S and must indicate:

4.5.1. Any coverage exclusions or deviations from the 1988 ISO commercial general liability form or subsequent versions;

4.5.2. A Best's rating for each insurance carrier at A minus VII or better;

4.5.3. That the issuing insurance company will provide thirty (30) days written notice of cancellation to the certificate holder and the words "endeavor to" and "but failure to mail such notice shall impose no obligation or liability of any kind upon the company, its agents or representatives" do not apply or have been removed;

4.5.4. That additional insured endorsements have been provided as required under the Contract Documents; and

4.5.5. Any deductibles over $10,000 applicable to any coverage.

4.6. All coverage must be primary and not excess over or contributory with any other valid, applicable, and collectible insurance in force for Barton Malow Company, Owner, or other additional insureds.

4.7. Contractor will provide full coverage for all of Contractor's equipment, property and tools used in the Work.

4.8. Contractor shall waive, and shall require (by endorsement or otherwise) its insurers providing the coverage required by these insurance requirements to waive, subrogation rights against Barton Malow Company, Owner, and all other additional insureds for losses and damages incurred and/or paid under the insurance policies required by these insurance requirements or other insurance applicable to Contractor or its Subordinate Parties, and will include this same requirement in contracts with its Subordinate Parties. If the policies of insurance referred to in this paragraph require an endorsement to provide for continued coverage where there is a waiver of subrogation, the owners of such policies will cause them to be so endorsed.

4.9. Contractor will send or fax a copy of these insurance requirements to its agent when an insurance certificate is requested to assure that the policies comply with the insurance requirements.

4.10. If Contractor requires its Subordinate Parties to provide additional insured endorsements in favor of Contractor, those endorsements shall be extended to Barton Malow Company, Owner and all other required additional insureds.

4.11. Contractor's duty to provide the insurance coverage set forth in these insurance requirements is a severable obligation from Contractor's indemnification obligations under the Contract Documents. Nothing in these insurance requirements shall be deemed to limit Contractor's liability under the Agreement.

4.12. If these insurance requirements are used in conjunction with a Project where an Affiliated Company of Barton Malow Company is acting as Construction Manager, Design Builder or otherwise (the "Construction Entity"), the term "Barton Malow Company" as used in these insurance requirements shall be deemed to be replaced with the name of the Construction Entity, and the additional insured requirements of Section 4.3 above shall be amended to include "Barton Malow Company", and all partners and/or members of the Construction Entity as applicable. "Affiliated Company" means any entity in which Barton Malow Company has an ownership interest.

SECTION 00700
GENERAL CONDITIONS OF THE CONTRACT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

B. Specific attention is directed to the requirements described in Section 00800 Supplementary General Conditions and Section 00500 Agreement Form.

1.02 GENERAL CONDITIONS OF THE CONTRACT

A. Document **AIA 201/CMa 1992** Edition, is bound within this Project Manual and is a part of the Contract Documents

END OF SECTION 00700

AIA Document A201/CMa - Electronic Format

General Conditions of the Contract for Construction

Where the Construction Manager is NOT a Constructor

1992 Construction Manager-Adviser Edition

THIS DOCUMENT HAS IMPORTANT LEGAL CONSEQUENCES; CONSULTATION WITH AN ATTORNEY IS ENCOURAGED WITH RESPECT TO ITS MODIFICATION. AUTHENTICATION OF THIS ELECTRONICALLY DRAFTED AIA DOCUMENT MAY BE MADE BY USING AIA DOCUMENT D401.

Copyright 1975, 1980, © 1992 by The American Institute of Architects, 1735 New York Avenue N.W., Washington D.C. 20006-5292. Reproduction of the material herein or substantial quotation of its provisions without written permission of the AIA violates the copyright laws of the United States and will subject the violator to legal prosecution.

Table of Articles

1. GENERAL PROVISIONS
2. OWNER
3. CONTRACTOR
4. ADMINISTRATION OF THE CONTRACT
5. SUBCONTRACTORS
6. CONSTRUCTION BY OWNER OR BY OTHER CONTRACTORS
7. CHANGES IN THE WORK
8. TIME
9. PAYMENTS AND COMPLETION
10. PROTECTION OF PERSONS AND PROPERTY
11. INSURANCE AND BONDS
12. UNCOVERING AND CORRECTION OF WORK
13. MISCELLANEOUS PROVISIONS
14. TERMINATION OR SUSPENSION OF THE CONTRACT

INDEX

Acceptance of Nonconforming Work 9.6.6, 9.9.3. **12.3**
Acceptance of Work 9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3
Access to Work **3.16,** 6.2.1, 12.1
Accident Prevention 4.6.6, 10
Acts and Omissions 3.2.1, 3.2.2, 3.3.2, 3.12.8, 3.18, 4.6.6, 4.6.2., 4.7.9, 8.3.1, 10.1.4, 10.2.5, 13.4.2, 13.7, 14.1
Addenda 1.1.1, 3.11
Additional Costs, Claims for 4.7.6, **4.7.7,** 4.7.9, 6.1.1, 10.3
Additional Inspections and Testing 4.6.10, 9.8.2, 12.2.1, 13.5
Additional Time, Claims for 4.7.6, **4.7.8,** 4.7.9, 8.3.2, 10.3
ADMINISTRATION OF THE CONTRACT 3.3.3, **4,** 9.4, 9.5
Advertisement or Invitation to Bid 1.1.1
Aesthetic Effect 4.6.20, 4.9.1
Allowances 3.8
All-risk Insurance 11.3.1.1
Applications for Payment 4.6.9, 7.3.7, 9.2, **9.3,** 9.4, 9.5.1, 9.6.3, 9.8.3, 9.10.1, 9.10.3, 9.10.4, 11.1.3, 14.2.4
Approvals 2.4, 3.3.3, 3.5, 3.10.3, 3.12.4 through 3.12.8, 3.18.3, 4.6.12, 9.3.2, 11.3.1.4, 13.4.2, 13.5
Arbitration 4.5, 4.7.4, **4.9,** 8.3.1, 10.1.2, 11.3.9, 11.3.10
Architect **4.1**
Architect, and Certificate of Payment 4.6.9
Architect, Definition of 4.1.1
Architect, Extent of Authority 2.4.1, 3.12.6, 4.6.6, 4.7.2, 5.2, 6.3, 7.1.2, 7.2.1, 7.4, 9.2, 9.3.1, 9.4, 9.5, 9.6.3, 9.8.2, 9.8.3, 9.10.1, 9.10.3, 12.1, 12.2.1, 13.5.1, 13.5.2, 14.2.2, 14.2.4
Architect, Limitations of Authority and Responsibility 3.3.3, 3.12.8, 3.12.11, 4.6.5, 4.6.6, 4.6.10, 4.6.12, 4.6.17, 4.6.19, 4.6.20, 4.7.2, 5.2.1, 7.4, 9.6.4
Architect's Additional Services and Expenses 2.4, 9.8.2 11.3.1.1, 12.2.1, 12.2.4, 13.5.2, 13.5.3, 14.2.4
Architect's Administration of the Contract 4.6, 4.7.6, 4.7.7, 4.8, 9.4, 9.5
Architect's Approvals 2.4.1, 3.5.1, 3.10.3, 3.12.6, 3.12.8, 3.18.3, 4.6.12
Architect's Authority to Reject Work 3.5.1, 4.6.10, 12.1.2, 12.2.1
Architect's Copyright 1.3
Architect's Decisions 4.6.10, 4.6.12, 4.6.18, 4.6.19, 4.6.20. 4.7.2, 4.7.6, 4.8.1, 4.8.4, 4.9, 6.3, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.2, 9.9.1, 10.1.2, 13.5.2, 14.2.2, 14.2.4
Architect's Inspections 4.6.5, 4.6.16, 4.7.6, 9.4.3, 9.8.2, 9.9.2, 9.10.1, 13.5
Architect's Instructions 4.6.10, 4.6.12, 7.4.1, 9.4.3, 12.1, 13.5.2
Architect's Interpretations 4.6.18, 4.6.19, 4.7.7
Architect's On-Site Observations 4.6.5, 4.6.9, 4.7.6, 9.4.3, 9.5.1, 9.10.1, 13.5
Architect's Project Representative 4.6.17
Architect's Relationship with Contractor 1.1.2, 3.2.1, 3.2.2, 3.3.3, 3.5.1, 3.7.3, 3.11, 3.12.8, 3.12.11, 3.16, 3.18, 4.6.6, 4.6.7, 4.6.10, 4.6.12, 4.6.19, 5.2, 6.2.2, 7.3.4, 9.8.2, 10.1.2, 10.1.4, 10.1.5, 11.3.7, 12.1, 13.5
Architect's Relationship with Construction Manager 1.1.2, 2.4.1, 3.12.6, 3.12.8, 4.6.8, 4.6.10, 4.6.14, 4.6.16, 4.6.18, 6.3.1, 9.7.1, 9.8, 9.9.1, 9.9.2, 9.10.1, 9.10.2, 9.10.3, 12.2.4, 13.5.1,

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

13.5.2, 13.5.4, 14.2.4
Architect's Relationship with Subcontractors 1.1.2, 4.6.6, 4.6.7, 4.6.10, 5.3.1, 9.6.3,9.6.4, 11.3.7
Architect's Representations 9.4.3, 9.5.1, 9.10.1
Architect's Site Visits 4.6.5, 4.6.9, 4.6.16, 4.7.6, 9.4.3, 9.5.1, 9.8.2, 9.9.2, 9.10.1, 13.5
Asbestos 10.1.2, 10.1.3,.10.1.4
Attorneys' Fees 3.18.1, 9.10.2, 10.1.4
Award of Separate Contracts 6.1.1
Award of Subcontracts and Other Contracts for Portions of the Work 5.2
Basic Definitions 1.1
Bidding Requirements 1.1.1, 1.1.7, 5.2.1, 11.4.1
Boiler and Machinery Insurance 11.3.2
Bonds, Lien 9.10.2
Bonds, Performance and Payment 7.3.6.4, 9.10.3, 11.3.9, 11.4
Building Permit 2.2.3, 3.7.1
Capitalization 1.4
Certificate of Substantial Completion 9.8.2
Certificates for Payment 4.6.8, 4.6.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7.1, 9.8.3, 9.10.1, 9.10.3, 13.7, 14.1.1.3, 14.2.4
Certificates of Inspection, Testing or Approval 3.12.11, 13.5.4
Certificates of Insurance 9.3.2, 9.10.2, 11.1.3
Change Orders 1.1.1, 2.4.1, 3.8.2.4, 3.11.1, 4.6.13, 4.7.3, 5.2.3, 7.1, **7.2**, 7.3.2, 8.3.1, 9.3.1.1, 9.10.3, 11.3.1.2, 11.3.4, 11.3.9, 12.1.2
Change Orders, Definition of 7.2.1
Changes 7.1
CHANGES IN THE WORK 3.11, 4.6.13, 4.6.14, **7**, 8.3.1, 9.3.1.1, 10.1.3
Claim, Definition of 4.7.1
Claims and Disputes **4.7**, 4.8, 4.9, 6.2.5, 8.3.2, 9.3.1.2, 9.3.3, 9.10.4, 10.1.4
Claims and Timely Assertion of Claims 4.9.6
Claims for Additional Cost 4.7.6, **4.7.7**, 4.7.9, 6.1.1, 10.3
Claims for Additional Time 4.6.9, 4.7.6, **4.7.8**, 4.7.9, 8.3.2
Claims for Concealed or Unknown Conditions 4.7.6
Claims for Damages 3.18, 4.7.9, 6.1.1, 6.2.5, 8.3.2, 9.5.1.2, 10.1.4
Claims Subject to Arbitration 4.7.2, 4.8.4, 4.6.1
Cleaning Up 3.15, 6.3
Commencement of Statutory Limitation Period 13.7
Commencement of the Work, Conditions Relating to 2.12 ,2.2.1, 3.2.1, 3.2.2, 3.7.1, 3.10.1 3.12.6, 4.7.7, 5.2.1, 6.2.2, 8.1.2, 8.2.2, 9.2, 11.1.3, 11.3.6, 11.4.1
Commencement of the Work, Definition of 8.1.2
Communications, Owner to Architect 2.2.6
Communications, Owner to Construction Manager 2.2.6
Communications Facilitating Contract Administration 3.9.1 4.6.7, 5.2.1
Completion, Conditions Relating to 3.11, 3.15, 4.6.5, 4.6.16, 4.7.2, 9.4.2, 9.8, 9.9.1, 9.10, 11.3.5, 12.2.2, 13.7.1
COMPLETION, PAYMENTS AND 9
Completion, Substantial 4.6.16, 4.7.5.2, 8.1.1, 8.1.3, 8.2.3, **9.8**, 9.9.1, 12.2.2, 13.7
Compliance with Laws 1.3, 3.6, 3.7, 3.13, 4.1.1, 10.2.2, 11.1, 11.3, 13.1, 13.5.1, 13.5.2, 13.6, 14.1.1, 14.2.1.3
Concealed or Unknown Conditions 4.7.6
Conditions of the Contract 1.1.1, 1.1.7, 6.1.1
Consent, Written 1.3.1, 3.12.8, 3.14.2, 4.7.4, 4.9.5, 9.3.2, 9.8.2, 9.9.1, 9.10.2, 9.10.3, 10.12, 10.1.3, 11.3.1, 11.3.1.4, 11.3.11, 13.2, 13.4.2
CONSTRUCTION BY OWNER OR BY OTHER CONTRACTORS 1.1.4, 6
Notice to Proceed~~Construction Change Directive~~, Definition of 7.3.1
Notices to Proceed 1.1.1, 4.6.13, 7.1, **7.3**, 9.3.1.1
Construction Manager 4.2
Construction Manager, and Building Permits 2.2.3
Construction Manager, Claims against 4.7.2
Construction Manager, Communications through 4.6.7
Construction Manager, and Construction Schedule 3.10.1, 3.10.2
Construction Manager, Definition of 4.2.1
Construction Manager, and Documents and Samples at the Site 3.11.1
Construction Manager, Extent of Authority 3.12.6, 3.12.8, 4.3, 4.6.3, 4.6.11, 7.1.2, 7.2.1, 7.3.1, 8.3.1, 9.2.1, 9.3.1, 9.4.1, 9.4.3, 9.8.2, 9.8.3, 9.9.1, 12.1, 12.2.1, 12.2.4, 14.2.2, 14.2.4
Construction Manager, Limitations of Authority and Responsibility 4.6.6, 4.6.10, 13.4.2
Construction Manager, and Submittals 3.10.3
Construction Manager's Additional Services and Expenses 12.2.1, 12.2.4
Construction Manager's Administration of the Contract 4.6, 9.4, 9.5
Construction Manager's Approval 2.4.1, 3.10.3
Construction Manager's Authority to Reject Work 4.6.10, 12.2.1
Construction Manager's Decisions 7.3.6, 7.3.7, 7.3.8, 9.3.1, 9.4.1, 9.5.1
Construction Manager's Inspections 4.6.10, 9.4.3, 9.8.2, 9.9.2, 12.1.1
Construction Manager's On-Site Observations 9.5.1
Construction Manager's Relationship with Architect 1.1.2, 4.6.8, 4.6.10, 4.6.11, 4.6.14, 4.6.16, 4.6.18, 6.3.1, 9.2.1, 9.4.2, 9.4.3, 9.5.1, 9.6.1, 9.6.3, 9.8.2, 9.8.3, 9.9.1, 9.10.1, 9.10.2, 9.10.3, 11.1.3, 12.2.4, 13.5.1, 13.5.2, 13.5.4, 14.2.2, 14.2.4
Construction Manager's Relationship with Contractor 3.2.1, 3.2.2 3.3.1, 3.3.3, 3.5.1, 3.7.3, 3.10.1, 3.10.2, 3.10.3, 3.11.1, 3.12.5, 3.12.6, 3.12.8, 3.12.9, 3.12.10, 3.12.11, 3.13.2, 3.14.2, 3.15.2, 3.16.1, 3.17.1, 3.18.1, 3.18.3, 4.6.3, 4.6.4, 4.6.6, 4.6.11, 5.2, 6.2.1, 6.2.2, 7.1.2, 7.2.1, 7.3.4, 7.3.6, 7.3.9, 8.3.1, 9.2.1,9.3.1, 9.4.1, 9.4.2, 9.4.3, 9.7.1, 9.8.2, 9.9.1, 9.10.1, 9.10.2, 9.10.3, 10.1.1, 10.1.2, 10.1.5, 10.2.6, 11.3.7, 12.1, 13.5.1, 13.5.2, 13.5.3, 13.5.4
Construction Manager's Relationship with Owner 2.2.3, 4.6.1, 4.6.2, 10.1.6
Construction Manager's Relationship with Other Contractors and Owner's Own Forces 4.6.3
Construction Manager's Relationship with Subcontractors 4.6.10, 5.3.1, 9.6.3, 9.6.4
Construction Manager's Representations 9.4.3, 9.5.1
Construction Manager's Site Visits 9.4.4, 9.5.1
Construction Schedules, Contractor's 3.10, 4.6.3, 4.6.4
Contingent Assignment of Subcontracts 5.4
Continuing Contract Performance 4.7.4
Contract, Definition of 1.1.2
CONTRACT, TERMINATION OR SUSPENSION OF THE 4.7.7, 5.4.1.1, **14**
Contract Administration 3.3.3, 4, 9.4, 9.5
Contract Award and Execution, Conditions Relating to 3.7.1, 3.10, 5.2,9.2, 11.1.3, 11.3.6, 11.4.1
Contract Documents, The 1.1, 1.2, 7
Contract Documents, Copies Furnished and Use of 1.3, 2.2.5, 5.3
Contract Documents, Definition of 1.1.1
Contract Performance During Arbitration 4.7.4, 4.9.3
Contract Sum 3.8, 4.7.6, 4.7.7, 4.8.4, 5.2.3, 7.2, 7.3, 9.1, 9.7, 11.3.1, 12.2.4, 12.3, 14.2.4
Contract Sum, Definition of 9.1.1
Contract Time 4.7.6, 4.7.8.1, 4.8.4, 7.2.1.3, 7.3, 8.2.1, 8.3.1, 9.7, 12.1.1
Contract Time, Definition of 8.1.1
CONTRACTOR 3
Contractor, Definition of 3.1.1, 6.1.2

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

Contractor's Bid 1.1.1
Contractor's Construction Schedules 3.10
Contractor's Employees 3.3.2, 3.4.2, 3.8.1, 3.9, 3.18, 4.6.6, 4.6.10, 8.1.2, 10.2, 10.3, 11.1.1, 14.2.1.1
Contractor's Liability Insurance 11.1, 11.3.1.5
Contractor's Relationship with Other Contractors and Owner's Own Forces 3.12.5, 3.14.2, 4.6.3, 4.6.7, 12.2.5
Contractor's Relationship with Subcontractors 1.2.4, 3.3.2, 3.18.1, 3.18.2, 5.2, 5.3, 5.4, 9.6.2, 11.3.7, 11.3.8, 14.2.1.2
Contractor's Relationship with the Architect 1.1.2, 3.2.1, 3.2.2, 3.3.3, 3.5.1, 3.7.3, 3.10.1, 3.10.3, 3.11.1, 3.12.6, 3.12.8, 3.12.9, 3.16.1, 3.18, 4.6.6, 4.6.7, 4.6.10, 4.6.12, 4.6.19, 5.2, 6.2.2, 7.3.4, 9.2, 9.3.1, 9.8.2, 9.10.3,10.1.2, 10.1.5, 10.2.6, 11.3.7, 12.1, 13.5
Contractor's Relationship with the Construction Manager 1.1.2, 3.2.1, 3.2.2,3.3.1, 3.3.3, 3.5.1, 3.7.3, 3.7.4, 3.10.1, 3.10.2, 3.10.3, 3.11.1, 3.12.5, 3.12.6, 3.12.8, 3.12.9, 3.12.11, 3.13.2, 3.14.2, 3.15.2, 3.16.1, 3.17.1, 3.18.1, 3.18.3, 4.6.3, 4.6.4, 4.6.6, 5.2, 6.2.1, 6.2.2, 7.1.2, 7.2.1, 7.3.4, 7.3.6, 7.3.9, 8.3.1, 9.2.1, 9.3.1, 9.4.1, 9.4.2, 9.4.3, 9.7.1, 9.8.2, 9.9.1, 9.10.1, 9.10.2, 9.10.3, 10.1.1,10.1.2, 10.1.5, 10.2.6, 11.3.7, 12.1, 13.5.1, 13.5.2, 13.5.3, 13.5.4
Contractor's Representations 1.2.2, 3.5.1, 3.12.7, 6.2.2, 8.2.1, 9.3.3
Contractor's Responsibility for Those Performing the Work 3.3.2, 3.18, 4.6.6, 10
Contractor's Review of Contract Documents 1.2.2, 3.2, 3.7.3
Contractor's Right to Stop the Work 9.7
Contractor's Right to Terminate the Contract 14.1
Contractor's Submittals 3.10, 3.11, 3.12, 4.6.12, 5.2.1, 5.2.3, 7.3.6, 9.2, 9.3.1, 9.8.2, 9.9.1, 9.10.2, 9.10.3, 10.1.2, 11.4.2
Contractor's Superintendent 3.9, 10.2.6
Contractor's Supervision and Construction Procedures 1.2.4, 3.3, 3.4, 4.6.6, 8.2.2, 8.2.3, 10
Contractual Liability Insurance 11.1.1.7, 11.2.1, 11.3.1.5
Coordination and Correlation 1.2.2, 1.2.4, 3.3.1, 3.10, 3.12.7, 6.2.1
Copies Furnished of Drawings and Specifications 1.3, 2.2.5, 3.11
Correction of Work 2.3, 2.4, 3.2.1, 4.6.1, 9.8.2, 9.9.1, 12.1.2, 12.2, 13.7.1.3
Cost, Definition of 7.3.6
Costs 2.4, 3.2.1, 3.7.4, 3.8.2, 3.15.2., 4.7.6, 4.7.7, 4.7.8.1, 5.2.3, 6.1.1, 6.2.3, 6.3.1, 7.3.3.3, 7.3.6, 7.3.7, 9.7, 9.8.2, 9.10.2, 11.3.1.2,11.3.1.3, 11.3.4, 11.3.9, 12.1, 12.2.1, 12.2.4, 12.2.5, 13.5, 14
Cutting and Patching 3.14, 6.2.6
Damage to Construction of Owner or Other Contractors 3.14.2, 6.2.4, 9.5.1.5, 10.2.1.2, 10.2.5, 10.3, 11.1, 11.3, 12.2.5
Damage to the Work 3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.3, 11.3
Damages, Claims for 3.18, 4.6.9, 6.1.1, 6.2.5, 8.3.2, 9.5.1.2, 10.1.4
Damages for Delay 6.1.1, 8.3.3, 9.5.1.6, 9.7
Date of Commencement of the Work, Definition of 8.1.2
Date of Substantial Completion, Definition of 8.1.3
Day, Definition of 8.1.4
Decisions of the Architect 4.6, 4.7, 6.3, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.2, 9.9.1, 10.1.2, 13.5.2, 14.2.2, 14.2.4
Decisions of the Construction Manager 4.3, 7.3.6, 7.3.7, 7.3.8, 9.3.1, 9.4.1, 9.4.3, 9.5.1
Decisions to Withhold Certification 9.5, 9.7, 14.1.1.3
Defective or Nonconforming Work, Acceptance, Rejection and Correction of 2.3, 2.4, 3.5.1, 4.6.1, 4.6.10, 4.7.5, 9.5, 9.8.2, 9.9.1, 10.2.5, 12, 13.7.1.3
Defective Work, Definition of 3.5.1
Definitions 1.1, 2.1.1, 3.1, 3.5.1, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 4.2.1, 4.7.1, 5.1, 6.1.1, 7.2.1, 7.3.1, 7.3.6, 8.1, 9.1, 9.8.1
Delays and Extensions of Time 4.7.1, 4.7.8.1, 4.7.8.2, 6.1.1, 6.2.3, 7.2.1, 7.3.1.3, 7.3.4, 7.3.5, 7.3.8, 7.3.9, 8.1.1, **8.3**, 10.3.1, 14.1.1.4
Disputes 4.7, 4.8, 4.9, 6.2.5, 6.3, 7.3.8, 9.3.1.2
Documents and Samples at the Site 3.11
Drawings, Definition of 1.1.5
Drawings and Specifications, Use and Ownership of 1.1.1, 1.3, 2.2.5, 3.11, 5.3
Duty to Review Contract Documents and Field Conditions 3.2
Effective Date of Insurance 8.2.2, 11.1.2
Emergencies 4.7.7, 10.3
Employees, Contractor's 3.3.2., 3.4.2, 3.8.1, 3.9, 3.18.1, 3.18.2, 4.6.6, 4.6.10, 8.1.2, 10.2, 10.3, 11.1.1, 14.2.1.1
Equipment, Labor, Materials and 1.1.3, 1.1.6, 3.4, 3.5.1, 3.8.2, 3.12.2, 3.12.3, 3.12.7, 3.12.11, 3.13, 3.15.1, 4.6.12, 6.2.1, 7.3.6, 9.3.2, 9.3.3, 11.3, 12.2.4, 14.1.2, 14.2.1, 14.2.2
Execution and Progress of the Work 1.2.3, 3.4.1, 3.5.1, 4.6.5, 4.6.6, 4.7.4, 4.7.8, 6.2.2, 7.1.3, 8.2, 8.3, 9.5, 9.9.1, 10.2.3, 10.2.4
Execution, Correlation and Intent of the Contract Documents **1.2**, 3.7.1
Extensions of Time 4.7.1, 4.7.8, 7.2.1.3, 8.3, 10.3.1
Failure of Payment by Contractor 9.5.1.3, 14.2.1.2
Failure of Payment by Owner 4.7.7, 9.7, 14.1.3
Faulty Work (See Defective or Nonconforming Work)
Final Completion and Final Payment 4.6.1, 4.6.16, 4.7.2, 4.7.5, **9.10**, 11.1.2, 11.1.3, 11.3.5, 12.3.1, 13.7
Financial Arrangements, Owner's 2.2.1
Fire and Extended Coverage Insurance 11.3.1.1, 11.3.5, 11.3.7
GENERAL PROVISIONS 1
Governing Law 13.1
Guarantees (See Warranty and Warranties)
Hazardous Materials 10.1, 10.2.4
Identification of Contract Documents 1.2.1
Identification of Subcontractors and Suppliers 5.2.1
Indemnification 3.17, **3.18**, 9.10.2, 10.1.4, 11.3.1.2, 11.3.7
Information and Services Required of the Owner 2.1.2, **2.2**, 4.7.4, 6.2.6, 9.3.2, 9.6.1, 9.6.4, 9.8.3, 9.9.2, 9.10.3, 10.1.4, 11.2, 11.3, 13.5.1, 13.5.2
Injury or Damage to Person or Property 4.7.9
Inspections 3.3.3, 3.3.4, 3.7.1, 4.6.5, 4.6.6, 4.6.16, 4.7.6, 9.4.3, 9.8.2, 9.9.2, 9.10.1, 12.2.1, 13.5
Instructions to Bidders 1.1.1
Instructions to the Contractor 3.8.1, 4.6.13, 5.2.1, 7, 12.1, 13.5.2
Insurance 4.7.9, 6.1.1, 7.3.6.4, 9.3.2, 9.8.2, 9.9.1, 9.10.2, 11
Insurance, Boiler and Machinery 11.3.2
Insurance, Contractor's Liability 11.1, 11.3.1.13
Insurance, Effective Date of 8.2.2, 11.1.2
Insurance, Loss of Use 11.3.3
Insurance, Owner's Liability 11.2, 11.3.1.3
Insurance, Property 10.2.5, 11.3
Insurance, Stored Materials 9.3.2, 11.3.1.4
INSURANCE AND BONDS 11
Insurance Companies, Consent to Partial Occupancy 9.9.1, 11.3.11
Insurance Companies, Settlement with 11.3.10
Intent of the Contract Documents 1.2.3, 3.12.4, 4.6.10, 4.6.12, 4.6.19, 4.6.20, 7.4
Interest 13.6
Interpretation 1.2.5, 1.4, **1.5**, 4.1.1, 4.7.1, 5.1, 6.1.2, 8.1.4
Interpretations, Written 4.6.18, 4.6.19, 4.7.7
Joinder and Consolidation of Claims Required 4.9.5
Judgment on Final Award 4.9.1, 4.9.4.1, **4.9.7**
Labor and Materials, Equipment 1.1.3, 1.1.6, **3.4**, 3.5.1, 3.8.2, 3.12.2, 3.12.3, 3.12.7, 3.12.11, 3.13, 3.15.1, 4.6.12,

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

6.2.1, 7.3.6, 9.3.2, 9.3.3, 12.2.4, 14.1.2, 14.2.1, 14.2.2
Labor Disputes 8.3.1
Laws and Regulations 1.3, 3.6, 3.7, 3.13, 4.1.1, 4.9.5, 4.9.7, 9.9.1, 10.2.2, 11.1, 11.3, 13.1, 13.4.1, 13.5.1, 13.5.2, 13.6
Liens 2.1.2, 4.7.2, 4.7.5.1, 8.2.2, 9.3.3, 9.10.2
Limitation on Consolidation or Joinder 4.9.5
Limitations, Statutes of 4.9.4.2, 12.2.6, 13.7
Limitations of Authority 3.3.1, 4.6.12, 4.6.17, 5.2.2, 5.2.4, 7.4, 11.3.10
Limitations of Liability 2.3, 3.2.1, 3.5.1, 3.7.3, 3.12.8, 3.12.11 3.17, 3.18, 4.6.10, 4.6.12, 4.6.19, 6.2.2, 9.4.3, 9.6.4, 9.10.4, 10.1.4, 10.2.5, 11.1.2, 11.2.1, 11.3.7, 13.4.2, 13.5.2
Limitations of Time, General 2.2.1, 2.2.4, 3.2.1, 3.7.3, 3.8.2, 3.10, 3.12.5, 3.15.1, 4.6.1, 4.6.12, 4.6.18, 4.7.2, 4.7.3, 4.7.4, 4.7.6,.4.7.9, 4.6.4.2, 5.2.1, 5.2.3, 6.2.4, 7.3.4, 7.4, 8.2, 9.2, 9.5, 9.6.2, 9.8, 9.10, 11.1.3, 11.3.1, 11.3.2, 11.3.5, 11.3.6, 12.2.1, 12.2.2, 13.5, 13.7, 14.3
Limitations of Time, Specific 2.1.2, 2.2.1, 2.4, 3.10, 3.11, 3.15.1, 4.6.1, 4.6.18, 4.7, 4.8, 4.9, 5.3, 5.4, 7.3.5, 7.3.9, 8.2, 9.3.1, 9.3.3, 9.4.1, 9.6.1, 9.7, 9.8.2, 9.10.2, 11.1.3, 11.3.6, 11.3.10, 11.3.11, 12.2.2, 12.2.4, 12.2.6, 13.7, 14.1, 14.2.2
Loss of Use Insurance 11.3.3
Material Suppliers 1.3.1, 3.12.1, 4.6.7, 4.6.10, 5.2.1, 9.3.1, 9.3.1.2, 9.3.3, 9.4.3, 9.6.5, 9.10.4
Materials, Hazardous 10.1, 10.2.4
Materials, Labor, Equipment and 1.1.3, 1.1.6, 3.4.1, 3.5.1, 3.8.2, 3.12.2, 3.12.3, 3.12.7, 3.12.11, 3.13, 3.15.1, 4.6.12, 6.2.1, 7.3.6, 9.3.2, 9.3.3, 12.2.4, 14.1.2, 14.2.1, 14.2.2
Means, Methods, Techniques, Sequences and Procedures of Construction 3.3.1, 4.6.6, 4.6.12, 9.4.3
Minor Changes in the Work 1.1.1, 4.6.13, 4.7.7, 7.1, **7.4**
MISCELLANEOUS PROVISIONS 13
Modifications, Definition of 1.1.1
Modifications to the Contract 1.1.1, 1.1.2, 3.7.3, 3.11, 4.1.2, 4.6.1, 5.2.3, 7, 8.3.1, 9.7
Mutual Responsibility 6.2
Nonconforming Work, Acceptance of 12.3
Nonconforming Work, Rejection and Correction of 2.3.1, 4.7.5.2, 9.5.2, 9.8.2, 12, 13.7.1.3
Notice 2.3, 2.4, 3.2.1, 3.2.2, 3.7.3, 3.7.4, 3.9, 3.12.8, 3.12.9, 3.17, 4.7, 4.8.4, 4.9, 5.2.1, 5.3, 5.4.1.1, 8.2.2, 9.4.1, 9.5.1, 9.7, 9.10, 10.1.2, 10.2.6, 11.1.3, 11.3, 12.2.2, 12.2.4, 13.3, 13.5.1, 13.5.2, 14,
Notice, Written 2.3, 2.4, 3.9, 3.12.8, 3.12.9,4.7, 4.8.4, 4.9, 5.2.1, 5.3, 5.4.1.1, 8.2.2, 9.4.1, 9.5.1, 9.7, 9.10, 10.1.2, 10.2.6, 11.1.3, 11.3, 12.2.2, 12.2.4, **13.3**, 13.5.2, 14
Notice of Testing and Inspections 13.5.1, 13.5.2
Notice to Proceed 8.2.2
Notices, Permits, Fees and 2.2.3, **3.7**, 3.13, 7.3.6.4, 10.2.2
Observations, Architect's On-Site 4.6.5, 4.6.9, 4.6.10, 4.7.6, 9.4.4, 9.5.1, 9.10.1, 12.1.1, 13.5
Observations, Construction Manager's On-Site 9.4.4, 12.1.1
Observations, Contractor's 1.2.2, 3.2.2
Occupancy 9.6.6, 9.8.1, 9.9, 11.3.11
On-Site Inspections by the Architect 4.6.5, 4.6.16, 4.7.6, 9.4.4, 9.8.2, 9.9.2, 9.10.1
On-Site Observations by the Architect 4.6.5, 4.6.9, 4.7.6, 9.4.4, 9.5.1, 9.10.1, 13.5
On-Site Observations by the Construction Manager 9.4.4, 9.5.1
Orders, Written 2.3, 3.9, 4.7.7, 7, 8.2.2, 11.3.9, 12.1, 12.2, 13.5.2, 14.3.1
Other Contracts and Contractors 1.1.4, 3.14.2, 4.6.7, 4.9.5, 6, 11.3.7, 12.1.2, 12.2.5
OWNER 2
Owner, Definition of 2.1
Owner, Information and Services Required of the 2.1.2, **2.2**, 4.6.2, 4.6.4, 6, 9, 10.1.4, 10.1.6, 11.2, 11.3, 13.5.1, 14.1.1.5, 14.1.3
Owner's Authority 3.8.1, 5.2.1, 5.2.4, 5.4.1, 7.3.1, 8.2.2, 9.3.1, 9.3.2, 11.4.1, 12.2.4, 13.5.2, 14.2, 14.3.1
Owner's Financial Capability 2.2.1, 14.1.1.5
Owner's Liability Insurance 11.2
Owner's Loss of Use Insurance 11.3.3
Owner's Relationship with Subcontractors 1.1.2, 5.2.1, 5.4.1, 9.6.4
Owner's Right to Carry Out the Work 2.4, 12.2.4, 14.2.2.2
Owner's Right to Clean Up 6.3
Owner's Right to Perform Construction with Own Forces and to Award Other Contracts 6.1
Owner's Right to Stop the Work 2.3, 4.7.7
Owner's Right to Suspend the Work 14.3
Owner's Right to Terminate the Contract 14.2
Ownership and Use of Architect's Drawings, Specifications and Other Documents 1.1.1, **1.3**, 2.2.5, 5.3
Partial Occupancy or Use 9.6.6, **9.9**, 11.3.11
Patching, Cutting and 3.14, 6.2.6
Patents, Royalties and 3.17
Payment, Applications for 4.6.9, 9.2, **9.3**, 9.4, 9.5.1, 9.8.3, 9.10.1, 9.10.3, 9.10.4, 14.2.4
Payment, Certificates for 4.6.9, 4.6.16, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7.1, 9.8.3, 9.10.1, 9.10.3, 13.7, 14.1.1.3, 14.2.4
Payment, Failure of 4.7.7, 9.5.1.3, **9.7**, 9.10.2, 14.1.1.3, 14.2.1.2
Payment, Final 4.6.1, 4.6.16, 4.7.2, 4.7.5, **9.10**, 11.1.2, 11.1.3, 11.3.5, 12.3.1
Payment Bond, Performance Bond and 7.3.6.4, 9.10.3, 11.3.9, **11.4**
Payments, Progress 4.7.4, 9.3, **9.6**, 9.8.3, 9.10.3, 13.6, 14.2.3
PAYMENTS AND COMPLETION 9, 14
Payments to Subcontractors 5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 11.3.8, 14.2.1.2
PCB 10.1.2, 10.1.3, 10.1.4
Performance Bond and Payment Bond 7.3.6.4, 9.10.3, 11.3.9, 11.4
Permits, Fees and Notices 2.2.3, **3.7**, 3.13, 7.3.6.4, 10.2.2
PERSONS AND PROPERTY, PROTECTION OF 10
Polychlorinated Biphenyl 10.1.2, 10.1.3, 10.1.4
Product Data, Definition of 3.12.2
Product Data and Samples, Shop Drawings 3.11, **3.12**, 4.2.7
Progress and Completion 4.6.5, 4.7.4, **8.2**
Progress Payments 4.7.4, 9.3, **9.6**, 9.8.3, 9.10.3, 13.6, 14.2.3
Project, Definition of the **1.1.4**
Project Manual, Definition of the **1.1.7**
Project Manuals 2.2.5
Project Representatives 4.6.17
Property Insurance 10.2.5, **11.3**
PROTECTION OF PERSONS AND PROPERTY 10
Regulations and Laws 1.3, 3.6, 3.7, 3.13, 4.1.1, 4.9.7 10.2.2, 11.1, 11.3, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14
Rejection of Work 3.5.1, 4.6.10, 12.2.
Releases of Waivers and Liens 9.10.2
Representations 1.2.2, 3.5.1, 3.12.7, 6.2.2, 8.2.1, 9.3.3, 9.4.3, 9.5.1, 9.8.2, 9.10.1
Representatives 2.1.1, 3.1.1, 3.9, 4.1.1, 4.6.1, 4.6.17, 5.1.1, 5.1.2, 13.2.1
Resolution of Claims and Disputes 4.8, 4.9
Responsibility for Those Performing the Work 3.3.2, 4.6.6, 6.2., 10
Retainage 9.3.1, 9.6.2, 9.8.3, 9.9.1, 9.10.2, 9.10.3
Review of Contract Documents and Field

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

Conditions by Contractor 1.2.2, **3.2**, 3.7.3, 3.12.7
Review of Contractor's Submittals by Owner, Construction Manager and Architect 3.10.1, 3.10.3, 3.11, 3.12, 4.6.12. 4.6.16, 5.2.1, 5.2.3, 9.2, 9.8.2
Review of Shop Drawings, Product Data and Samples by Contractor 3.12.5
Rights and Remedies 1.1.2, 2.3, 2.4, 3.5.1, 3.15.2, 4.6.10, 4.7.6, 4.9, 5.3, 6.1, 6.3, 7.3.1, 8.3.1, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.2, 12. 2.4, **13.4**, 14
Royalties and Patents **3.17**
Rules and Notices for Arbitration **4.9.2**
Safety of Persons and Property **10.2**
Safety Precautions and Programs 4.6.6, 4.6.12, **10.1**
Samples, Definition of 3.12.3
Samples, Shop Drawings, Product Data and 3.11, **3.12**, 4.6.12
Samples at the Site, Documents and **3.11**
Schedule of Values **9.2**, 9.3.1
Schedules, Construction 3.10
Separate Contracts and Contractors 1.1.4
Shop Drawings, Definition of 3.12.1
Shop Drawings, Product Data and Samples 3.11, **3.12**, 4.6.11, 4.6.12, 4.6.15
Site, Use of **3.13**, 6.1.1, 6.2.1
Site Inspections 1.2.2, 3.3.4, 4.6.5, 4.6.16, 4.7.6, 9.8.2, 9.10.1, 13.5
Site Visits, Architect's 4.6.5, 4.6.9, 4.7.6, 9.4, 9.5.1, 9.8.2, 9.9.2, 9.10.1, 13.5
Special Inspections and Testing 4.6.10, 12.2.1, 13.5
Specifications, Definition of the **1.1.6**
Specifications, The 1.1.1, **1.1.6**, 1.1.7, 1.2.4, 1.3, 3.11
Statute of Limitations 4.9.4.2, 12.2.6, 13.7
Stopping the Work 2.3, 4.7.7, 9.7, 10.1.2, 10.3, 14.1
Stored Materials 6.2.1, 9.3.2, 10.2.1.2, 11.3.1.4, 12.2.4
Subcontractor, Definition of 5.1.1
SUBCONTRACTORS **5**
Subcontractors, Work by 1.2.4, 3.3.2, 3.12.1, 4.6.6, 4.6.10, 5.3, 5.4
Subcontractual Relations **5.3**, 5.4, 9.3.1.2, 9.6.2, 9.6.3, 9.6.4, 10.2.1, 11.3.7, 11.3.8, 14.1.1, 14.2.1.2, 14.1.3
Submittals 1.3, 3.2.3, 3.10, 3.11, 3.12, 4.6.12, 5.2.1, 5.2.3, 7.3.6, 9.2, 9.3.1, 9.8.2, 9.9.1, 9.10.2, 9.10.3, 11.1.3
Subrogation, Waivers of 6.1.1, 11.3.5, **11.3.7**
Substantial Completion 4.6.16, 8.1.1, 8.1.3, 8.2.3, **9.8**, 9.9.1, 12.2.1, 12.2.2, 13.7
Substantial Completion, Definition of 9.8.1
Substitution of Subcontractors 5.2.3, 5.2.4
Substitution of Architect 4.4
Substitution of Construction Manager 4.4
Substitutions of Materials 3.5.1
Sub-subcontractor, Definition of 5.1.2
Subsurface Conditions 4.7.6
Successors and Assigns **13.2**
Superintendent **3.9**, 10.2.6
Supervision and Construction Procedures 1.2.4, **3.3**, 3.4, 4.6.6, 4.7.4, 6.2.4, 7.1.3, 7.3.4, 8.2, 8.3.1, 10, 12, 14
Surety 4.8.1, 4.8.4, 5.4.1.2, 9.10.2, 9.10.3, 14.2.2
Surety, Consent of 9.10.2, 9.10.3
Surveys 2.2.2, 3.18.3
Suspension by the Owner for Convenience **14.3**
Suspension of the Work 4.7.7, 5.4.2, 14.1.1.4, 14.3
Suspension or Termination of the Contract 4.7.7, 5.4.1.1, 14
Taxes **3.6**, 7.3.6.4
Termination by the Contractor **14.1**
Termination by the Owner for Cause 5.4.1.1, **14.2**
Termination of the Architect 4.4
Termination of the Construction Manager 4.4
Termination of the Contractor 14.2.2
TERMINATION OR SUSPENSION OF THE CONTRACT **14**
Tests and Inspections 3.3.3, 4.6.10, 4.6.16, 9.4.3, 12.2.1, **13.5**
TIME **8**
Time, Delays and Extensions of 4.7.8, 7.2.1, **8.3**
Time Limits, Specific 2.1.2, 2.2.1, 2.4, 3.10, 4.6.18, 4.7, 4.8.1, 4.8.3, 4.8.4, 4.9.1, 4.9.4.1, 4.9.4.2, 5.3, 5.4, 7.3.5, 7.3.9, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.6.1, 9.7, 9.8.2, 9.10.2, 11.1.3, 11.3.6, 11.3.10, 11.3.11, 12.2.2, 12.2.4, 12.2.6, 13.7, 14
Time Limits on Claims 4.7.2, **4.7.3**, 4.7.6, 4.7.9, 4.8, 4.9
Title to Work 9.3.2, 9.3.3
UNCOVERING AND CORRECTION OF WORK **12**
Uncovering of Work **12.1**
Unforeseen Conditions 4.7.6, 8.3.1, 10.1
Unit Prices 7.1.4, 7.3.3.2
Use of Documents 1.1.1, 1.3, 2.2.5, 3.12.7, 5.3
Use of Site **3.13**, 6.1.1, 6.2.1
Values, Schedule of **9.2**, 9.3.1
Waiver of Claims: Final Payment **4.7.5**, 4.9.1, 9.10.3
Waiver of Claims by the Architect 13.4.2
Waiver of Claims by the Contractor 9.10.4, 11.3.7, 13.4.2
Waiver of Claims by the Owner 4.7.5, 4.9.1, 9.9.3, 9.10.3, 11.3.3, 11.3.5, 11.3.7, 13.4.2
Waiver of Liens 9.10.2
Waivers of Subrogation 6.1.1, 11.3.5, **11.3.7**
Warranty and Warranties **3.5**, 4.6.16, 4.7.5, 9.3.3, 9.8.2, 9.9.1, 12.2.2, 13.7.1.3
Weather Delays 4.7.8.2
When Arbitration May Be Demanded **4.9.4**
Work, Definition of 1.1.3
Written Consent 1.3.1, 3.12.8, 3.14.2, 4.7.4, 4.9.5, 9.3.2, 9.8.2, 9.9.1, 9.10.2, 9.10.3, 10.1.2, 10.1.3, 11.3.1, 11.3.1.4, 11.3.11, 13.2, 13.4.2
Written Interpretations 4.6.18, 4.6.19, 4.7.7
Written Notice 2.3, 2.4, 3.9, 3.12.8, 3.12.9, 4.7.1, 4.7.6, 4.7.9, 4.8.4, 4.9.4.1, 5.2.1, 5.3, 5.4.1.1, 8.2.2, 9.4, 9.5.1, 9.7, 9.10, 10.1.2, 10.2.6, 11.1.3, 11.3, 12.2.2, 12.2.4, **13.3**, 13.5.2, 14
Written Orders 2.3, 3.9, 4.7.7, 8.2.2, 11.3.9, 12.1, 12.2, 13.5.2, 14.3.1

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

ARTICLE 1
GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents consist of the Agreement between Owner and Contractor (hereinafter the Agreement), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, addenda issued prior to execution of the Contract, the portions of the Project Manual defined as Contract Documents therein, and other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Notice to Proceed~~Construction Change Directive~~ or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include other documents such as bidding requirements (advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or portions of addenda relating to bidding requirements).

In the event of any conflict among the Contract Documents, the Contract Documents shall be construed according to the following priorities:

Highest Priority: Modifications including Change Orders and Notice to Proceeds;
2nd Priority: Owner/Contractor Agreement;
3rd Priority: Addenda, later date to take precedence;
4th Priority: The Contract Documents (other than those mentioned above) that are included in the Project Manual sections 0 - 2000;
5th Priority: Drawings and Technical Specifications.

In the event of a conflict among the General Conditions and Supplementary Conditions, the Supplementary Conditions shall control.

1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Architect and Contractor, (2) between the Construction Manager and Contractor, (3) between the Architect and Construction Manager, (4) between the Owner and a Subcontractor or Sub-subcontractor or (5) between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of their duties.

1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by other Contractors and by the Owner's own forces including persons or entities under separate contracts not administered by the Construction Manager.

1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents, ~~wherever located and whenever issued,~~ showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards and workmanship for the Work, and performance of related services.

1.1.7 THE PROJECT MANUAL

The Project Manual is the volume usually assembled for the Work which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications.

1.1.8 Provide. When the word "provide," including derivatives, is used, it shall mean to fabricate properly, complete, transport, deliver, install, erect, construct, test, and furnish all labor, materials, equipment, apparatus, appurtenances, and all other items necessary to properly

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

complete in place, ready for operation or use under the terms of the Specifications.

1.1.9 Addenda. Addenda are written or graphic instruments issued prior to the execution of the Contract that modify or interpret the Bidding Documents, including the Drawings and Specifications, by additions, deletions, clarifications, or corrections.

1.1.10 Knowledge. The terms "knowledge," "recognize," and "discover," their respective derivatives, and similar terms in the Contract Documents, as used in reference to the Contractor, shall mean that which the Contractor knows (or should know), recognizes (or should recognize) and discovers (or should discover) in exercising the care, skill, and diligence required by the Contract Documents. Analogously, the expression "reasonably inferable" and similar terms in the Contract Documents shall be interpreted to mean reasonably inferable by a contractor exercising the care, skill and diligence required of the Contractor by the Contract Documents.

1.1.11 Persistently. The phrase "persistently fails" and other similar expressions, as used in reference to the Contractor, shall mean any combination of acts and omissions that cause the Owner, Construction Manager, or Architect to reasonably conclude that the Contractor will not complete the Work within the Contract Time, for the Contract Sum, or in substantial compliance with the requirements of the Contract Documents.

1.2 EXECUTION, CORRELATION AND INTENT

1.2.1 The Contract Documents shall be signed, in not less than triplicate, by the Owner and Contractor as provided in the Agreement. If either the Owner or Contractor or both do not sign all the Contract Documents, the Architect shall identify such unsigned Documents upon request.

1.2.2 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

1.2.3 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; ~~performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results.~~ In the event of inconsistencies within or between parts of the Contract Documents, or between the Contract Documents and the applicable standards, codes, and ordinances, the Contractor shall (1) provide the better quality or greater quantity of Work, or (2) comply with the more stringent requirement, either or both in accordance with the Architect's interpretation. The terms and conditions of this Subparagraph 1.2.3, however, shall not relieve the Contractor of any of the obligations set forth in Paragraphs 3.2 and 3.7.

1.2.3.1 On the Drawings, given dimensions shall take precedence over scaled measurements, and large-scale drawings over small scale drawings.

1.2.3.2 Before ordering any materials or doing any Work, the Contractor and each Subcontractor shall verify measurements at the Project site and shall be responsible for the correctness of such measurements. No extra charges or compensation will be allowed on account of differences between actual dimensions and the dimensions indicated on the Drawings. Any difference that may be found shall be submitted to the Construction Manager and Architect for resolution before proceeding with the Work.

1.2.3.3 If a minor change in the Work is found necessary due to actual field conditions, the Contractor shall submit detailed drawings of such departure to the Construction Manager for approval by the Architect before making the change.

1.2.4 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

1.2.5 Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

1.3 OWNERSHIP AND USE OF ARCHITECT'S DRAWINGS, SPECIFICATIONS AND OTHER DOCUMENTS

1.3.1 The Drawings, Specifications and other documents prepared by the Architect are instruments of the Architect's service through which the Work to be executed by the Contractor is described. The Contractor may retain one contract record set. Neither the Contractor nor any Subcontractor, Sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect, and unless otherwise indicated the Architect shall be deemed the author of them and will retain all common law, statutory and other reserved rights, in addition to the copyright. All

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

copies of them, except the Contractor's record set, shall be returned or suitably accounted for to the Architect, on request, upon completion of the Work. The Drawings, Specifications and other documents prepared by the Architect, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner and Architect. The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are granted a limited license to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect appropriate to and for use in the execution of their Work under the Contract Documents. All copies made under this license shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's copyright or other reserved rights.

1.4 CAPITALIZATION

1.4.1 Terms capitalized in these General Conditions include those which are (1) specifically defined, (2) the titles of numbered articles and identified references to Paragraphs, Subparagraphs and Clauses in the document or (3) the titles of other documents published by the American Institute of Architects.

1.5 INTERPRETATION

1.5.1 In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

ARTICLE 2
OWNER

2.1 DEFINITION

2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Owner" means the Owner or the Owner's authorized representative.

~~**2.1.2** The Owner upon reasonable written request shall furnish to the Contractor in writing information which is necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein at the time of execution of the Agreement and, within five days after any change, information of such change in title, recorded or unrecorded.~~

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.1 The Owner shall, at the request of the Contractor, prior to execution of the Agreement and promptly from time to time thereafter, furnish to the Contractor reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. ~~*[Note: Unless such reasonable evidence were furnished on request prior to the execution of the Agreement, the prospective contractor would not be required to execute the Agreement or to commence the Work.]*~~

2.2.2 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. Information will be furnished only to the extent it is readily available to the Owner.

2.2.3 Except as provided in Subparagraph 3.7.1, or elsewhere in the Construction Documents ~~for permits and fees which are the responsibility of the Contractor under the Contract Documents,~~ the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities. Unless otherwise provided under the Contract Documents, the Owner, through the Construction Manager, shall secure and pay for the building permit. Refer to Project Manual Section 00880 Regulatory Requirements and Section 00890 Permits which detail Contractor's obligations in relation to permits.

2.2.4 Information or services under the Owner's control shall be furnished by the Owner, upon request, with reasonable promptness to avoid delay in orderly progress of the Work.

2.2.5 Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, such copies of Drawings and Project Manuals as are reasonably necessary for execution of the Work.

2.2.6 The Owner shall forward all communications to the Contractor through the Construction Manager and shall contemporaneously provide the same communications to the Architect.

2.2.7 The foregoing are in addition to other duties and responsibilities of the Owner enumerated herein and especially those in respect to Article 6 (Construction by Owner or by Other Contractors), Article 9 (Payments and Completion) and Article 11 (Insurance and Bonds).

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

2.3 OWNER'S / CONSTRUCTION MANAGER'S RIGHT TO STOP THE WORK

2.3.1 If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Paragraph 12.2 or persistently fails to carry out Work in accordance with the Contract Documents, the Owner or Construction Manager, ~~by written order signed personally or by an agent specifically so empowered by the Owner in writing,~~ may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner or Construction Manager to stop the Work shall not give rise to a duty on the part of the Owner or the Construction Manager to exercise this right for the benefit of the Contractor or any other person or entity.

2.4 OWNER'S / CONSTRUCTION MANAGER'S RIGHT TO CARRY OUT THE WORK

2.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seventy-two (72) hour period (or such lesser period as determined by Owner or Construction Manager in its discretion when grounds exist to complete the neglected or defaulted Work in a shorter time-period) ~~seven-day period~~ after receipt of written notice from the Owner or Construction Manager to commence and continue correction of such default or neglect with diligence and promptness, ~~the Owner may after such seven-day period give the Contractor a second written notice to correct such deficiencies within a second seven-day period. If the Contractor within such second seven-day period after receipt of such second notice fails to commence and continue to correct any deficiencies,~~ the Owner or Construction Manager may, without prejudice to other remedies the Owner or Construction Manager may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Construction Manager's and Architect's and their respective consultants' additional services and expenses made necessary by such default, neglect or failure. ~~Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect, after consultation with the Construction Manager.~~ If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner through the Construction Manager.

2.5 The rights of the Owner and Construction Manager stated in this Article 2 and elsewhere in the Contract Documents are cumulative and not in limitation of any rights of the Owner or Construction Manager granted in the Contract Documents, at law, or in equity.

ARTICLE 3
CONTRACTOR

3.1 DEFINITION

3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout this Agreement as if singular in number. The term "Contractor" means the Contractor or the Contractor's authorized representative.

3.1.2 The plural term "Contractors" refers to persons or entities who perform construction under Conditions of the Contract that are administered by the Construction Manager, and that are identical or substantially similar to these Conditions.

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.1 The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by the Owner pursuant to Subparagraph 2.2.2 and shall at once report to the Construction Manager and Architect any errors, inconsistencies or omissions discovered. The Contractor shall not be liable to the Owner, Construction Manager or Architect for damage resulting from errors, inconsistencies or omissions in the Contract Documents unless the Contractor, any member of its organization, or any of its Subcontractors, recognized such error, inconsistency or omission and knowingly failed to report it to the Construction Manager and Architect before proceeding with the Work. If the Contractor performs any construction activity knowing it involves an ~~recognized~~ error, inconsistency or omission in the Contract Documents without such notice to the Construction Manager and Architect, the Contractor shall ~~assume appropriate responsibility for such performance and shall bear an appropriate amount of the attributable costs for correction.~~ correct such errors, inconsistencies, or omissions at no additional cost to the Owner.

3.2.2 The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies or omissions discovered shall be reported to the Construction Manager and Architect at once. Refer to Project Manual Section 01530 - Field Engineering and Layout, which details Contractor's responsibilities for field layout and verification.

3.2.3 The Contractor shall perform the Work in accordance with the Contract Documents and submittals approved pursuant to Paragraph 3.12.

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

3.2.4 Except as to any reported errors, inconsistencies, or omissions, and to concealed or unknown conditions defined in Subparagraph 4.7.6, by executing the Agreement, the Contractor represents the following:

3.2.4.1 The Contract Documents are sufficiently complete and detailed for the Contractor to: (1) perform the Work required to produce the results intended by the Contract Documents; and (2) comply with all the requirements of the Contract Documents.

3.2.4.2 The Work required by the Contract Documents, including, without limitation, all construction details, construction means, methods, procedures, and techniques necessary to perform the Work, use of materials, selection of equipment, and requirements of product manufacturers are consistent with: (1) good and sound practices within the construction industry; (2) generally prevailing and accepted industry standards applicable to the Work; and (3) requirements of any warranties applicable to the Work.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under this Contract, subject to overall coordination of the Construction Manager as provided in Subparagraphs 4.6.3 and 4.6.4. The Contractor shall ensure that product suppliers, Subcontractors, and their agents and employees, perform their Work in accordance with the Contract Documents and that all products are ordered and delivered in strict accordance with the schedule. The Contractor shall coordinate its Work with that of all persons or entities on the Project site. The Contractor shall be responsible for the space requirements, locations, and routing of its equipment. In areas and locations where the proper and most effective space requirements, locations, and routing cannot be made as indicated, the Contractor shall meet with all others involved, before installation, to plan the most effective and efficient method of overall installation. A general example is equipment above corridor ceilings where ductwork, piping, conduit, lights, etc. will be installed. A thorough coordinated plan shall be used to install the equipment, to furnish proper clearances, radii of turns, locations, pipe slopes, supporting appurtenances, and access where required. Refer to Project Manual 001530 - Field Engineering and Layout.

3.3.2 The Contractor shall be fully responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors, Suppliers and their agents and employees, and any entity or other persons performing portions of the Work at any tier, directly or indirectly, under a contract with the Contractor. The Contractor shall coordinate the Work of its Subcontractors engaged in construction at the Project. Whenever interference might occur, before any Work is done at the places in question, Contractor shall consult with others and shall come to agreement with them as to the exact location and level of piping, conduits, ducts and/or other Work which might cause interference. Refer to Project Manual 001530 - Field Engineering and Layout.

3.3.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Construction Manager or Architect in their administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor.

3.3.4 The Contractor shall inspect portions of the Project related to the Contractor's Work in order to determine that such portions are in proper condition to receive subsequent Work.

3.3.5 The Contractor shall be responsible for its own, its employees' and its Subcontractors' workmanship and quality of materials and every part thereof or in connection therewith against risk of any and every kind (except those covered by a Builder's Risk Policy applicable to the Project) until the final acceptance of the Work by Owner.

3.3.6 Within fifteen (15) days of award of contract, each awarded Contractor shall assemble all necessary information and data concerning its supervision and construction procedures, as identified in Project Manual Section 00200 - Instructions to Bidders. Contractor shall submit updated information from the post-bid meetings as well as the following:

3.3.6.1 A schedule of values in the format and detail as the Construction Manager may require.

3.3.6.2 Contractor's Project Safety Program.

3.3.6.3 A complete list of all items, products and layouts for which shop drawings, brochures or samples are required; a list of each Subcontractor or supplier; the date of planned submission and time period for fabrication and delivery to the jobsite after approval of the submission. The foregoing items will be provided on forms furnished by the Construction Manager. The Contractor shall thoroughly review the

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

Project Manual and adhere to any additional instructions with regard to Submittals.

3.4 LABOR AND MATERIALS

3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

3.4.2 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

3.4.3 If any person employed by or under the Contractor is found in the judgment of the Construction Manager or Owner to be incompetent, disorderly, unfaithful, disobedient so far as to endanger proper fulfillment of the Contract or otherwise objectionable, such person shall, if directed by the Construction Manager, be discharged immediately and not employed again on any part of the Work without any liability to Owner or Construction Manager for such discharge.

3.5 WARRANTY

3.5.1 The Contractor warrants to the Owner, Construction Manager and Architect that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, ~~may~~ shall be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Construction Manager or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. This warranty is not limited by the provisions of Paragraph 12.2.

3.5.2 ALL WRITTEN WARRANTIES REQUIRED BY THE CONTRACT DOCUMENTS SHALL INCLUDE LABOR AND MATERIALS AND SHALL BE SIGNED BY THE MANUFACTURER OR SUBCONTRACTOR RESPECTIVELY, AND COUNTERSIGNED BY THE CONTRACTOR. ALL WARRANTIES SHALL BE ADDRESSED TO THE OWNER AND DELIVERED TO THE ARCHITECT THROUGH THE CONSTRUCTION MANAGER UPON COMPLETION OF THE PROJECT AND BEFORE OR WITH THE SUBMISSION OF REQUEST FOR FINAL PAYMENT.

3.5.3 The Contractor agrees to assign to the Owner at the time of final completion of the Work any and all manufacturer's warranties relating to materials and labor used in the Work and further agrees to perform the Work in such manner so as to preserve any and all such manufacturer's warranties.

3.6 TAXES

3.6.1 The Contractor shall pay sales, consumer, use and similar taxes for the Work or portions thereof provided by the Contractor which are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

3.7 PERMITS, FEES AND NOTICES

3.7.1 ~~Unless otherwise provided in the Contract Documents, the Owner shall secure and pay for the building permit and the Contractor shall secure and pay for all other permits and governmental fees, licenses and inspections necessary for proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required when bids are received or negotiations concluded.~~ Refer to Project Manual: Section 00880-Regulatory Requirements and Project Manual Section 00890-Permits for a description of Contractor's obligations in relation to Permits.

3.7.2 The Contractor shall comply with and give notices required by laws, ordinances, rules and regulations and lawful orders, and all other requirements of public authorities bearing on performance of the Work. The Contractor shall procure and obtain all bonds required of the Owner or the Contractor by the municipality in which the Project is located or by any other public or private body with jurisdiction over the Project. In connection with such bonds, the Contractor shall prepare all applications, supply all necessary backup material, and furnish the surety with any required personal undertakings. The Contractor shall also obtain and pay all charges for all approvals for street closing, parking meter removal, and other similar matters as may be necessary or appropriate from time to time for the performance of the Work.

3.7.3 It is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations. However, if the Contractor observes that portions of the Contract Documents are at variance therewith, the Contractor shall promptly notify the Construction Manager,

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

Architect and Owner in writing, and necessary changes shall be accomplished by appropriate Modification.

3.7.4 If the Contractor performs Work knowing it to be contrary to laws, statutes, ordinances, building codes, and rules and regulations ~~without such notice to the Construction Manager, Architect and Owner,~~ the Contractor shall assume full responsibility for such Work and shall bear the attributable costs.

3.8 ALLOWANCES

3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities against which the Contractor makes reasonable objection.

3.8.2 Unless otherwise provided in the Contract Documents:

.1 materials and equipment under an allowance shall be selected promptly by the Owner to avoid delay in the Work;

.2 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.3 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum and not in the allowances;

.4 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. ~~The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Clause 3.8.2.2 and (2) changes in Contractor's costs under Clause 3.8.2.3.~~

3.9 SUPERINTENDENT

3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case. The Contractor's superintendent and assistants shall be satisfactory to the Construction Manager and the Owner. The Contractor's superintendent shall not be replaced except with the prior consent of the Construction Manager and Owner, unless the superintendent ceases to be in the Contractor's employ. The Contractor shall maintain order and discipline among all workers involved in the Project at all times. The superintendent shall be present at the Project site at all times when Work is performed by the Contractor or its Subcontractors.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULE

3.10.1 The Contractor, promptly, and within the time set forth in Project Manual Section 00230 - Schedule and Phasing, after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information and the Construction Manager's approval a Contractor's Construction Schedule for the Work. Such schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project construction schedule ~~to the extent required by the Contract Documents~~, and shall provide for expeditious and practicable execution of the Work. Refer to Project Manual Section 00230 - Schedule and Phasing.

3.10.2 The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict, delay in or interference with the Work of other Contractors or the construction or operations of the Owner's own forces. Refer to Project Manual Section 00230 - Schedule and Phasing.

3.10.3 The Contractor shall prepare and keep current, for the Construction Manager's and Architect's approval, a schedule of submittals which is coordinated with the Contractor's Construction Schedule and allows the Construction Manager and Architect reasonable time to review submittals. Refer to Project Manual 01330 - Submittals.

3.10.4 The Contractor shall conform to the most recent schedules.

3.10.5 In the event the Construction Manager or Owner determines that the performance of the Work, as of a Milestone Date, has not progressed or reached the level of completion required by the Contract Documents, the Construction Manager shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitation, (1) working additional shifts or overtime; (2) supplying additional manpower, equipment, and facilities; and (3) other similar measures (referred to collectively as "Extraordinary Measures"). Such Extraordinary Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents. The Construction Manager or Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

with the schedule. Failure to order Extraordinary Measures shall not excuse late completion.

3.10.5.1 The Contractor shall not be entitled to an adjustment in the Contract Sum in connection with Extraordinary Measures required by the Construction Manager or Owner under or pursuant to this Subparagraph 3.10.5.

3.10.5.2 The Construction Manager or Owner may exercise the rights furnished the Owner under or pursuant to this Subparagraph 3.10.5 as frequently as the Construction Manager or Owner deems necessary to ensure that the Contractor's performance of the Work will comply with any Milestone Date or completion date set forth in the Contract Documents.

3.10.6 The Construction Manager or Owner shall have the right to direct a postponement or rescheduling of any date or time for the performance of any part of the Work that may interfere with the operations of other contractors or of the Owner's premises or any of the Owner's tenants or invitees. The Contractor shall, upon the Construction Manager's or Owner's request, schedule any portion of the Work affecting other contractors or other operation of the premises during hours when the premises are not in operation. Any postponement, rescheduling, or performance of the Work under this Subparagraph 3.10.6 may be grounds for an extension of the Contract Time, if permitted under Paragraph 8.3, and an equitable adjustment in the Contract Sum if (1) the performance of the Work was properly scheduled by the Contractor in compliance with the requirements of the Contract Documents, and (2) such rescheduling or postponement is required for the convenience of the Owner.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

3.11.1 The Contractor shall maintain at the site for the Owner one record copy of the Drawings, Specifications, addenda, Change Orders and other Modifications, in good order and marked currently to record changes and selections made during construction, and in addition approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Construction Manager and Architect and shall be delivered to the Construction Manager for submittal to the Owner upon completion of the Work. The Contractor shall advise the Construction Manager on a current basis of all changes in the Work made during construction. Refer to Project Manual Section 01320 - Communications, Section 01700 - Contract Close Out, and Section 01720 - Project Record Documents.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

3.12.3 Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required the way the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review by the Architect is subject to the limitations of Subparagraph 4.6.12.

3.12.5 Within seven (7) days after award of Contract, the Contractor shall submit to Construction Manager a submittal register as set forth in Project Manual Section 01330 - Submittals. The Contractor shall review, approve and submit to the Construction Manager, in accordance with the schedule and sequence approved by the Construction Manager, and in a manner calculated to cause no delay in Contractor's Work or the Work of Owner or other Contractor. Shop Drawings, Product Data, Samples, brochures and similar submittals required by the Contract Documents. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples and similar submittals with related documents submitted by other Contractors. Submittals made by the Contractor which are not required by the Contract Documents may be returned without action.

3.12.6 The Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Construction Manager and Architect. Such Work shall be in accordance with approved submittals.

3.12.7 By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

3.12.8 The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

by the Construction Manager's and Architect's review or approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Construction Manager and Architect in writing of such deviation at the time of submittal and the Construction Manager and Architect have given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Construction Manager's and Architect's approval thereof.

3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Construction Manager and Architect on previous submittals.

3.12.10 Informational submittals upon which the Construction Manager and Architect are not expected to take responsive action may be so identified in the Contract Documents.

3.12.11 When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the Construction Manager and Architect shall be entitled to rely upon the accuracy and completeness of such calculations and certifications. Refer to Project Manual Section 01330 - Submittals and Architect's technical specifications for specific instructions regarding Contractor's submittal requirements.

3.13 USE OF SITE

3.13.1 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Construction Manager before using any portion of the site.

3.13.3 Only materials and equipment that are to be used directly in the Work shall be brought and stored on the Project Site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project site. Protection of construction materials and equipment stored at the Project site from weather, theft, damage, and all other adversity is solely the Contractor's responsibility.

3.13.4 The Contractor and any entity the Contractor is responsible for shall not erect any sign on the Project site without the Owner's prior written consent, which may be withheld in the Owner's sole discretion.

3.13.5 The Contractor shall ensure that the Work, at all times, is performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed, to the fullest extent possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building materials, and equipment. Without limitation of any other provision of the Contract Documents, the Contractor shall minimize any interference with the occupancy or beneficial use of any areas in buildings adjacent to the site of the Work or the premises in the event of partial occupancy, as more specifically described in Paragraph 9.9.

3.13.6 The Contractor shall not permit any workers to use any existing facilities at the Project site, including, without limitation, lavatories, toilets, entrances, and parking areas other than those designated by the Owner. Without limitation of any other provision of the Contract Documents, the Contractor shall use its best efforts to comply with all rules and regulations promulgated by the Owner in connection with the use and occupancy of the Project site, as amended from time to time. The Contractor shall immediately notify the Construction Manager and Owner in writing if during the performance of the Work the Contractor finds compliance with any portion of such rules and regulations to be impracticable. The Contractor's notice shall set forth the specific issues with such compliance and suggest alternatives under which the same results intended by the rules and regulations may be achieved. The Owner may in such a circumstance, in the Owner's sole discretion, adopt such suggestions, develop new alternatives or require compliance with the existing requirements of the rules and regulations. The Contractor shall also comply with all insurance requirements and collective bargaining agreements applicable to use and occupancy of the Project site. Refer to Project Manual Section 01140 - Use of Premises for a complete description of Contractor's obligations regarding use of the site.

3.14 CUTTING AND PATCHING

3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner's own forces or of other Contractors by cutting, patching, excavating or otherwise altering such construction. The Contractor shall not cut or otherwise alter such construction by other Contractors or by the Owner's own forces except with written consent of the Construction Manager, Owner and such other Contractors; such consent shall not be unreasonably withheld. The Contractor shall not

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

unreasonably withhold from the other Contractors or the Owner the Contractor's consent to cutting or otherwise altering the Work.

3.14.3 See technical specifications for further requirements.

13.5 CLEANING UP

13.5.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work the Contractor shall remove from and about the Project waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials.

3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Construction Manager may do so with the Owner's approval and the cost thereof shall be charged to the Contractor. Refer to Project Manual Section 01550 - Cleaning Up and Final Cleaning.

3.16 ACCESS TO WORK

3.16.1 The Contractor shall provide the Owner, Construction Manager and Architect access to the Work in preparation and progress wherever located.

3.17 ROYALTIES AND PATENTS

3.17.1 The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of patent rights and shall hold the Owner, Construction Manager and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect and Construction Manager.

3.18 INDEMNIFICATION

3.18.1 ~~To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Construction Manager, Architect, Construction Manager's and Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including loss of use resulting therefrom, but only to the extent caused in whole or in part by negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Paragraph 3.18.~~

To the fullest extent permitted by law, the Contractor shall defend, indemnify, and hold harmless the Owner, Architect and Construction Manager, and their respective agents, representatives, employees, officers, affiliates, and successors (collectively, "Indemnitees") from and against any and all claims, demands, liabilities, causes of action, costs, and expenses, including reasonable attorney fees and litigation expenses (collectively "Indemnification Claims"), involving:

(a) personal injury or death of any person;
(b) property damage (including loss of use);
(c) the breach of any provision in the Owner-Contractor Agreement;
(d) money claims by subcontractors, suppliers or any entity involved in the Work at any tier;
(e) any contractual duty of an Indemnitee to indemnify another person; or
(f) the enforcement by an Indemnitee of its rights under this provision;

but only if such Indemnification Claims arise from or relate directly or indirectly to the Work under the Contract by, or the acts or omissions of: (i) the Contractor; (ii) its subcontractors, vendors or suppliers at any tier, or (iii) any persons for whom any of them are responsible, including their employees, agents, officers, or representatives. In any event, the obligations contained in Subparagraph 3.18.1 shall not apply to an Indemnification Claim resulting from the sole negligence of an Indemnitee.

3.18.2 In claims against any person or entity indemnified under this Paragraph 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this Paragraph 3.18 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

3.18.3 The obligations of the Contractor under this Paragraph 3.18 shall not extend to the liability of the ~~Construction Manager,~~ Architect, ~~their~~ its consultants, and agents and employees of any of them arising out of ~~(1)~~ the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications, ~~or (2) the giving of or the failure to give directions or instructions by the Construction Manager, Architect, their consultants, and agents~~

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

~~and employees of any of them provided such giving or failure to give is the primary cause of the injury or damage.~~

3.18.4 In the event that any claim is made or asserted, or lawsuit filed for damages or injury arising out of or resulting from the performance of the Work, whether or not the Owner or Construction Manager is named as a party, the Contractor shall immediately advise the Owner and Construction Manager, in writing, of such claim or lawsuit, and shall provide a full and complete copy of any documents or pleadings relating thereto, as well as a full and accurate report of the facts involved.

3.18.5 An Indemnitee, at its option, may select counsel to defend any claim, cause of action or lawsuit brought against it without impairing any obligation of Contractor to provide indemnification.

ARTICLE 4
ADMINISTRATION OF THE CONTRACT

4.1 ARCHITECT

4.1.1 The Architect is the person lawfully licensed to practice architecture or an entity lawfully practicing architecture identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Architect" means the Architect or the Architect's authorized representative.

4.2 CONSTRUCTION MANAGER

4.2.1 The Construction Manager is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Construction Manager" means the Construction Manager or the Construction Manager's authorized representative.

4.2.1.1 The Construction Manager shall act as the Owner's agent for purposes of administering and enforcing the Contract.

4.3 Duties, responsibilities and limitations of authority of the Construction Manager and Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Construction Manager, Architect and Contractor. Consent shall not be unreasonably withheld.

4.4 In case of termination of employment of the Construction Manager or Architect, the Owner shall appoint a construction manager or architect against whom the Contractor makes no reasonable objection and whose status under the Contract Documents shall be that of the former construction manager or architect, respectively.

4.5 Disputes arising under Paragraphs 4.3 and 4.4 shall be subject to arbitration.

4.6 ADMINISTRATION OF THE CONTRACT

4.6.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents, and will be the Owner's representatives (1) during construction, (2) until final payment is due and (3) with the Owner's concurrence, from time to time during the correction period described in Paragraph 12.2. All instructions to the Contractor shall be forwarded through the Construction Manager. The Construction Manager and Architect will advise and consult with the Owner and will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified by written instrument in accordance with other provisions of the Contract.

4.6.2 The Construction Manager will determine in general that the Work is being performed in accordance with the requirements of the Contract Documents, will keep the Owner informed of the progress of the Work, and will endeavor to guard the Owner against defects and deficiencies in the Work.

4.6.3 The Construction Manager will provide for coordination of the activities of other Contractors and of the Owner's own forces with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other Contractors and the Construction Manager and Owner in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule as set forth in Paragraph 3.10, ~~deemed necessary after a joint review and mutual agreement. The construction schedules shall constitute the schedules to be used by the Contractor, other Contractors, the Construction Manager and the Owner until subsequently revised~~.

4.6.4 The Construction Manager will schedule and coordinate the activities of the Contractors in accordance with the latest approved Project construction schedule.

4.6.5 The Architect will visit the site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the completed Work and to determine in general if the Work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check quality or quantity of the Work. On the basis of on-site observations as an architect, the Architect will keep the Owner informed of progress of the Work, and will endeavor to guard the Owner against defects and deficiencies in the Work.

4.6.6 The Construction Manager, ~~except to the extent required by Subparagraph 4.6.4,~~ and Architect will not have control over or charge of and will not be responsible for construction means, methods, techniques, sequences or

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility as provided in Paragraph 3.3, and neither will be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. Neither the Construction Manager nor the Architect will have control over or charge of or be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or of any other persons performing portions of the Work.

4.6.6.1 The Architect, the Owner and the Construction Manager shall at all times have access to the Work wherever it is in preparation and progress. The Contractor shall provide facilities for such access so that the Architect and the Construction Manager may perform their functions under the Contract Documents.

4.6.7 Communications Facilitating Contract Administration. Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall communicate through the Construction Manager, and shall contemporaneously provide the same communications to the Architect. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with other Contractors shall be through the Construction Manager and shall be contemporaneously provided to the Architect.

4.6.8 The Construction Manager will review and certify all Applications for Payment by the Contractor, including final payment. The Construction Manager will assemble each of the Contractor's Applications for Payment with similar Applications from other Contractors into a Project Application and Project Certificate for Payment. After reviewing and certifying the amounts due the Contractors, the Construction Manager will submit the Project Application and Project Certificate for Payment, along with the applicable Contractors' Applications and Certificates for Payment, to the Architect.

4.6.9 Based on the Architect's observations and evaluations of Contractors' Applications for Payment, and the certifications of the Construction Manager, the Architect will review and certify the amounts due the Contractors and will issue a Project Certificate for Payment.

4.6.10 The Architect will have authority to reject Work which does not conform to the Contract Documents, and to require additional inspection or testing, in accordance with Subparagraphs 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed, but will take such action only after notifying the Construction Manager. Subject to review by the Architect, the Construction Manager will have the authority to reject Work which does not conform to the Contract Documents. Whenever the Construction Manager considers it necessary or advisable for implementation of the intent of the Contract Documents, the Construction Manager will have authority to require additional inspection or testing of the Work in accordance with Subparagraphs 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Subparagraphs 4.6.18 through 4.6.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor the Construction Manager's authority to act under this Subparagraph 4.6.10 nor a decision made by either of them in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Construction Manager to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons performing any of the Work.

4.6.11 The Construction Manager will receive from the Contractor and review ~~and approve~~ all Shop Drawings, Product Data and Samples, coordinate them with information contained in related documents received from other Contractors, and transmit to the Architect those recommended for approval. The Construction Manager's actions will be taken with such reasonable promptness as to cause no delay in the Work of the Contractor or in the activities of other Contractors, the Owner, or the Architect.

4.6.12 The Architect will review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken with such reasonable promptness as to cause no delay in the Work of the Contractor or in the activities of the other Contractors, the Owner, or the Construction Manager, while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Paragraphs 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

4.6.13 The Construction Manager will prepare Change Orders and Notices to Proceed~~Construction Change Directives~~.

4.6.14 Following consultation with the Construction Manager, the Architect will take appropriate action on Change Orders or Notice to Proceed~~Construction Change Directives~~ in accordance with Article 7 and will have authority to order minor changes in the Work as provided in Paragraph 7.4.

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

4.6.15 The Construction Manager will maintain at the site for the Owner one record copy of all Contracts, Drawings, Specifications, addenda, Change Orders and other Modifications, in good order and marked currently to record all changes and selections made during construction, and in addition approved Shop Drawings, Product Data, Samples and similar required submittals. These will be available to the Architect and the Contractor, and will be delivered to the Owner upon completion of the Project.

4.6.16 The Construction Manager will assist the Architect in conducting inspections to determine the dates of Substantial Completion and final completion, and will receive and forward to the Architect written warranties and related documents required by the Contract and assembled by the Contractor. The Construction Manager will forward to the Architect a final Project Application and Project Certificate for Payment upon compliance with the requirements of the Contract Documents.

4.6.17 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

4.6.18 The Architect will interpret and decide matters concerning performance under and requirements of the Contract Documents on written request of the Construction Manager, Owner or Contractor. Any such requests by the Contractor shall be submitted through the Construction Manager. The Architect's response to such requests will be made with reasonable promptness and within any time limits agreed upon. If no agreement is made concerning the time within which interpretations required of the Architect shall be furnished in compliance with this Paragraph 4.6, then delay shall not be recognized on account of failure by the Architect to furnish such interpretations until 15 days after written request is made for them.

4.6.19 Interpretations and decisions of the Architect will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions so rendered in good faith.

4.6.20 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

4.7 CLAIMS AND DISPUTES

4.7.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims must be made by written notice. The responsibility to substantiate Claims shall rest with the party making the Claim.

4.7.2 Decision of Architect. Claims, including those alleging an error or omission by the Construction Manager or Architect, shall be referred initially to the Architect through the Construction Manager for action as provided in Paragraph 4.8. A decision by the Architect, after consultation with the Construction Manager, as provided in Subparagraph 4.8.4, shall be required as a condition precedent to arbitration or litigation of a Claim between the Contractor and Owner as to all such matters arising prior to the date final payment is due, regardless of (1) whether such matters relate to execution and progress of the Work or (2) the extent to which the Work has been completed. The decision by the Architect in response to a Claim shall not be a condition precedent to arbitration or litigation in the event (1) the position of Architect is vacant, (2) the Architect has not received evidence or has failed to render a decision within agreed time limits, (3) the Architect has failed to take action required under Subparagraph 4.8.4 within 30 days after the Claim is made, (4) 45 days have passed after the Claim has been referred to the Architect or (5) the Claim relates to a mechanic's lien.

4.7.3 Time Limits on Claims. Claims by ~~either party~~Contractor must be made within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the ~~claimant~~Contractor first recognizes the condition giving rise to the Claim, whichever is later, provided, however, that the Contractor shall use its best efforts to furnish the Construction Manager, Architect, and the Owner, as expeditiously as possible, with notice of any Claim, including, without limitation, those in connection with concealed or unknown conditions, as soon as such Claim is recognized. Contractor shall cooperate with the Construction Manager, Architect, and the Owner in any effort to mitigate the alleged or potential damages, delay, or other adverse consequences arising out of the condition that is the cause of the Claim. Claims must be made by written notice. An additional Claim made after the initial Claim has been implemented by Change Order will not be considered unless submitted in a timely manner.

4.7.4 Continuing Contract Performance. Pending final resolution of a Claim including arbitration, unless otherwise agreed in writing the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

4.7.5 Waiver of Claims: Final Payment. The making of final payment shall constitute a waiver of Claims by the Owner except those arising from:

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

.1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;

.2 failure of the Work to comply with the requirements of the Contract Documents; or

.3 ~~terms of special~~ warranties required by the Contract Documents.

4.7.6 Claims for Concealed or Unknown Conditions. If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then notice by the observing party shall be given to the other party promptly before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect and Construction Manager will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines after consultation with the Construction Manager that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall so notify the Owner and Contractor through the Construction Manager in writing, stating the reasons. Claims by either party in opposition to such determination must be made within 21 days after the Architect has given notice of the decision. If the Owner and Contractor cannot agree on an adjustment in the Contract Sum or Contract Time, the adjustment shall be referred to the Architect for initial determination, subject to further proceedings pursuant to Paragraph 4.8. No adjustment in the Contract Time or Contract Sum shall be permitted, however, in connection with a concealed or unknown condition that does not differ materially from those conditions disclosed or that reasonably should have been disclosed by the Contractor's prior inspections, tests, reviews, and preconstruction services for the Project, or inspections, tests, reviews, and preconstruction services that the Contractor had the opportunity to make or should have performed in connection with the Project in the exercise of the care and skill required of the Contractor by the Contract Documents.

4.7.7 Claims for Additional Cost. If the Contractor wishes to make Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Paragraph 10.3. If the Contractor believes additional cost is involved for reasons including but not limited to (1) a written interpretation from the Architect, (2) an order by the Owner to stop the Work where the Contractor was not at fault, (3) a written order for a minor change in the Work issued by the Architect, (4) failure of payment by the Owner, (5) termination of the Contract by the Owner, (6) Owner's suspension or (7) other reasonable grounds, Claim shall be filed in accordance with the procedure established herein.

4.7.8 Claims for Additional Time.

4.7.8.1 If the Contractor wishes to make Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

4.7.8.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time and could not have been reasonably anticipated, and that weather conditions had an adverse effect on the scheduled construction.

4.7.9 Injury or Damage to Person or Property. If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, of any of the other party's employees or agents, or of others for whose acts such party is legally liable, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after first observance. The notice shall provide sufficient detail to enable the other party to investigate the matter. If a Claim for additional cost or time related to this Claim is to be asserted, it shall be filed as provided in Subparagraphs 4.7.7 or 4.7.8.

4.8 RESOLUTION OF CLAIMS AND DISPUTES

4.8.1 The Architect will review with the Construction Manager Claims and take one or more of the following preliminary actions within ten days of its receipt of a Claim: (1) request additional supporting data from the claimant, (2) submit a schedule to the parties indicating when the Architect expects to take action, (3) reject the Claim in whole or in part, stating reasons for rejection, (4) recommend approval of the Claim by the other party or (5) suggest a compromise. The Architect may also, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim.

4.8.2 If a Claim has been resolved, the Architect will prepare or obtain appropriate documentation.

4.8.3 If a Claim has not been resolved, the party making the Claim shall, within ten days after the Architect's preliminary response, take one or more of the following actions: (1) submit additional supporting data requested by the Architect, (2) modify the initial Claim or (3) notify the Architect that the initial Claim stands.

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

4.8.4 If a Claim has not been resolved after consideration of the foregoing and of further evidence presented by the parties or requested by the Architect, the Architect will notify the parties in writing that the Architect's decision will be made within seven days, which decision shall be final and binding on the parties but subject to arbitration. Upon expiration of such time period, the Architect will render to the parties the Architect's written decision relative to the Claim, including any change in the Contract Sum or Contract Time or both. If there is a surety and there appears to be a possibility of a Contractor's default, the ~~Architect~~ Construction Manager may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

4.9 ARBITRATION

4.9.1 Controversies and Claims Subject to Arbitration. Unless otherwise provided in the Agreement between Owner and Contractor or in the Supplementary Conditions, ~~A~~any controversy or Claim arising out of or related to the Contract, or the breach thereof, shall be settled by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association, and judgment upon the award rendered by the arbitrator or arbitrators may be entered in any court having jurisdiction thereof, except controversies or Claims relating to aesthetic effect and except those waived as provided for in Subparagraph 4.7.5. Such controversies or Claims upon which the Architect has given notice and rendered a decision as provided in Subparagraph 4.8.4 shall be subject to arbitration upon written demand of either party. Arbitration may be commenced when 45 days have passed after a Claim has been referred to the Architect as provided in Paragraph 4.7 and no decision has been rendered.

4.9.2 Rules and Notices for Arbitration. Claims between the Owner and Contractor not resolved under Paragraph 4.8 shall, if subject to arbitration under Subparagraph 4.9.1, be decided by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association currently in effect, unless the parties mutually agree otherwise. Notice of demand for arbitration shall be filed in writing with the other party to the Agreement between the Owner and Contractor and with the American Arbitration Association, and copies shall be filed with the Construction Manager and Architect.

4.9.3 Contract Performance During Arbitration. During arbitration proceedings, the Owner and Contractor shall comply with Subparagraph 4.7.4.

4.9.4 When Arbitration May Be Demanded. Demand for arbitration of any Claim may not be made until the earlier of (1) the date on which the Architect has rendered a final written decision on the Claim, (2) the tenth day after the parties have presented evidence to the Architect or have been given reasonable opportunity to do so, if the Architect has not rendered a final written decision by that date, or (3) any of the five events described in Subparagraph 4.7.2.

4.9.4.1 When a written decision of the Architect states that (1) the decision is final but subject to arbitration and (2) a demand for arbitration of a Claim covered by such decision must be made within 30 days after the date on which the party making the demand receives the final written decision, then failure to demand arbitration within said 30 days' period shall result in the Architect's decision becoming final and binding upon the Owner and Contractor. If the Architect renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence, but shall not supersede arbitration proceedings unless the decision is acceptable to all parties concerned.

4.9.4.2 A demand for arbitration shall be made within the time limits specified in Subparagraphs 4.9.1 and 4.9.4 and Clause 4.9.4.1 as applicable, and in other cases within a reasonable time after the Claim has arisen, and in no event shall it be made after the date when institution of legal or equitable proceedings based on such Claim would be barred by the applicable statute of limitations as determined pursuant to Paragraph 13.7.

4.9.5 Limitation on Consolidation or Joinder. No arbitration arising out of or relating to the Contract Documents shall include, by consolidation or joinder or in any other manner, the Construction Manager, the Architect, or the Construction Manager's or Architect's employees or consultants, except by written consent containing specific reference to the Agreement and signed by the Construction Manager, Architect, Owner, Contractor and any other person or entity sought to be joined. No arbitration shall include, by consolidation or joinder or in any other manner, parties other than the Owner, Contractor, other Contractors as described in Article 6 and other persons substantially involved in a common question of fact or law whose presence is required if complete relief is to be accorded in arbitration. No persons or entities other than the Owner, Contractor or other Contractors as defined in Subparagraph 3.1.2 shall be included as an original third party or additional third party to an arbitration whose interest or responsibility is insubstantial. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of a dispute not described therein or with a person or entity not named or described therein. The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

4.9.6 Claims and Timely Assertion of Claims. A party who files a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded. When a party fails to include a Claim through oversight, inadvertence or excusable neglect, or when a Claim has matured or been acquired subsequently, the arbitrator or arbitrators may permit amendment.

4.9.7 Judgment on Final Award. The award rendered by the arbitrator or arbitrators shall be final, and judgment may

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

ARTICLE 5
SUBCONTRACTORS

5.1 DEFINITIONS

5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include other Contractors or subcontractors of other Contractors.

5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

5.2.1 Within seven (7) days after award of the Contract, the Contractor shall submit in writing to the Construction Manager, for review by the Owner, Architect and Construction Manager, (1) the name, trade, and subcontract amount for each Subcontractor and (2) the names of all persons or entities proposed as manufacturers of the products identified in the Specifications (including those who are to furnish materials or equipment fabricated to a special design) and, where applicable, the name of the installing Subcontractor. ~~Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Construction Manager for review by the Owner, Construction Manager and Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work.~~ The Construction Manager will promptly reply to the Contractor in writing stating whether or not the Owner, Construction Manager or Architect, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the Construction Manager to reply promptly shall constitute notice of no reasonable objection.

5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner, Construction Manager or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

5.2.3 If the Owner, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager or Architect has no reasonable objection. ~~The Contract Sum shall be increased or decreased by the difference in cost occasioned by such change and an appropriate Change Order shall be issued.~~ The Contract Sum shall be amended by either of the following at the Owner's sole discretion: (1) the difference between the subcontract amount proposed by the person or entity recommended by the Contractor and the subcontract amount proposed by the person or entity accepted or designated by the Owner and the Construction Manager; or (2) the amount by which the subcontract amount proposed by the person or entity accepted or designated by the Owner and Construction Manager exceeds the amount set forth in the Schedule of Values that is applicable to the Work covered by such subcontract. However, no increase in the Contract Sum shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

5.2.4 The Contractor shall not change a Subcontractor, person or entity previously selected if the Owner, Construction Manager or Architect makes reasonable objection to such change.

5.3 SUBCONTRACTUAL RELATIONS

5.3.1 By appropriate written agreement, ~~written where legally required for validity~~, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents, assumes toward the Owner, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement which may be at variance with the Contract Documents. Subcontractors shall similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

5.3.2 All subcontracts shall be in writing and shall specifically provide that the Owner is an intended third-party beneficiary of such subcontracts.

5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner provided that:

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Paragraph 14.2 and only for those subcontract agreements which the Owner accepts by notifying the Subcontractor in writing; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

5.4.2 ~~If the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted.~~ If the Work in connection with a subcontract has been suspended for more than thirty (30) days after termination of the Contract by the Owner pursuant to Paragraph 14.2 or Paragraph 14.4 and the Owner accepts assignment of such subcontract, the Subcontractor's compensation shall be equitably adjusted for any increase in direct costs necessarily incurred by such subcontractor as a result of the suspension. In no event will such an adjustment include extended home office overhead or lost profit.

ARTICLE 6
CONSTRUCTION BY OWNER OR BY OTHER CONTRACTORS

6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION WITH OWN FORCES AND TO AWARD OTHER CONTRACTS

6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, which may include persons or entities under separate contracts not administered by the Construction Manager. The Owner further reserves the right to award other contracts in connection with other portions of the Project or other construction or operations on the site ~~under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation~~. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided elsewhere in the Contract Documents.

6.1.2 When the Owner performs construction or operations with the Owner's own forces including persons or entities under separate contracts not administered by the Construction Manager, the Owner or the Construction Manager shall provide for coordination of such forces with the Work of the Contractor, who shall cooperate with them.

6.1.3 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to ~~be subject to the same obligations and to~~ have the same rights which apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in this Article 6 and in Articles 3, 10, 11 and 12, as amended.

6.2 MUTUAL RESPONSIBILITY

6.2.1 The Contractor shall afford the Owner's own forces, Construction Manager and other Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner's own forces or other Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Construction Manager and Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's own forces or other Contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

6.2.3 Costs caused by delays or by improperly timed activities or defective construction shall be borne by the party responsible therefor.

6.2.4 The Contractor shall promptly remedy damage wrongfully caused by the Contractor to completed construction or partially completed construction or to property of the Owner or other Contractors as provided in Subparagraph 10.2.5. Should a claim be made that the Contractor wrongfully delayed or caused damage to the Work or property of another contractor, the Contractor shall, promptly settle the dispute with such other contractor. If a separate contractor sues or initiates an arbitration proceeding against the Construction Manager or Owner on account of any delay or damage alleged to have been caused by the Contractor, the Construction Manager will notify the Contractor who shall defend such proceedings at the Contractor's sole expense. If any judgment or award against the Construction Manager or Owner arises therefrom, the Contractor shall pay or satisfy it and shall reimburse the Construction Manager or Owner for all costs, including attorney's fees and court or arbitration costs which either may have incurred.

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

6.2.5 Claims and other disputes and matters in question between the Contractor and other Contractors shall be subject to the provisions of Paragraph 4.7 provided the other Contractors have reciprocal obligations.

6.2.6 The Owner and other Contractors shall have the same responsibilities for cutting and patching as are described for the Contractor in Paragraph 3.14.

6.3 OWNER'S OR CONSTRUCTION MANAGER'S RIGHT TO CLEAN UP

6.3.1 If a dispute arises among the Contractor, other Contractors and the Construction Manager and/or the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish as described in Paragraph 3.15, the Owner or Construction Manager may clean up and allocate the cost among those responsible as the Construction Manager, in consultation with the Architect, determines to be just. Refer to Project Manual Section 01550 - Clean Up and Final Cleaning.

ARTICLE 7
CHANGES IN THE WORK

7.1 CHANGES

7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, ~~Construction Change Directive~~ Notice to Proceed, or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents. Refer to Project Manual Section 01250 - Changes in the Work.

7.1.2 A Change Order shall be based upon agreement among the Owner, Construction Manager, Architect and Contractor; a ~~Construction Change Directive~~Notice to Proceed requires agreement by the Owner, Construction Manager and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and Contractor shall proceed promptly, unless otherwise provided in the Change Order, ~~Construction Change Directive~~Notice to Proceed, or order for a minor change in the Work. Except as permitted in Paragraph 7.3, an increase in the Contract Sum or the Contract Time shall be accomplished only by Change Order. Accordingly, no course of conduct or dealings between the parties, nor express or implied acceptance of alterations or additions to the Work, and no claim that the Owner has been unjustly enriched by any alteration or addition to the Work, whether or not there is, in fact, any unjust enrichment to the Work, shall be the basis of any claim for an increase in any amounts due under the Contract Documents or for a change in any time period provided for in the Contract Documents.

7.1.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are so changed in a proposed Change Order or Notice to Proceed~~Construction Change Directive~~ that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

7.2 CHANGE ORDERS

7.2.1 A Change Order is a written instrument prepared by the Construction Manager and signed by the Owner, Construction Manager, Architect and Contractor, stating their agreement upon all of the following:

.1 a change in the Work;

.2 the amount of the adjustment in the Contract Sum, if any; and

.3 the extent of the adjustment in the Contract Time, if any.

7.2.2 Methods used in determining adjustments to the Contract Sum ~~may include~~ shall be those listed in Subparagraph 7.3.3.

7.2.3 Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work that is the subject of the Change Order, including, but not limited to, all direct and indirect costs associated with such change, any impact such change may have on the unchanged Work, including but not limited to claims for acceleration, stacking, inefficiency, ripple effect, disruption, compression, interference, delay and cumulative impact, and any and all adjustments to the Contract Sum and the Schedule. In the event a Change Order increases the Contract Sum, the Contractor shall include the Work covered by such Change Orders in Applications for Payment as if such Work were originally part of the Contract Documents.

7.3 ~~CONSTRUCTION CHANGE DIRECTIVES~~ NOTICE TO PROCEED and QUOTATION ONLY

7.3.1 A ~~Construction Change Directive~~Notice to Proceed is a written order prepared by the Construction Manager and signed by the Owner, Construction Manager and Architect, directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by ~~Construction Change~~

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

~~Directive~~Notice to Proceed, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly. A Quotation Only has the meaning set forth in Project Manual Section 01250 - Changes in the Work.

7.3.2 A ~~Construction Change Directive~~Notice to Proceed shall be used in the absence of total agreement on the terms of a Change Order or when time constraints preclude getting a Change Order issued.

7.3.3 If the ~~Construction Change Directive~~Notice to Proceed provides for an adjustment to the Contract Sum, the adjustment shall be based on one or more of the following methods:

.1 mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

.2 unit prices stated in the Contract Documents or subsequently agreed upon; or

.3 actual cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee as set forth in Project Manual section 01250 - Changes in the Work.; ~~or~~,

~~.4 as provided in Subparagraph 7.3.6.~~

7.3.4 Upon receipt of a ~~Construction Change Directive~~Notice to Proceed, the Contractor shall promptly proceed with the change in the Work involved, ~~and advise the Construction Manager and Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.~~

7.3.5 A ~~Construction Change Directive~~Notice to Proceed signed by the Contractor indicates the agreement of the Contractor therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

~~**7.3.6** If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the method and the adjustment shall be determined by the Construction Manager on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, a reasonable allowance for overhead and profit. In such case, and also under Clause 7.3.3.3, the Contractor shall keep and present, in such form as the Construction Manager may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Subparagraph 7.3.6 shall be limited to the following:~~

~~.1 costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers compensation insurance;~~

~~.2 costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;~~

~~.3 rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;~~

~~.4 costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and~~

~~.5 additional costs of supervision and field office personnel directly attributable to the change.~~

~~**7.3.7** Pending final determination of cost to the Owner, amounts not in dispute may be included in Applications for Payment. The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Construction Manager. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.~~

~~**7.3.8** If the Owner and Contractor do not agree with the adjustment in Contract Time or the method for determining it, the adjustment or the method shall be referred to the Construction Manager for determination.~~

~~**7.3.9** When the Owner and Contractor agree with the determination made by the Construction Manager concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately issued through the Construction Manager and shall be recorded by preparation and execution of an appropriate Change Order.~~

7.4 MINOR CHANGES IN THE WORK

7.4.1 The Architect will have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order issued through the Construction Manager and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly.

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final January 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

ARTICLE 8
TIME

8.1 DEFINITIONS

8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

8.1.2 The date of commencement of the Work is the date established in the Agreement. The date shall not be postponed by the failure to act of the Contractor or of persons or entities for whom the Contractor is responsible.

8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Paragraph 9.8.

8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

8.2 PROGRESS AND COMPLETION

8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor. The date of commencement of the Work shall not be changed by the effective date of such insurance. Unless the date of commencement is established by a notice to proceed given by the Owner, the Contractor shall notify the Owner in writing not less than five days or other agreed period before commencing the Work to permit the timely filing of mortgages, mechanic's liens and other security interests.

8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time. All Work shall be completed in sufficient time to allow for clean-up and preparation for Owner move-in prior to the date of Substantial Completion of the Work.

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 If the Contractor is delayed at any time in progress of the Work by an act or neglect of the Owner's own forces, Construction Manager, Architect, any of the other Contractors or an employee of any of them, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, adverse weather conditions not reasonably anticipated, unavoidable casualties or other causes beyond the Contractor's control, or by delay authorized by the Owner pending arbitration, or by other causes which the ~~Architect, based on the recommendation of the~~ Construction Manager, determines may justify delay, then the Contract Time shall be extended by Change Order to the extent such delay will prevent the Contractor from achieving Substantial Completion within the Contract Time and if the performance of the Work is not, was not, or would not have been delayed by any other cause for which the Contractor is not entitled to an extension in the Contract Time under the Contract Documents. The Contractor further acknowledges and agrees that adjustments in the Contract Time will be permitted for a delay only to the extent such delay is not caused, or could not have been anticipated or prevented by the Contactor, could not be limited or avoided by the Contractor's timely notice to the Owner of the delay, and is of a duration not less than one (1) day. ~~for such reasonable time as the Architect may determine~~.

8.3.2 ~~Claims relating to time shall be made in accordance with applicable provisions of Paragraph 4.7.~~ Any claim for extension of time shall be made in writing to the Construction Manager in the manner and time specified by Paragraph 4.7; otherwise it shall be waived. In the case of a continuing delay only one claim is necessary. The Contractor shall provide a written estimate of the probable effect of such delay on the progress of the Work.

8.3.3 ~~This Paragraph 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.~~ Notwithstanding anything to the contrary in the Contract Documents, an extension in the Contract Time, to the extent permitted under Subparagraph 8.3.1, shall be the sole remedy of the Contractor for any (1) delay in the commencement, prosecution, or completion of the Work; (2) hinderance or obstruction in the performance of the Work; (3) loss of productivity or acceleration; or (4) other similar claims (collectively referred to in this Subparagraph 8.3.3 as Delays) whether or not such Delays are foreseeable, unless a Delay is caused by the Owner's active interference with the Contractor's performance of the Work, and only to the extent such acts continue after the Contractor furnishes the Owner with notice of such interference. In no event shall the Contractor be entitled to any compensation or recovery of any damages in connection with any Delay, including, without limitation, consequential damages, lost opportunity costs, impact damages, or other similar remuneration. The Owner's exercise of any of its rights or remedies under the Contract Documents (including, without limitation, ordering changes in the Work, or directing suspension, rescheduling, or correction of the Work), regardless of the extent or frequency of the Owner's exercise of such rights or remedies, shall not be construed as active

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

interference with the Contractor's performance of the Work.

ARTICLE 9
PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

9.2 SCHEDULE OF VALUES

9.2.1 ~~Before the first Application for Payment, the~~ Within seven (7) days after award of contract, Contractor shall submit to the Architect, through the Construction Manager, a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Construction Manager and Architect may require. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

9.3 APPLICATIONS FOR PAYMENT

9.3.1 At least fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager an itemized Application for Payment for Work completed in accordance with the schedule of values. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner, Construction Manager or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and reflecting retainage if provided for elsewhere in the Contract Documents. See Project Manual Section 01290 - Payment Procedures for a description of Contractor's obligations in relation to Applications for Payment.

9.3.1.1 Such applications may include requests for payment on account of changes in the Work which have been properly authorized by ~~Construction Change Directives~~Notice to Proceed but not yet included in Change Orders.

9.3.1.2 Such applications may not include requests for payment of amounts the Contractor does not intend to pay to a Subcontractor or material supplier because of a dispute or other reason.

9.3.1.3 The Contractor shall provide supporting data substantiating the Contractor's right to payment as the Owner, Architect and Construction Manager may require.

9.3.2 Payment will not be made on account of materials or equipment stored on or off site unless the requirements set forth in Project Manual Section 01290 regarding materials stored off site are met to the satisfaction of Construction Manager. ~~Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.~~

9.3.3 The Contractor warrants that title to all Work (including materials and equipment) covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances (hereinafter collectively referred to as "Liens") in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

9.3.3.1 The Contractor further expressly undertakes to defend the Indemnitees, at the Contractor's sole expense, against any actions, lawsuits, or proceedings brought against the Indemnitees as a result of Liens filed against the Work, the site of the Work, the Project site and any improvements on it, payments due the Contractor, or any portion of the property of any of the Indemnities. The Contractor agrees to indemnify and hold the Indemnitees harmless against any such Liens and agrees to pay any judgment resulting from any such actions, lawsuits, or proceedings.

9.3.3.2 The Owner shall release any payments withheld due to a Lien if the Contractor obtains security acceptable to the Owner or a lien bond that is (1) issued to a surety acceptable to the Owner; (2) in form and substance satisfactory to the Owner; and (3) in an amount not less than one hundred fifty percent (150%) of such Lien. By posting a lien bond or other acceptable security, however, the Contractor shall not be relieved of any responsibilities or obligations under this Paragraph 9.3, including, without limitation, the duty to defend and indemnify the Indemnitees. The cost of any premiums incurred in connection with such bonds and security shall be the Contactor's responsibility and shall not be part of, or cause any adjustment to, the Contract Sum.

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

9.3.3.3 Notwithstanding the foregoing, the Owner reserves the right to settle any disputed Lien by making payment to the lien claimant or by such other means as the Owner, in the Owner's sole discretion, determines is the most economical or advantageous method of settling the dispute. The Contractor shall promptly reimburse Owner, upon demand, for any payments so made.

9.4 CERTIFICATES FOR PAYMENT

9.4.1 ~~The Construction Manager will assemble a Project Application for Payment by combining the Contractor's applications with similar applications for progress payments from other Contractors and, after certifying the amounts due on such applications, forward them to the Architect within seven days.~~ The Architect will, after the receipt of the Project Application for Payment with the recommendations of the Construction Manager, review the Project Application for Payment and either issue a Project Certificate for Payment to the Owner with a copy to the Construction Manager for such amounts as the Architect determines are properly due, or notify the Construction Manager and Owner in writing of the reasons for withholding a Certificate as provided in Subparagraph 9.5.1. Such notifications will be forwarded to the Contractor by the Construction Manager.

~~**9.4.2** Within seven days after the Architect's receipt of the Project Application for Payment, the Construction Manager and Architect will either issue to the Owner a Project Certificate for Payment, with a copy to the Contractor, for such amount as the Construction Manager and Architect determine is properly due, or notify the Contractor and Owner in writing of the Construction Manager's and Architect's reasons for withholding certification in whole or in part as provided in Subparagraph 9.5.1. Such notification will be forwarded to the Contractor by the Construction Manager.~~

9.4.2 The issuance of a separate Certificate for Payment or a Project Certificate for Payment will constitute representations made separately by the Construction Manager and Architect to the Owner, based on their individual observations at the site and the data comprising the Application for Payment submitted by the Contractor, that the Work has progressed to the point indicated and that, to the best of the Construction Manager's and Architect's knowledge, information and belief, quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to minor deviations from the Contract Documents correctable prior to completion and to specific qualifications expressed by the Construction Manager or Architect. The issuance of a separate Certificate for Payment or a Project Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a separate Certificate for Payment or a Project Certificate for Payment will not be a representation that the Construction Manager or Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed the Contractor's construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

9.5.1 The Construction Manager or Architect may decide not to certify payment and may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Subparagraph ~~9.4.3~~ 9.4.2 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager or Architect will notify the Contractor and Owner as provided in Subparagraph ~~9.4.2.~~ 9.4.1. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Construction Manager and Architect will promptly issue a Certificate for Payment for the amount for which the Construction Manager and Architect are able to make such representations to the Owner. The Construction Manager or Architect may also decide not to certify payment or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Construction Manager's or Architect's opinion to protect the Owner from loss because of:

.1 defective Work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims;

.3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or Construction Manager or another contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

.7 persistent failure to carry out the Work in accordance with the Contract Documents.

9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

9.5.3 Should the Subcontractor be in debt to the Owner for any reason, whether in connection with this Contract or a separate contract on this, or another Project, then Owner shall have the right to apply funds from this Contract against the debt owed.

9.6 PROGRESS PAYMENTS

9.6.1 The Owner shall either forward payments for the preceding month's Work to the Contractor directly, or forward payments for the preceding month's Work to the Construction Manager for distribution to Contractors. As agent of the Owner, Construction Manager shall forward payment to Contractor following verification of Owner's disbursement checks. ~~After the Construction Manager and Architect have issued a Project Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Construction Manager and Architect.~~

9.6.2 The Contractor shall promptly pay each Subcontractor, ~~upon~~within five (5) days of receipt of payment from the Owner or Construction Manager, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of such Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in similar manner.

9.6.3 The Construction Manager ~~will, on request~~ may, on request, and in the Construction Manager's discretion, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Owner, Construction Manager and Architect on account of portions of the Work done by such Subcontractor.

9.6.4 Neither the Owner, Construction Manager nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor except as may otherwise be required by law. However, if either Owner, Construction Manager or Architect has cause for concern of whether all payments have been made or will be made as required to subcontractors, laborers or suppliers or creditors of the Subcontractor, Owner, Construction Manager or Architect, in their sole discretion, and without limiting other remedies, after seventy-two (72) hours notice to Contractor, have the right to issue payments either by joint check, payable to both Contractor and the subcontractor, laborer, supplier or creditor, or directly to the subcontractor, laborer, supplier or creditor. Such payments shall be applied against the Contract Sum to the same extent as if the payment were made solely to the Contractor. The Owner, Construction Manager or Architect's rights to issue joint checks or direct payments shall in no event create an obligation on the part of the Owner, Construction Manager or Architect to exercise this right on behalf of a subcontractor, labor, supplier or creditor.

9.6.5 Payment to material suppliers shall be treated in a manner similar to that provided in Subparagraphs 9.6.2, 9.6.3 and 9.6.4.

9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

9.7 FAILURE OF PAYMENT

9.7.1 If the Construction Manager should fail to issue recommendations within fourteen (14) days of receipt of the Contractor's Application for Payment, or if, through no fault of the Contractor, the Architect does not issue a Project Certificate for Payment within fourteen (14) days after the Architect's receipt of the Project Application for Payment, or if the Owner does not pay the Contractor within fourteen (14) days after the date established in the Contract Documents any amount certified by the Architect or awarded by arbitration, then the Contractor may, upon fourteen (14) additional days' written notice to the Owner, the Architect and the Construction Manager, stop Work until payment of the amount owing has been received. The Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, which shall be accomplished as provided in Article 7. ~~If, through no fault of the Contractor, 1) the Construction Manager and Architect do not issue a Project Certificate for Payment within fourteen days after the Construction Manager's receipt of the Contractor's Application for Payment or 2) the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Construction Manager and Architect or awarded by arbitration, then the Contractor may, upon seven additional days' written notice to the Owner, Construction Manager and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, which shall be accomplished as provided in Article 7.~~

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

9.7.2 If the Owner is entitled to reimbursement or payment from the Contractor under or pursuant to the Contract Documents, such payment shall be made promptly upon demand by the Owner. Notwithstanding anything contained in the Contract Documents to the contrary, if the Contractor fails to promptly make any payment due the Owner, or the Owner incurs any costs and expenses to cure any default of the Contactor or to correct defective Work, the Owner shall have an absolute right to offset such amount against the Contract Sum and may, in the Owner's sole discretion, elect either to deduct an amount equal to that which the Owner is entitled from any payment then or thereafter due the Contractor from the Owner, or issue a written notice to the Contractor reducing the Contract Sum by an amount equal to that which the Owner is entitled.

9.8 SUBSTANTIAL COMPLETION

9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use.

9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor ~~and Construction Manager~~ shall ~~jointly~~ prepare and submit to the Architect through the Construction Manager a comprehensive list of items to be completed or corrected. The Contractor shall proceed promptly to complete and correct items on the list. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Upon receipt of the list, the Architect, assisted by the Construction Manager, will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the list, which is not in accordance with the requirements of the Contract Documents, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. The Contractor shall then submit through the Construction Manager a request for another inspection by the Architect, assisted by the Construction Manager, to determine Substantial Completion. When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. In no case shall the Contractor's final completion of the Work and contract closeout (see Project Manual Section 01700 - Contract Closeout) exceed sixty (60) days from the date of issuance of the Certificate of Substantial Completion. In the event Contractor fails to complete the Work within the sixty (60) day period, the Owner may, in addition to all of its other rights and remedies under the Contract and at law and/or equity, complete the Contractor's Work at the sole expense of Contractor. Owner shall be entitled to deduct from the final payment all costs and expenses incurred in completing the Work, including additional Construction Management and Architecture fees and costs. In the event the costs exceed the amounts being withheld by Owner for final payment, the Contractor or its surety shall make the excess payment within five (5) days of demand by the Owner.

9.8.3 Upon Substantial Completion of the Work or designated portion thereof and upon application by the Contractor and certification by the Construction Manager and Architect, the Owner ~~shall~~ or Construction Manager may make payment, reflecting adjustment in retainage, if any, for such Work or portion thereof as provided in the Contract Documents.

9.8.3.1 Within thirty (30) days after Certificate of Substantial Completion has been issued for all portions of its Work, Contractor may be paid at the discretion of the Construction Manager and Owner, a sum sufficient to increase total payments to One Hundred Percent (100%) of Contract Sum, or portion thereof, less such retainage as Architect and Construction Manager determine in their sole discretion is necessary to protect Owner for any and all incomplete work and unsettled claims.

9.9 PARTIAL OCCUPANCY OR USE

9.9.1 The Owner reserves the right to occupy the whole or any portion of the premises at any time prior to completion of the Work provided such occupancy or use is consented to by the insurer as required under Subparagraph 11.3.11 and authorized by public authorities having jurisdiction over the Work. It is understood and agreed that the right to use the premises is part of the Contract and the Contractor has taken this possibility into account when preparing its bid, and that the Contractor shall proceed with the Work in such a manner as may be directed and shall cooperate with the Owner to limit interruptions to the Owner's routine operations. ~~The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by~~

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

~~the insurer as required under Subparagraph 11.3.11 and authorized by public authorities having jurisdiction over the Work.~~ Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor ~~and Construction Manager~~ shall ~~jointly~~ prepare and submit a list to the Architect, through the Construction Manager, as provided under Subparagraph 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect after consultation with the Construction Manager.

9.9.2 Immediately prior to such partial occupancy or use, the Owner, Construction Manager, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

9.10 FINAL COMPLETION AND FINAL PAYMENT

9.10.1 Upon completion of the Work, the Contractor shall forward to the Construction Manager a written notice that the Work is ready for final inspection and acceptance and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager will forward the notice and Application to the Architect, along with Construction Manager's recommendation, if any, who will promptly make such inspection. When the Architect, and based ~~on the recommendation of the~~ Construction Manager, finds the Work acceptable under the Contract Documents and the Contract fully performed, the ~~Construction Manager and~~ Architect will promptly issue a final Certificate for Payment stating that to the best of ~~their~~ its knowledge, information and belief, and on the basis of ~~their~~ its observations and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in said final Certificate is due and payable. The ~~Construction Manager's and~~ Architect's approval of the final Certificate for Payment will constitute a further representation that conditions listed in Subparagraph 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. All warranties and guarantees and specified closeout documents required under or pursuant to the Contract Documents shall be assembled and delivered by the Contractor to the Construction Manager as part of the final Application for Payment (Refer to Project Manual Section 01700 - Contract Closeout, Section 01720 - Project Record Documents, Section 01730 - Operations and Maintenance Data, Section 01740 - Warranties and Guarantees, and Section 01750 - Systems Demonstration, Training and Start Up). The final Certificate for Payment will not be issued by the Architect until all warranties and guarantees and other specified closeout documentation have been received and accepted by the Owner.

9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect through the Construction Manager (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or Construction Manager or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or other wise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner or Construction Manager, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner or Construction Manager. If a Subcontractor refuses to furnish a release or waiver required by the Owner or Construction Manager, the Contractor may furnish a bond satisfactory to the Owner and Construction Manager to indemnify the Owner and Construction Manager against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner and/or Construction Manager all money that the Owner and/or Construction Manager may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect through the

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

Construction Manager prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims. The making of final payment shall constitute a waiver of Claims by the Owner as provided in Subparagraph 4.4.5.

9.10.4 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment. Such waivers shall be in addition to the waiver described in Subparagraph 4.7.5. If Contractor fails to submit a final Application for Payment or a final waiver within a reasonable time after request by Construction Manager, and in no event later than sixty (60) days after the issuance of the Certificate of Substantial Completion, the Owner and Construction Manager may unilaterally determine the balance due to the Contractor and the Contractor shall be bound by such determination.

ARTICLE 10
PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 The Contractor shall be solely responsible to the Owner and Construction Manager for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall submit the Contractor's safety program to the Construction Manager for review and coordination with the safety programs of other Contractors. Contractor shall be responsible for payment of all fines levied against Owner, Architect or Construction Manager and all costs (including attorney's fees) incurred as a result of such fines arising from or relating to conduct of Contractor's Work.

10.1.2 In the event the Contractor encounters on the site material reasonably believed to be asbestos or polychlorinated biphenyl (PCB), or any other hazardous material, which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner, Construction Manager and Architect in writing. The Work in the affected area shall not thereafter be resumed except by written agreement of the Owner and Contractor if in fact the material is asbestos or polychlorinated biphenyl (PCB), or any other material deemed hazardous, and has not been rendered harmless. The Work in the affected area shall be resumed in the absence of asbestos, ~~or~~ polychlorinated biphenyl (PCB), or any other hazardous material, or when it has been rendered harmless, by written agreement of the Owner and Contractor, or in accordance with final determination by the Architect on which arbitration has not been demanded, or by arbitration under Article 4. The term "rendered harmless" shall be interpreted to mean that levels of asbestos, polychlorinated biphenyls, and other hazardous materials are less than any applicable exposure standards set forth in OSHA regulations. In no event, however, shall the Owner, Construction Manager or Architect have any responsibility for any substance or material that is brought to the Project site by the Contractor, any Subcontractor, any material supplier, or any entity for whom any of them is responsible. The Contractor agrees not to use any fill or other materials to be incorporated into the Work that are hazardous, toxic, or made up of any items that are hazardous or toxic. Refer to Project Manual Section 00840 - Hazardous Materials.

10.1.3 The Contractor shall not be required pursuant to Article 7 to perform without consent any Work relating to asbestos or polychlorinated biphenyl (PCB), or any other hazardous material.

10.1.4 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Construction Manager, Architect, their consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material is asbestos or polychlorinated biphenyl (PCB) and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including loss of use resulting therefrom, but only to the extent caused in whole or in part by negligent acts or omissions of the Owner, anyone directly or indirectly employed by the Owner or anyone for whose acts the Owner may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Subparagraph 10.1.4.

10.1.5 If reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner, Construction Manager and Architect in writing. The Owner, Contractor, Construction Manager and Architect shall then proceed in the same manner described in Subparagraph 10.1.2.

10.1.6 The Owner shall be responsible for obtaining the services of a licensed laboratory to verify a presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to verify that it has been rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor, Construction Manager and

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager and the Architect have no reasonable objection.

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.1 The Contractor shall take ~~reasonable~~ all necessary or appropriate precautions for safety of, and shall provide ~~reasonable~~ all necessary or appropriate protection to prevent damage, injury or loss to:

.1 all employees involved in the Project and all other persons who may be affected thereby; ~~employees on the Work of other persons who may be affected thereby;~~

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors;

.3 other property at the site or adjacent thereto, such as, but not limited to, trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction; and

.4 construction or operations by the Owner, the Construction Manager or other Contractors.

10.2.2 The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, ~~reasonable~~ all necessary or appropriate safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities. The Contractor shall also be responsible, at the Contractor's sole cost and expense, for all measures necessary to protect any property and improvements adjacent to the Project. Any damages to such property or improvements shall be promptly repaired by the Contractor. Without limiting the indemnity provisions elsewhere in the Contract Documents, the Contractor shall indemnify and hold harmless the Owner and Construction Manager from and against any and all actions or damages arising out of or resulting from damage to such property or improvements.

10.2.4 Use of explosives is not permitted. When use or storage of hazardous substances or equipment, or unusual construction methods are necessary, Contractor shall give Owner, Construction Manager and Architect reasonable advanced notice. When driving or removing piles, wrecking, performing excavation work or other similar potentially dangerous work, the Contractor shall provide protection and exercise utmost care, under supervision of properly qualified personnel, so as not to endanger life or property. Contractor is fully responsible for any and all damages, claims and for defense of all actions against Owner, Construction Manager and Architect resulting from prosecution of such work in connection with or arising out of the Contract. ~~When use for storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.~~

10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Clauses 10.2.1.2, 10.2.1.3 and 10.2.1.4 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Clauses 10.2.1.2, 10.2.1.3 and 10.2.1.4, except damage or loss attributable to acts or omissions of the Owner, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Paragraph 3.18.

10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner, Construction Manager and Architect.

10.2.7 The Contractor shall not load or permit any part of the construction or site to be loaded so as to endanger its safety.

10.2.8 When all or a portion of the Work is suspended for any reason, the Contractor shall securely fasten down all coverings and protect the Work, as necessary, from injury by any cause.

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

10.2.9 The Contractor shall promptly report by telephone and in writing to the Owner, Construction Manager and Architect all accidents arising out of or in connection with the Work that cause death, personal injury, or property damage, giving full details and observations of any witnesses. See Project Manual Section 00810 - Safety Program.

10.3 EMERGENCIES

10.3.1 In an emergency affecting safety or persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Paragraph 4.7 and Article 7.

ARTICLE 11
INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

.1 claims under workers compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;

.2 claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;

.3 claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

.4 claims for damages insured by usual personal injury liability coverage which are sustained (1) by a person as a result of an offense directly or indirectly related to employment of such person by the Contractor, or (2) by another person;

.5 claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

.6 claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle; and

.7 claims involving contractual liability insurance applicable to the Contractor's obligations under Paragraph 3.18.

.8 The Contractor's liability insurance shall include all major divisions of coverage and be on a comprehensive basis, including, without limitation:

(1) Premises/Operations (including X, C, and U coverages as applicable).
(2) Independent Contractors' Protective.
(3) Products and Completed Operations.
(4) Personal Injury Liability with Employment Exclusion deleted.
(5) Contractual, including specified provision for Contractor's obligations under Paragraph 3.18.
(6) Owned, nonowned, and hired motor vehicles.
(7) Broad Form Property Damage, including Completed Operations.

The Contractor's insurance shall meet all additional insurance requirements set forth in the Project Manual Section 00620 - Insurance.

.9 If the Contractor has design responsiblity under the Contract Documents, the Contractor shall procure and maintain professional liability insurance in a form and substance that is satisfactory to the Owner. See Project Manual Section 00620 - Insurance.

.10 If the Work involves hazardous waste, hazardous material or asbestos, the Contractor shall procure and maintain pollution liability insurance in a form and substance that is satisfactory to the Owner. See Project Manual Section 00620 - Insurance.

11.1.2 ~~The insurance required by Subparagraph 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims made basis, shall be maintained without interruption from date of commencement of the Work until date of final payment and termination of any coverage required to be maintained after final payment.~~ Refer to Project Manual Section 00620 - Insurance for the specific required coverages, limits, endorsements and time periods that Contractor's insurance must be maintained.

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

~~11.1.3 Certificates of insurance acceptable to the Owner shall be submitted to the Construction Manager for transmittal to the Owner with a copy to the Architect prior to commencement of the Work. These certificates and the insurance policies required by this Paragraph 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. If any of the foregoing insurance coverages are required to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the final Application for Payment as required by Subparagraph 9.10.2. Information concerning reduction of coverage shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor's information and belief.~~ The Contractor agrees to deliver to the Construction Manager, within ten (10) days of the date of the Owner-Contractor Agreement and prior to bringing any equipment or personnel onto the site of the Work or the Project site, certified copies of all insurance policies procured by the Contractor under or pursuant to this Paragraph 11.1 or, with consent of the Owner and Construction Manager, Certificates of Insurance in form and substance satisfactory to the Owner and Construction Manager evidencing the required coverages with limits not less than those specified in the Project Manual Section 00620 - Insurance. The coverage afforded under any insurance policy obtained under or pursuant to this Paragraph 11.1 shall be primary and not excess over or contributory with any valid and collectible insurance carried separately by any of the Indemnitees. Furthermore, all policies and Certificates of Insurance shall expressly provide that no less than thirty (30) days' prior written notice shall be given the Construction Manager, Architect, and Owner in the event of material alteration, cancellation, nonrenewal, or expiration of the coverage contained in such policy or evidenced by such certified copy or Certificate of Insurance. The Owner and Construction Manager ("Barton Malow Company") shall be named additional insureds on the General Liability, Excess Liability, Pollution Liability and Auto Coverage and the policy endorsement form must be the ISO Additional Insured - Owners, Lessees or Contractors (Form B) CG2010 11 85, CG2026 11 85 or an equivalent and must provide additional insured status during completion operations.

11.1.4 In no event shall any failure of the Construction Manager or Owner to receive certified copies or certificates or policies required under Paragraph 11.1 or to demand receipt of such certified copies or certificates prior to the Contractor's commencing the Work be construed as a waiver by the Owner of the Contactor's obligations to obtain insurance pursuant to this Article 11.

11.1.5 When any required insurance, due to the attainment of a normal expiration date or renewal date, shall expire, the Contractor shall furnish to the Construction Manager Certificates of Insurance and amendatory riders or endorsements that clearly evidence the continuation of all coverage in the same manner, limits of protection, and scope of coverage as was provided by the previous policy. In the event any renewal or replacement policy, for whatever reason obtained or required, is written by a carrier other than that with whom the coverage was previously placed, or the subsequent policy differs in any way from the previous policy, the Contractor shall also furnish the Construction Manager with a certified copy of the renewal or replacement policy unless the Owner provides the Contractor with prior written consent to submit only a Certificate of Insurance for any such policy. All renewal and replacement policies shall be in the form and substance satisfactory to the Owner and written by carriers acceptable to the Owner.

11.1.6 Any aggregate limit under the Contractor's liability insurance shall, by endorsement, apply to this Project separately.

11.1.7 Where the provisions of this Paragraph 11.1 and the Project Manual Section 00620 - Insurance conflict, the stricter provision requiring the more extensive insurance coverage shall control.

11.2 OWNER'S LIABILITY INSURANCE

11.2.1 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance. Optionally, the Owner may purchase and maintain other insurance for self-protection against claims which may arise from operations under the Contract. The Contractor shall not be responsible for purchasing and maintaining this optional Owner's liability insurance unless specifically required by the Contract Documents.

11.3 PROPERTY INSURANCE

11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance in the amount of the initial Contract Sum as well as subsequent modifications thereto for the entire Work at the site on a replacement cost basis without voluntary deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Paragraph 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Paragraph 11.3 to be covered, whichever is earlier. This insurance shall include

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Work.

11.3.1.1 Property insurance shall be on an "all-risk" policy form and shall insure against the perils of fire and extended coverage and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, falsework, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's services and expenses required as a result of such insured loss. Coverage for other perils shall not be required unless otherwise provided in the Contract Documents.

11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance which will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor, then the Owner shall bear all reasonable costs properly attributable thereto.

11.3.1.3 If the property insurance requires minimum deductibles and such deductibles are identified in the Contract Documents, the Contractor shall pay costs not covered because of such deductibles. If the Owner or insurer increases the required minimum deductibles above the amounts so identified or if the Owner elects to purchase this insurance with voluntary deductible amounts, the Owner shall be responsible for payment of the additional costs not covered because of such increased or voluntary deductibles.

11.3.1.4 ~~Unless otherwise provided in the Contract Documents, this property insurance shall cover portions of the Work stored off the site after written approval of the Owner at the value established in the approval, and also portions of the Work in transit.~~

11.3.1.5 The insurance required by this Paragraph 11.3 is not intended to cover machinery, tools or equipment owned or rented by the Contractor which are utilized in the performance of the Work but not incorporated into the permanent improvements. The Contractor shall, at the Contractor's own expense, provide insurance coverage for owned or rented machinery, tools or equipment which shall be subject to the provisions of Subparagraph 11.3.7. Refer to Project Manual Section 00620 - Insurance.

11.3.2 Boiler and Machinery Insurance. The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Construction Manager, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

11.3.3 Loss of Use Insurance. The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. ~~The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.~~

11.3.4 The Owner and Construction Manager, "Barton Malow Company", shall be named as an additional insured on all property and liability policies. Refer to Project Manual 00620 - Insurance. ~~If the Contractor requests in writing that insurance for risks other than those described herein or for other special hazards be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.~~

11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, adjoining or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Subparagraph 11.3.7 for damages caused by fire or other perils covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

11.3.6 Before an exposure to loss may occur, the Owner shall file with the ~~Contractor~~ Construction Manager a copy of each policy that includes insurance coverages required by this Paragraph 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Contractor.

11.3.7 Waivers of Subrogation. The Owner and Contractor waive all rights against each other and against the Construction Manager, Architect, Owner's other Contractors and own forces described in Article 6, if any, and the subcontractors, sub-subcontractors, consultants, agents and employees of any of them, for damages caused by fire or other perils to the extent covered by property insurance obtained pursuant to this Paragraph 11.3 or other property insurance applicable to the Work, except such rights as the Owner and Contractor may have to the proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, Owner's separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged. This section shall be deemed null and void if its enforcement jeopardizes the Owner's insurance coverage.

11.3.8 A loss insured under Owner's property insurance shall be adjusted by the Owner as fiduciary through the Construction Manager and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Subparagraph 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or in accordance with an arbitration award in which case the procedure shall be as provided in Paragraph 4.9. If after such loss no other special agreement is made, replacement of damaged property shall be covered by appropriate Change Order.

11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection be made, arbitrators shall be chosen as provided in Paragraph 4.9. The Owner as fiduciary shall, in that case, make settlement with insurers in accordance with directions of such arbitrators. If distribution of insurance proceeds by arbitration is required, the arbitrators will direct such distribution.

11.3.11 Partial occupancy or use in accordance with Paragraph 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

11.4 PERFORMANCE BOND AND PAYMENT BOND

11.4.1 The Contractor shall furnish performance and labor and material payment bonds, in a form satisfactory to the Construction Manager and Owner, and each in the amount of One-Hundred Percent (100%) of its contract amount (unless a lesser amount is specifically authorized in Project Manual Section 00610 - Bonds) covering all Work to be performed by the contractor and its subcontractors and suppliers. The Bonds shall be written in favor of both the Construction Manager and the Owner as dual obligees, using a dual obligee rider that is acceptable to the Owner and the Construction Manager. The Bonds shall also meet all additional requirements set forth in Project Manual Section 00610 - Bonds. ~~The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.~~

11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall permit a copy to be made.

11.4.3 Additional Performance and Payment Bonds may be required by the Owner, in the Owner's sole discretion, from any Subcontractor. The Owner shall pay for any premiums charged for obtaining required Subcontractor bonds by executing a Change Order that shall increase the Contract Sum in an amount equal to such premiums. All such bonds shall be in form and substance satisfactory to the Owner in the Owner's sole judgment.

ARTICLE 12
UNCOVERING AND CORRECTION OF WORK

12.1 UNCOVERING OF WORK

12.1.1 If a portion of the Work is covered contrary to the Construction Manager's or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by either, be uncovered for their observation and be replaced at the Contractor's expense without change in the Contract Time.

12.1.2 If a portion of the Work has been covered which the Construction Manager or Architect has not specifically requested to observe prior to its being covered, the Construction Manager or Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work is not in accordance with the Contract Documents, the Contractor shall pay such costs unless the condition was caused by the Owner or one of the other Contractors in which event the Owner shall be responsible for payment of such costs.

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

12.2 CORRECTION OF WORK

12.2.1 The Contractor shall promptly correct Work rejected by the Construction Manager or Architect or failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear costs of correcting such rejected Work, including additional testing and inspections and compensation for the Construction Manager's and Architect's services and expenses made necessary thereby.

12.2.2 If, within one year after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under Subparagraph 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner or Construction Manager to do so unless the Owner or Construction Manager has previously given the Contractor a written acceptance of such condition. This period of one year shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work. This obligation under this Subparagraph 12.2.2 shall survive acceptance of the Work under the Contract and termination of the Contract. The Owner shall give such notice promptly after discovery of the condition. Refer to Project Manual Section 01740 - Warranties and Guarantees.

12.2.3 The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

12.2.4 If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Paragraph 2.4. If the Contractor does not proceed with correction of such nonconforming Work within a reasonable time fixed by written notice from the Construction Manager or from the Architect issued through the Construction Manager, the Owner or Construction Manager may remove it and store the salvable materials or equipment at the Contractor's expense. If the Contractor does not pay costs of such removal and storage within ten days after written notice, the Owner or Construction Manager may upon ten additional days' written notice sell such materials and equipment at auction or at private sale and shall account for the proceeds thereof, after deducting costs and damages that should have been borne by the Contractor, including compensation for the Construction Manager's and Architect's services and expenses made necessary thereby. If such proceeds of sale do not cover costs which the Contractor should have borne, the Contract Sum shall be reduced by the deficiency. If payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner through the Construction Manager.

12.2.5 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or Construction Manager or other Contractors caused by the Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

12.2.6 Nothing contained in this Paragraph 12.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the time period of one year as described in Subparagraph 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

12.3 ACCEPTANCE OF NONCONFORMING WORK

12.3.1 If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13
MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

13.1.1 The Contract shall be governed by the law of the place where the Project is located.

13.2 SUCCESSORS AND ASSIGNS

13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect to covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract as a whole or part without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

13.3 WRITTEN NOTICE

13.3.1 Written notice shall be deemed to have been duly served if delivered in person to the individual or a member of

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

the firm or entity or to an officer of the corporation for which it was intended, or if delivered at or sent by registered or certified mail to the last business address known to the party giving notice. Owner or Construction Manager as Owner's agent, may, at their option, serve notice on the Contractor by faxing a copy of the notice to the Contractor at its last knonw facsimile number and subsequently mailing the notice to the Contractor's last known business address.

13.4 RIGHTS AND REMEDIES

13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

13.4.2 No action or failure to act by the Owner, Construction Manager, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

13.5 TESTS AND INSPECTIONS

13.5.1 Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Construction Manager and Architect timely notice of when and where tests and inspections are to be made so the Construction Manager and Architect may observe such procedures. The Owner shall bear costs of tests, inspections or approvals which do not become requirements until after bids are received or negotiations concluded.

13.5.2 If the Construction Manager, Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Subparagraph 13.5.1, the Construction Manager and Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Construction Manager and Architect of when and where tests and inspections are to be made so the Construction Manager and Architect may observe such procedures. The Owner shall bear such costs except as provided in Subparagraph 13.5.3.

13.5.3 If such procedures for testing, inspection or approval under Subparagraphs 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, the Contractor shall bear all costs made necessary by such failure including those of repeated procedures and compensation for the Construction Manager's and Architect's services and expenses. The Contractor also agrees that the cost of testing services required for the convenience of the Contractor in its scheduling and performance of the Work, and the cost of testing services related to remedial operations performed to correct deficiencies in the Work, shall be borne by the Contractor.

13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Construction Manager for transmittal to the Architect.

13.5.5 If the Construction Manager or Architect is to observe tests, inspections or approvals required by the Contract Documents, the Construction Manager or Architect will do so promptly and, where practicable, at the normal place of testing.

13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

13.6 INTEREST

13.6.1 Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

13.7 COMMENCEMENT OF STATUTORY LIMITATION PERIOD

13.7.1 As between the Owner and Contractor, the limitation period shall commence to run as determined by state law.~~:~~

~~.1 **Before Substantial Completion,** As to acts or failures to act occurring prior to the relevant date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than such date of Substantial Completion;~~

~~.2 **Between Substantial Completion and Final Certificate for Payment,** As to acts or failures to act occurring subsequent to the relevant date of Substantial Completion and prior to issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of the final Certificate for Payment; and~~

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

~~.3 After Final Certificate for Payment. As to acts or failures to act occurring after the relevant date of issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of any act or failure to act by the Contractor pursuant to any warranty provided under Paragraph 3.5, the date of any correction of the Work or failure to correct the Work by the Contractor under Paragraph 12.2, or the date of actual commission of any other act or failure to perform any duty or obligation by the Contractor or Owner, whichever occurs last.~~

ARTICLE 14
TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor, for any of the following reasons:

.1 issuance of an order of a court or other public authority having jurisdiction;

.2 an act of government, such as a declaration of national emergency, making material unavailable;

~~.3 because the Construction Manager or Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Subparagraph 9.4.2, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents;~~

~~.4 if repeated suspensions, delays or interruptions by the Owner as described in Paragraph 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365 day period, whichever is less; or~~

~~.5 the Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Subparagraph 2.2.1.~~

14.1.2 If one of the above reasons exists, the Contractor may, upon seven additional days' written notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner payment for Work executed and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead, profit and damages.

14.1.3 If the Work is stopped for a period of 60 days or if repeated suspensions, delays, or interruptions by the Owner as described in Paragraph 14.3 constitute in the aggregate the lesser of an amount equal to the Contract time or 120 days in any one (1) year period through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has persistently failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner as provided in Subparagraph 14.1.2.

14.2 TERMINATION BY THE OWNER FOR CAUSE

14.2.1 The Owner may terminate the Contract if the Contractor:

.1 persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;

.3 persistently disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

.5 Is petitioned bankrupt, or makes a general assignment for the benefit of creditors, or if a receiver is appointed on account of the Contractor's insolvency.

.6 breaches any warranty made by the Contractor under or pursuant to the Contract Documents.

.7 fails to furnish the Owner with assurances satisfactory to the Owner evidencing the Contractor's ability to complete the Work in compliance with all the requirements of the Contract Documents.

.8 fails after commencement of the Work to proceed continuously with the construction and completion of the Work for more than ten (10) days, except as permitted under the Contract Documents.

14.2.2 When any of the above reasons exist, the Owner, after consultation with the Construction Manager, and upon

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

certification by the Architect that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, ~~seven days'~~ seventy-two hours written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 accept assignment of subcontracts pursuant to Paragraph 5.4; and

.3 finish the Work by whatever reasonable method the Owner may deem expedient.

14.2.3 When the Owner terminates the Contract for one of the reasons stated in Subparagraph 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner through the Construction Manager. The amount to be paid to the Contractor or Owner, as the case may be, shall, upon application, be certified by the Architect after consultation with the Construction Manager, and this obligation for payment shall survive termination of the Contract.

14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

14.3.2 An adjustment shall be made for increases in the cost of performance of the Contract, including profit on the increased cost of performance, caused by suspension, delay or interruption. No adjustment shall be made to the extent:

.1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of this Contract.

14.3.3 Adjustments made in the cost of performance may have a mutually agreed fixed or percentage fee.

14.4 Owner's Termination for Convenience

14.4.1 The Owner reserves the right to terminate the Contract, or any portion thereof, for convenience and without cause, even though the Contractor has not failed to perform any part of the Contract. Termination of the Work hereunder shall be effected by written notice to the Contractor. Upon receipt of such notice, the Contractor shall, unless the notice otherwise directs:

.1 Immediately discontinue the terminated portion of the Work and the placing of all orders and subcontracts in connection with the terminated portion of the Work;

.2 Immediately cancel all of the existing orders and subcontracts in connection with the terminated portion of the Work;

.3 Immediately transfer to the Owner all materials, supplies, Work in progress, appliances, facilities, machinery, and tools acquired by the Contractor in connection with the performance of the terminated portion of the Work, and take such action as may be necessary or as the Owner or Construction Manager may direct for protection and preservation of the work relating to this Contract; and

.4 deliver all plans, drawings, specifications, and other necessary information to the Owner through the Construction Manager.

14.4.2 If the Owner terminates the Contract for convenience, the following shall be the Contractor's exclusive remedies:

14.4.2.1 Reimbursement of all actual expenditures and costs approved by the Owner through the Construction Manager and Architect as having been made or incurred in performing the terminated Work;

14.4.2.2 Reimbursement of expenditures made and costs incurred with the Owner's prior written approval in settling or discharging outstanding commitments entered into by the Contractor in performing the Contract; and

14.4.2.3 Payment of profit, insofar as profit is realized hereunder, of an amount equal to the estimated profit on the entire Contract at the time of termination multiplied by the percentage of completion of the Work. In no event shall the Contractor be entitled to anticipated fees or profits on work not required to be performed.

14.4.3 All obligations of the Contactor under the Contract with respect to completed Work, including but

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

not limited to all warranties, guarantees, indemnities, insurance and bonds shall apply to all Work completed or substantially completed by the Contractor prior to a convenience termination by the Owner. Notwithstanding the above, any convenience termination by the Owner or payments to the Contractor shall be without prejudice to any claims or legal remedies that the Owner may have against the Contractor for any cause.

14.4.4 Upon a determination that a termination of this Contract, other than a termination for convenience under this Paragraph 14.4, was wrongful or improper for any reason, such termination shall automatically be deemed converted to a convenience termination under this Paragraph 14.4, and the Contractor's remedy for such wrongful termination shall be limited to the recoveries specified under Subparagraph 14.4.2.

14.4.5 Contractor is required to include a termination for convenience clause in all of its subcontractor and supplier contracts, in substantially similar form as set forth in this Paragraph 14.4, and that limits the subcontractors and suppliers to exclusive remedies no greater than those set forth in Subparagraph 14.4.2 that are available to Contractor. Contractor shall bear all costs arising or related to its failure to include such clause in its subcontracts.

© 1992 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, N.W., WASHINGTON, D.C., 20006-5292. AIA DOCUMENT A201/CMa - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - CONSTRUCTION MANAGER-ADVISER EDITION - 1992 EDITION - AIA® - WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. expiration as noted below. expiration as noted below. User Document: a201cma pe group final january 1, 2004.aia -- 1/13/2004. AIA License Number 1015952, which expires on 6/20/2004.

SECTION 00800
SUPPLEMENTARY GENERAL CONDITIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

B. Specific attention is directed to the requirements described in Section 00700 General Conditions of the Contract and Section 00500 Agreement Form.

1.02 SUPPLEMENTARY GENERAL CONDITIONS

A. Document **PCP 14-11, Supplementary Conditions to AIA 201/CMa 1992 When Project is not Subject to Mandatory Arbitration, is** bound within this Project Manual and is a part of the Contract Documents.

B. Document **PCP 14-12, Supplementary Conditions to AIA 201/CMa 1992 When Owner does not Mutually Waive Subrogation, is** bound within this Project Manual and is a part of the Contract Documents.

These documents are attached immediately following this page.

END OF SECTION 00800

Supplementary Conditions to AIA A201 CMa – 1992 When Project is not Subject to Mandatory Arbitration

Subparagraph 4.5 – Replace "arbitration" with "litigation".

Subparagraph 4.7.2 – Delete "arbitration or" in the 2nd and 3rd sentences respectively.

Subparagraph 4.7.4 – Replace "arbitration" with "litigation".

Subparagraph 4.8.4 – Replace "arbitration" with "litigation".

Subparagraph 4.9.1 – Delete this Subparagraph and replace with "Any controversy or Claim arising out of or related to the Contract, or the breach thereof and not resolved under Paragraph 4.8 shall be subject to litigation in a court of competent jurisdiction."

Subparagraph 4.9.2 – Delete this Subparagraph.

Subparagraph 4.9.3 – Delete this Subparagraph and replace it with "During litigation or other dispute resolution proceedings, the Owner and Contractor shall comply with Subparagraph 4.7.4."

Subparagraph 4.9.4 – Delete this Subparagraph and replace it with "When a written decision of the Architect states that (1) the decision is final but subject to litigation then (2) a suit must be filed within 30 days after the date on which the party filing the suit receives the final written decision (unless a longer period of time is agreed upon, in writing, by the other party). Failure to file a suit within said 30 days' period shall result in the Architect's decision becoming final and binding upon the Owner and Contractor. If the Architect renders a decision after litigation has been initiated, such decision may be entered as evidence, but shall not supersede litigation proceedings unless the decision is acceptable to all parties concerned."

Subparagraph 4.9.4.1 – Delete this Subparagraph.

Subparagraph 4.9.4.2 – Delete this Subparagraph.

Subparagraph 4.9.5 – Delete this Subparagraph.

Subparagraph 4.9.6 – Delete this Subparagraph.

Subparagraph 4.9.7 – Delete this Subparagraph.

Subparagraph 8.3.1 – Replace "arbitration" with "dispute resolution".

Subparagraph 9.7.1 – In the first sentence, replace "arbitration" with "litigation".

Subparagraph 10.1.2 – Replace both occurrences of "arbitration" with "litigation".

Subparagraph 11.3.9 – Replace "or in accordance with an arbitration award, in which case the procedure shall be as provided in Paragraph 4.9" with "or in accordance with a court judgment or order."

Subparagraph 11.3.10 – In the first sentence delete ", if such objection be made, arbitrators shall be chosen as provided in Paragraph 4.9." Delete the 2nd and 3rd sentences in their entirety.

Supplementary Conditions to AIA A201 CMa – 1992 When Owner does not Mutually Waive Subrogation

Subparagraph 11.3.7 – Replace entire Subparagraph with the following: "The Contractor waives all rights against the Owner and against the Construction Manager, Architect, Owner's other Contractors and own forces described in Article 6, if any, and the subcontractors, sub-subcontractors, consultants, agents and employees of any of them, for damages caused by fire or other perils to the extent covered by property insurance obtained pursuant to this Paragraph 11.3 or other property insurance applicable to the Work, except such rights as the Contractor may have to the proceeds of such insurance. The Contractor shall require the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements written where legally required for validity, similar waivers each in favor of the Owner, the Construction Manager and the Architect. The policies shall provide for such waivers by endorsement or otherwise."

SECTION 00810
ON-SITE PROJECT SAFETY AND LOSS CONTROL PROGRAM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 **CONTRACTOR'S** SAFETY REQUIREMENTS

A. Generally

1. **Contractor** is responsible for its own Safety Program for Work on this Project that is at least as stringent as the requirements set forth in this section of the Project Manual.

2. **Contractor** shall provide a safe workplace and shall otherwise take all precautions for the safety of Subordinate Parties and persons and property in or near the premises where Work is being performed.

3. **Contractor** shall comply with all applicable federal, state and local laws, rules and regulations, including, but not limited to, applicable provisions of the Occupational Safety and Health Act ("OSHA") and/or the governing state law.

4. **Contractor** shall comply with all requirements stated in the Site Specific Safety Instructions (SSSI) form or elsewhere in the Contract Documents.

5. **Contractor** shall ensure that its employees understand and comply with applicable safety and health programs, rules, and regulations.

6. **Contractor** will assign an individual to act as Safety Representative who will have the responsibility of resolving safety matters, and act as a liaison among **Contractor**, Barton Malow Company and the Owner. The Safety Representative must be a person who is capable of identifying existing and predictable hazards in surroundings that are unsanitary, hazardous or dangerous to employees, and has the authority to take prompt corrective measures to eliminate them. The Safety Representative must meet the standards for a Competent Person under applicable law when required (scaffolding, confined spaces, etc.). The Safety Representative must be on site full time. The Safety Representative or an alternate must attend periodic safety meetings as directed by Barton Malow Company.

7. **Contractor** shall ensure that its site supervisors and/or Safety Representative attend a pre-construction meeting where planning for safe execution of the project will be addressed.

8. **Contractor** is fully responsible for all Hazardous Materials it creates or releases in connection with, or brings to, the Project. **Contractor** shall immediately report to Barton Malow Company any Hazardous Materials that it discovers or which are released at the Project.

9. Minimum training for on-site employees shall include basic safety orientation, task-specific safety instruction, weekly Tool Box Talks, and other periodic safety meetings. **Contractor** shall document all such training.

10. **Contractor** shall self-inspect its areas of control to assure compliance with the safety requirements.

11. All on-site employees of either **Contractor** or its Subordinate Parties are required to report any unsafe act or condition and any work-related injuries or illness immediately to a supervisor. If the act or condition can be safely and easily corrected, the employee or supervisor should make the correction.

12. **Contractor** shall notify Barton Malow Company immediately of all injuries requiring clinical attention and all property damage potentially in excess of $1,000.

13. **Contractor** shall have emergency procedures to deal with the immediate removal and treatment, if necessary, of any employee who may be injured or become ill. **Contractor** shall keep on the Project site a first-aid kit supplied according to current regulations, and shall have on-site a person trained to administer first aid.

14. **Contractor** shall inform Barton Malow Company of the arrival of any federal or state inspector or compliance officer prior to touring the site. Any reports, citations, or other documents related to the inspection shall be provided promptly to Barton Malow.

15. **Contractor** shall have a written Substance Abuse Policy. The use or possession of illegal drugs or the use of alcohol while performing Work on the Project are strictly prohibited and may lead to immediate removal from the Project.

16. **Contractor** shall be responsible for payment of all safety-related citations, fines and/or claims arising out of or relating to its Work levied against the Owner, Architect, Barton Malow Company, or their employees or affiliates.

17. Barton Malow has the right to require that **Contractor** submit monthly its hours worked and incident rates for the Project.

B. Additional Barton Malow Requirements

1. Work crews shall conduct a Job Hazard Analysis (JHA) discussion to plan for safe performance before beginning any work task. **Contractor** is encouraged to prepare a written record of each JHA.

2. All workers, management, and visitors shall wear approved hard hats while on site, outside the trailers. Cowboy-style hard hats are prohibited. Hardhats must not be removed to use welding shields. Welding shields must attach to hardhats or be hand held.

3. Sleeved shirts (minimum of four inches), long pants, and durable work boots are required minimum clothing.

4. Personal cell phones are not to be used on construction sites except to report an emergency or on approved break time. Use of business cell phones must not interfere with jobsite safety.

5. Personal radios or music players with earphones are not permitted.

6. **All persons working at elevations of six feet or greater must have 100% continuous fall protection. Engineering controls are preferred, but personal fall arrest systems are also permissible. An exception is permitted for safe use of ladders up to 24 feet long.**

7. **Contractor** is responsible to repair or restore any barricade that it modifies or removes.

8. Class III (household) stepladders are prohibited; metal ladders are strongly discouraged.

9. All scaffolds must be checked daily and before each use for safety compliance. Scaffolds shall never be left in an unsafe condition and must be removed/disabled immediately if not to be used again.

10. All persons operating cranes must be certified as crane operators by the National Commission on the Certification of Crane Operators (NCCCO). Daily crane inspection reports must be prepared by the operator and kept with the crane, available for inspection.

11. Riding the headache ball is prohibited.

12. All dozers, loaders, tractors and end loader backhoes must have functioning backup alarms.

13. Keep equipment at least 15 feet from energized power lines.

14. Electrical, pneumatic, and other energy systems that could be accidentally energized or started up while work is in process must be locked out (not merely tagged out).

15. Only fire retardant materials may be used to build shanties or other temporary enclosures inside of buildings finished or under construction. Shanties shall be continually policed by their occupants to prevent the accumulation of waste or other combustibles.

16. Engineering controls must be used to restrain silica dust per applicable law.

1.03 **CONTRACTOR'S** SAFETY SUBMITTALS

A. **Contractor** shall provide copies of the following written safety submittals to Barton Malow Company at the times indicated:

Submittal	**Timing**
Contractor Safety Certificate, Barton Malow form SAF 6.3.3.3	Before on-site work begins
Site-specific Safety Program, including substance abuse policy, hazard communication program, and Material Safety Data Sheets (MSDS)	Before on-site work begins
Tool Box Talk Reports	Weekly
Incident Reports (OSHA form 301or equivalent)	Within 24 hours of incident
Hours worked and incident rates	Monthly (if applicable)

B. Barton Malow's receipt of the Safety Program or other submittals from **Contractor** does not constitute approval of the Program or submittal or permission to deviate from the requirements of the Contract Documents and applicable law.

C. **Contractor** will allow inspection of, and Barton Malow Company may request copies of, any and all safety-related documents and records in its possession relating to the Project.

1.04 BARTON MALOW COMPANY RIGHTS

A. **Safety Hazard Notifications** may be issued to the **Contractor** when an unsafe act or condition is reported or observed. Barton Malow Company shall not be required to supervise the abatement or associated reprimand of unsafe acts or conditions within a **Contractor's** scope of work as this is solely the responsibility of **Contractor**. Nevertheless, Barton Malow Company has the right, but not the obligation, to require **Contractor** to cease or abate any unsafe practice or activity it notices, at **Contractor's** sole expense.

B. **Contractor's** failure to comply with the contract safety requirements will be considered a default of the Agreement, and may result in remedial action including, but not limited to, withholding of payment of any sums due or termination.

C. Barton Malow Company's failure to require the submission of any form, documentation, or any other act required under this Section, 00810, of the Project Manual shall not relieve the **Contractor** from any of its safety obligations.

D. Nothing in this Section or in this Agreement makes Barton Malow Company responsible or liable for protecting **Contractor's** employees and other Subordinate Parties or assuring or providing for their safety or preventing accidents or property damage.

E. All requirements referenced in this Section 00810 are binding on **Contractor** and all of its Subordinate Parties, even where such requirements may exceed the standards of applicable law.

1.05 SAFETY RELATED FORMS

A. The following safety related forms are in Section 01600 Forms:

Trade Contractor Safety Certificate, Barton Malow Form SAF 6.3.3.3/CON 7.9

END OF SECTION 00810

SITE-SPECIFIC SAFETY INFORMATION (SSSI) FORM

ZERO TOLERANCE FOR UNSAFE ACTS OR CONDITIONS

PROJECT IDENTIFICATION

Owner Name:	Troy School District	Project Name :	International Baccalaureate Academy East (Existing Baker Middle School)
Jobsite Location:	1291 Torpey	BMC Project No.:	041049 - BP #9444
Jobsite Phone (voice):	248.823.4631	Jobsite Fax:	248.823.4672

PROJECT OPERATIONAL LEADERSHIP

Title	Name	Office Phone #	Cell Phone #	24 hour contact #
Project Director	Beth Yorke	248.213.1822	248.755.2702	SAME
Project Manager	Leah Bossert	248.823.4631	248.640.5272	SAME
Project Engineer	Kelly Stahley	248.823.4677	248.343.4871	SAME
Superintendent	Clarence Rempel	248.823.4631	810.691.4695	SAME
Safety Representative	Gary Jordan	248.436.5406	248.219.3693	SAME
Owner's Representative	Michael Adamczyk	248.823.4022		

EMERGENCY RESPONSE INFORMATION

Key Phone Numbers				**Utilities**	
Emergency Response (medical/fire):	911			Gas Company:	Consumer Power/800.477.50
Police Dept. (non-emergency):	248.524.3477			Electric Company:	dte/800.477.4747
Fire Dept. (non-emergency):	248.524.3419			Water Company:	248.524.3370 or 524.3392
Security Service:					
Injury Response				**Evacuation/Rescue**	
Certified First Aid Provider at Jobsite:				Location of rescue equipment:	
Name:	Clarence Rempel	Cell	810.691.4695	Defibrillator – School Clinic, Main Level, leftside of office	
Location of First Aid Equipment				Gathering point after evacuation:	
Each Contractor have in job box, Supt. have in office onsite				West & South side of building, 100 ft. away/ Football Field	
Nearest Hospital:	Troy Beaumont			Severe weather shelter:	
Directions to Hospital:				Corridors away from windows / Classrooms w/no windows	
Long Lake Rd. East to Dequindre, North on Dequindre to				**Emergency Signals**	
hospital, Westside of Road; if past M-59 you went to far.				Evacuation (fire, bomb, etc): Short blasts of air horn	
Hospital phone number:	248.964.5111			- Proceed to gathering point for roll call	
Recommended Clinic:	Troy Medical PC 2649 Crooks Rd. (2 blks S. 16)			- Never leave without notifying your company	
Directions to Clinic:				Seek Shelter (weather): Long continuous blast of air horn	
East on Wattles, South on Crooks				- Proceed to shelter for roll call	
Clinic phone number:	248.643.0044			- Never leave without notifying your company	
Clinic hours:	Mon-Thurs 8:00 -5:00, Fri 4:30, Sat 8-12				
BMC Safety Department:	248-436-5400			All Clear:	
				- Barton Malow notifies contractors by cell phone or radio	

OTHER SITE-SPECIFIC SAFETY INFORMATION

(If not applicable or no additional information beyond Contract Documents, leave item blank.)

1) General Safety Requirements. Each Contractor on the jobsite is required to observe all applicable laws and contractual duties, including Section 00810 of the Project Manual and any procedures or other requirements set forth in this SSSI form or its Exhibits. Nothing stated in or omitted from this SSSI form excuses compliance with requirements stated elsewhere in the Contract Documents. The failure to identify a safety condition in this document does not represent or warrant that no such condition is present.

2) Postings. Notices required by federal or state law regarding safety, employment, and other matters will be posted on a bulletin board at the following jobsite location: 1301 Boyd, Troy, MI 48083

3) MSDS forms. Material Safety Data Sheet (MSDS) information for all Contractors will be maintained at the following jobsite location: 1301 Boyd, Troy, MI 48083 and Each Jobsite Location

4) Owner Requirements. Special Owner safety requirements for this project are:
   a) ☐ Attached as Exhibit SSSI-4; or
   b) ☒ Stated here: Follow and Implement BMC Safety Procedures

5) Insurance. Is this project covered by a Controlled Insurance Program (CIP)?
   a) ☒ Yes, an Owner Controlled Insurance Program (OCIP)
   b) ☐ Yes, a Contractor Controlled Insurance Program (CCIP)
   c) ☐ No CIP
   d) CIP procedures or other special insurance procedures are:
      i) ☐ Attached as Exhibit SSSI-5; or
      ii) ☐ Stated here:

6) Employees. Information on employee requirements specific to this jobsite (jobsite safety orientation, identification badges, drug testing, etc.) is:
   i) ☐ Attached as Exhibit SSSI-6; or
   ii) ☒ Stated here: A Site Specific Safety Program/Emergency Response Team and Identification Procedures

7) Planning. Information on special requirements for safety planning (e.g., written job hazard analysis or pre-task planning) is:
   a) ☒ Attached as Exhibit SSSI-7; or
   b) ☒ Stated here: A Site Specific Safety Program, Trade Contractor Safety Certificate and Substance Abuse Policy Implemented

8) Jobsite Access. Information relating to site access (parking, pedestrians, deliveries, heavy equipment, traffic control, emergency vehicle access, etc.) is:
   a) ☐ Attached as Exhibit SSSI-8; or
   b) ☒ Stated here: Keyed Gates and See Project Superintendent

9) Jobsite Security. Information relating to jobsite security procedures (security services, visitor policy, etc.) is:
   a) ☐ Attached as Exhibit SSSI-9; or
   b) ☒ Stated here: ONLY Trades people working on-site with badges issued by Troy School District

10) Staging and Laydown. Information on staging and laydown areas at the jobsite is:
   a) ☐ Attached as Exhibit SSSI-10; or
   b) ☒ Stated here: Specified on drawings and under the direction of the Project Superintendent

11) Cranes. Special requirements associated with crane access or placement at the jobsite are:
   a) ☐ Attached as Exhibit SSSI-11; or
   b) ☒ Stated here: Designated crane staging area, coordinated by BMC and Structural Steel Trade (Intrepid)

12) Environmental Hazards. Information on hazards and procedures associated with environmental conditions at the jobsite (including known or suspected hazardous materials, toxic chemicals, pollutants, etc.) is:
a) ☐ Attached as Exhibit SSSI-12; or
b) ☒ Stated here: DEQ approved document on file, no environmental hazards on jobsite

13) Utilities. Information on hazards and procedures associated with underground or overhead utilities at the jobsite is:
a) ☐ Attached as Exhibit SSSI-13; or
b) ☒ Stated here: MIS DIG is contacted

14) Risks to or from Property. Information on structures, animals, plants, habitats, artifacts, or other property, on or near the jobsite, which either present a hazard or must be protected from damage, is:
a) ☐ Attached as Exhibit SSSI-14; or
b) ☒ Stated here: Fenced secured, removed and replaced or returned at end of job

15) Sitework. Information on management of stormwater or sediment runoff at this jobsite is:
a) ☐ Attached as Exhibit SSSI-15; or
b) ☒ Stated here: Soil Erosion control has been assigned to sitework contractor, See Project Manual Section 02200

16) Underground. Information on known or suspected unusual conditions in the soil or underground at this jobsite is:
a) ☐ Attached as Exhibit SSSI-16; or
b) ☒ Stated here: N/A

17) Interim Life Safety. Information on how interim life safety measures will be handled during construction is:
a) ☐ Attached as Exhibit SSSI-17; or
b) ☒ Stated here: BMC & Tradesman have First Aid Certified personnel on-site

18) Fire Protection. Information on fire hazards and procedures specific to this jobsite is
a) ☐ Attached as Exhibit SSSI-18; or
b) ☒ Stated here: Fire Extinguishers within construction area

19) Confined Spaces. Information on confined spaces at the jobsite and procedures for safe entry is:
a) ☐ Attached as Exhibit SSSI-19; or
b) ☒ Stated here: Specified contractors trained on-site

20) Energy Lockout/Tagout. Information on hazards from energized systems (electrical, machinery, high pressure piping, etc.) and lockout/tagout procedures is:
a) ☐ Attached as Exhibit SSSI-20; or
b) ☒ Stated here: Systems tagged and locked with proper written information completed if required

21) Infection Control. Information on special procedures for infection control is:
a) ☐ Attached as Exhibit SSSI-21; or
b) ☒ Stated here: N/A

22) Hazardous Operations. Information on unusual or hazardous construction methods or other dangerous operations at or near the jobsite (demolition, blasting, etc.) is:
a) ☐ Attached as Exhibit SSSI-22; or
b) ☒ Stated here: N/A

23) Other. Other information on hazards or safety-related procedures or requirements for the jobsite is:
a) ☐ Attached as Exhibit SSSI-23; or
b) ☒ Stated here: Project Manual, Section 00810, On-Site Project Safety & Loss Control Program and 00840, Hazardous Materials, Refer to Material Safety Data Sheets (MSDS) and Hazard Communication Booklet.

SECTION 00840
HAZARDOUS MATERIALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 SUMMARY

A. This Section describes the following requirements including:
   1. Definition of Hazardous Materials
   2. Awareness of Hazardous Materials

PART 2 - HAZARDOUS MATERIALS

2.01 DEFINITION OF HAZARDOUS MATERIALS

A. A "Hazardous Material", as used in this Project Manual means asbestos; asbestos containing material; lead (including lead-based paint); PCB; molds; any other chemical, material, or substance subject to regulation as a hazardous material, hazardous substance, toxic substance, or otherwise, under applicable federal, state, or local law; and any other chemical, material, or substance that may have adverse effects on human health or the environment.

2.02 AWARENESS OF HAZARDOUS MATERIALS

A. Each Contractor shall be constantly aware of the possible discovery of Hazardous Materials. Should Contractor encounter any Hazardous Material or suspected Hazardous Material, the Contractor shall immediately stop Work in the area affected and report the condition to Barton Malow Company.

B. If the Contractor encounters any Hazardous Material or suspected Hazardous Material, the Contractor agrees to immediately initiate the required procedures of the Environmental Protection Agency (EPA), and/or state or local agencies having jurisdiction to protect any and all persons exposed to the affected areas or adjacent areas affected thereby.

C. Contractor is fully responsible for all Hazardous Materials it creates or releases in connection with, or brings to, the Project.

D. See the General and Supplementary Conditions of the Agreement for further instructions and obligations related to Hazardous Materials.

E. Each Contractor shall be responsible to bind ALL of its personnel and its Subordinate Parties to the provisions in these paragraphs and to instruct each employee of the of its duty to report any and all suspected Hazardous Materials and to comply with all applicable laws.

F. ABSOLUTELY NO MATERIAL SHALL BE BROUGHT ON OR TO THE PROJECT SITE THAT DOES NOT HAVE A MANUFACTURER'S LABEL STATING CONTENTS.

G. The Contractor shall comply with all applicable federal and state laws, rules, ordinances and regulations regarding transportation, storage, spills, releases and disposal of Hazardous Materials.

H. No asbestos or asbestos-containing material will be brought to the jobsite or incorporated into the Work by Contractor or its Subordinate Parties.

END OF SECTION 00840

SECTION 00870
LABOR RELATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

PART 2 SCOPE

2.01 PREVAILING WAGES

A. In any Agreement entered into pursuant to this **advertisement**, the **Contractor** shall comply with the provisions of the PREVAILING WAGE LAW.

The **Contractor** will pay the latest prevailing wages and fringe benefits for all Work as required **by State of Michigan/Public Act 166 dated 1965 as amended. The prevailing wage and fringe benefit rates are included immediately behind this Section. NOTE: IN MICHIGAN, THE OWNER PROVIDES THE CURRENT PREVAILING WAGE (90 DAY DOCUMENT).**

B. Additionally, **Contractor** is required to comply with all other provisions of the governing prevailing wage law, and shall ensure its Subordinate Parties' compliance therewith.

C. Allegations that individuals working on this Project are not receiving compensation required by law are considered seriously by the Owner and the Construction Manager. In order to expedite the resolution of prevailing wage complaints related to this Project, the Owner and Construction Manager have determined that the Michigan Fair Contracting Center ("MFCC") is the organization best equipped to expedite the investigation of these matters. Any person or entity (the "Complainant") who reasonably believes that a particular contractor, subcontractor, sub-subcontractor, supplier or other person or entity providing labor, materials, goods or services on this Project (each, an "Employer") is not paying prevailing wages as required by applicable law may ask the MFCC to determine whether proper rates are being paid either by completing and submitting to MFCC a request for assistance (the "RFA") or by contacting MFCC by telephone at (734) 462-2330 or (877) 611-6322. The RFA can be downloaded electronically at http://mifcc.org/Brochures/KnowYourRights.pdf and delivered to MFCC by facsimile to (734) 462-2318 or by mail to P.O. Box 530492, Livonia, Michigan 48153-0492.

Each and every Employer who is subject to an audit by MFCC pursuant to any RFA shall cooperate and comply fully with all requests, requirements and inquiries of MFCC. If, after investigation, MFCC determines that a Complainant's allegations are meritorious and the Complainant, MFCC and the Employer are unable to resolve the dispute following MFCC's determination, then, under the direction and with the assistance of MFCC, the Complainant shall file a Prevailing Wage Complaint (the "PWC") with the State of Michigan Department of Labor and Economic Growth Wage and Hour Division (the "Wage and Hour Division"). The PWC can be downloaded electronically at http://mifcc.org/Brochures/PrevailingWageComplaint.pdf and delivered by facsimile to (517) 322-6352 or by mail to 7150 Harris Drive, P.O. Box 30476, Lansing, Michigan 48909-7076.

Upon commencement of the audit from MFCC, the Owner and/or Barton Malow Company reserves the right to hold all payments, pending the conclusion of the audit. If the Wage and Hour Division determines that the Employer has violated any applicable prevailing wage law, then the Owner and/or Construction Manager shall automatically be entitled to and will (a) withhold from such Employer any and all payments due and owing until the Employer remedies any and all violations cited by the Wage and Hour Division, and (b) backcharge the Employer for all costs actually incurred in MFCC's audit of the Employer.

The Owner and/or Construction Manager shall keep a hard copy of these requirements posted at the Project site at all times.

D. The **Contractor** shall be financially responsible for the payment of prevailing wages by all Subordinate Parties that are subject to the prevailing wage law for Work on the Project.

E. If there is a dispute between any **Contractor** and the unions, the **Contractor** will be required to meet with Barton Malow Company and the Union involved to try and resolve the issue.

F. Because Work on this Project is covered by the Michigan Prevailing Wage Act ("Act"), the **Contractor** and its subcontractors and other Subordinate Parties that are governed by the prevailing wage law shall pay all hours at the prevailing wage rates at the applicable hourly rate; no Work performed by or on behalf of the **Contractor** on this Project will be paid on a lump sum basis or a piece rate basis in violation of the Act.

G. The **Contractor** will pay its workers at wage and fringe benefit rates consistent with the Act regardless of whether the workers are classified as employees or independent contractors.

H. The **Contractor** shall not misclassify any work assignments, but shall in each and every case follow proper jurisdictional assignments in compliance with the Act.

I. The **Contractor** shall assure that any persons paid at apprentice rates under the Act are properly classified as apprentices by actual participation in a BAT certified program or as may otherwise be permitted by the Act.

END OF SECTION 00870

State of Michigan
Department of Labor and Economic Growth

Wage and Hour Division
6546 Mercantile Way, Suite 5
PO Box 30476
Lansing, MI 48909-7976
Telephone: 517-335-0400
Fax: 517-335-0077
www.michigan.gov/wagehour

Official Request 848
Requestor: TROY SCHOOL DISTRICT

Project Description: RENOVATIONS
Project Number: International Baccalaureate Academy (Baker MS)

Oakland County

Official 2007 Prevailing Wage Rates for State Funded Projects

Issue Date: 7/2/2007
Contract must be awarded by 9/30/2007

Classification Name	Description		Straight Hourly	Time and a Half	Double Time	Overtime Provision
Asbestos & Lead Abatement Laborer						
Asbestos & Lead Abatement Laborer		MLDC	$31.30	$41.83	$52.35	H H H X X X X D Y
Asbestos & Lead Abatement, Hazardous Material Handler						
Asbestos and Lead Abatement, Hazardous Material Handler		AS207	$31.30	$43.13	$54.95	X X X X X X X D Y
Boilermaker						
Boilermaker		BO169	$48.71	$68.13	$87.54	H H D H D D D D Y
	Apprentice Rates:					
	1st 6 months		$37.07	$50.67	$64.26	
	2nd 6 months		$38.03	$52.10	$66.18	
	3rd 6 months		$39.00	$53.56	$68.12	
	4th 6 months		$39.97	$55.02	$70.06	
	5th 6 months		$40.58	$56.11	$71.64	
	6th 6 months		$42.88	$59.38	$75.88	
	7th 6 months		$44.83	$62.31	$79.78	
	8th 6 months		$46.77	$65.21	$83.66	
Bricklayer						
Bricklayer, stone mason, pointer, cleaner, caulker		BR1	$47.76	$71.64	$95.52	H H D H D D D D N
	Apprentice Rates:					
	First 6 months		$30.33	$45.50	$60.66	
	2nd 6 months		$32.21	$48.32	$64.42	
	3rd 6 months		$34.10	$51.15	$68.20	
	4th 6 months		$35.98	$53.97	$71.96	
	5th 6 months		$37.86	$56.79	$75.72	
	6th 6 months		$39.73	$59.60	$79.46	

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: Oakland

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Official 2007 Prevailing Wage Rates for State Funded Projects

Issue Date: 7/2/2007

Contract must be awarded by 9/30/2007

Classification Name	Description		Straight Hourly	Time and a Half	Double Time	Overtime Provision
Carpenter						
Carpet and Resilient Floor Layer, (does not include installation of prefabricated formica & parquet flooring which is to be paid carpenter rate)		CA1045	$40.22	$56.42	$72.61	H H H H D D D D N
	Apprentice Rates:					
	1st 6 months		$20.93	$25.25	$31.05	
	2nd 6 months		$24.02	$31.26	$39.07	
	3rd 6 months		$25.64	$33.59	$42.17	
	4th 6 months		$27.26	$35.95	$45.33	
	5th 6 months		$28.87	$38.28	$48.43	
	6th 6 months		$30.50	$40.64	$51.57	
	7th 6 months		$32.11	$42.96	$54.67	
	8th 6 months		$33.73	$45.30	$57.79	
Carpenter, piledriver		CA687Z1	$44.37	$62.97	$81.56	H H D H D D D D Y
	Apprentice Rates:					
	1st Year		$27.63	$37.85	$48.08	
	3rd 6 months		$29.49	$40.65	$51.80	
	4th 6 months		$31.34	$43.42	$55.50	
	5th 6 months		$33.21	$46.23	$59.24	
	6th 6 months		$35.08	$49.03	$62.98	
	7th 6 months		$36.92	$51.79	$66.66	
	8th 6 months		$38.80	$54.61	$70.42	
Cement Mason						
Cement Mason		CE514	$42.63	$60.13	$77.63	H H D H H H H D N
	Apprentice Rates:					
	1st 6 months		$24.90	$33.67	$42.43	
	2nd 6 months		$26.65	$36.28	$45.92	
	3rd 6 months		$30.15	$41.55	$52.93	
	4th 6 months		$33.66	$46.80	$59.94	
	5th 6 months		$35.40	$49.43	$63.44	
	6th 6 months		$38.92	$54.70	$70.47	
Drywall						
Drywall Taper		PT-22-D	$38.45	$50.90	$63.35	H H D H D D D D N
	Apprentice Rates:					
	First 3 months		$26.00	$32.23	$38.45	
	Second 3 months		$28.49	$35.96	$43.43	
	Second 6 months		$30.98	$39.69	$48.41	
	Third 6 months		$33.47	$43.43	$53.39	
	4th 6 months		$34.71	$45.29	$55.87	

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: Oakland

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Official 2007 Prevailing Wage Rates for State Funded Projects

Issue Date: 7/2/2007
Contract must be awarded by 9/30/2007

Classification Name / Description		Straight Hourly	Time and a Half	Double Time	Overtime Provision
Electrician					
Inside Wireman	EC-58-IW	$46.88	$64.00	$81.13	H H H H H H H D N
	Apprentice Rates:				
	0-1000 hours	$26.33	$33.18	$40.03	
	1000-2000 hours	$28.04	$35.75	$43.45	
	2000-3500 hours	$29.75	$38.31	$46.87	
	3500-5000 hours	$31.47	$40.90	$50.31	
	5000-6500 hours	$34.89	$46.03	$57.15	
	6500-8000 hours	$38.32	$51.17	$64.01	
Sound and Communication Installer/Technician	EC-58-SC	$29.33	$41.30	$53.26	H H H H H H H D N
	Apprentice Rates:				
	Period 1	$17.16	$23.04	$28.93	
	Period 2	$18.38	$24.88	$31.37	
	Period 3	$19.59	$26.69	$33.79	
	Period 4	$20.81	$28.53	$36.23	
	Period 5	$22.02	$30.33	$38.65	
	Period 6	$23.24	$32.17	$41.09	
Elevator Constructor					
Elevator Constructor Elevator Constructor	EL 36	$47.71		$81.45	D D D D D D D D Y
	Apprentice Rates:				
	1st Year Apprentice	$31.14		$49.70	
	2nd Year Apprentice	$34.82		$56.75	
	3rd Year Apprentice	$36.66		$60.28	
	4th Year Apprentice	$40.34		$67.33	
Glazier					
Glazier	GL-357	$41.56	$55.41		H H H H H H H H Y
	Apprentice Rates:				
	1st 6 months	$28.36	$35.29		
	2nd 6 months	$29.82	$37.44		
	3rd 6 months	$32.72	$41.72		
	4th 6 months	$34.18	$43.87		
	5th 6 months	$35.64	$46.03		
	6th 6 months	$37.09	$48.17		
	7th 6 months	$38.54	$50.31		
	8th 6 months	$41.46	$54.62		
Heat and Frost Insulator					
Spray Insulation	AS25S	$20.14	$29.14		H H H H H H H H N

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: 1

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Official 2007 Prevailing Wage Rates for State Funded Projects

Issue Date: 7/2/2007

Contract must be awarded by 9/30/2007

Classification Name / Description			Straight Hourly	Time and a Half	Double Time	Overtime Provision
Heat and Frost Insulator and Asbestos Worker						
Heat and Frost Insulators and Asbestos Workers		AS25	$48.20	$62.86	$77.52	H H H H H H H D Y
	Apprentice Rates:					
	1st Year		$29.59	$37.66	$45.72	
	2nd Year		$37.60	$47.13	$56.66	
	3rd Year		$39.40	$49.66	$59.92	
	4th Year		$42.34	$54.07	$65.80	
Ironworker						
Fence Erecting		IR-25-F	$39.87	$59.58	$79.29	H H D H H H D D Y
Glazing		IR-25-GZ1	$48.48	$72.64	$96.65	H H D H H H D D Y
Mesh Iron Work		IR-25-MR	$42.25	$60.43	$78.60	H H D H D D D D N
Pre-engineered Metal Work		IR-25-PE-Z1-Z2	$39.88	$50.38	$60.88	H H H X X X X D Y
	Apprentice Rates:					
	1st level		$22.79	$27.88	$32.97	
	2nd level		$24.01	$29.61	$35.21	
	3rd level		$25.25	$31.36	$37.47	
	4th level		$26.47	$33.08	$39.70	
	5th level		$27.70	$34.83	$41.95	
	6th level		$28.93	$36.56	$44.20	
Reinforced Iron Work		IR-25-RF	$47.46	$68.09	$88.71	H H D H D D D D N
Rigging Work		IR-25-RIG	$52.48	$78.56	$104.64	H H H H H H H D N
Siding & Decking		IR-25-SD	$45.10	$67.43	$89.75	H H D H H H D D Y
Structural, ornamental, conveyor, welder and pre-cast Apprentice rates apply to structural, converyor, fence, glazing, reinforced, rigging, & siding decking		IR-25-STR	$52.61	$78.69	$104.77	H H D H H H D D Y
	Apprentice Rates:					
	Level 1		$26.51	$39.54	$52.57	
	Level 2		$29.12	$43.46	$57.79	
	Level 3		$31.73	$47.37	$63.01	
	Level 4		$34.34	$51.29	$68.23	
	Level 5		$36.94	$55.19	$73.43	
	Level 6		$39.57	$59.13	$78.69	
	Level 7		$42.16	$63.02	$83.87	
	Level 8		$44.78	$66.95	$89.11	

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: Oakland

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Official 2007 Prevailing Wage Rates for State Funded Projects

Issue Date: 7/2/2007

Contract must be awarded by 9/30/2007

Classification Name / Description		Straight Hourly	Time and a Half	Double Time	Overtime Provision
Industrial Door erection & construction	IR-25-STR-D	$34.69	$46.09	$57.48	H H D H H H D D Y
Laborer					
Construction Laborer, Mason Tender, Carpenter Tender, Drywall Handler, Cement Finisher tender, concrete chute and concrete Bucket Handler, Concrete Laborer, Demolition Laborer	L1076-A-A	$37.62	$53.35	$69.07	H H D H D D D D Y
Apprentice Rates:					
0-1,000 work hours		$31.98	$44.89	$57.79	
1,001-2,000 work hours		$33.11	$46.58	$60.05	
2,001-3,000 work hours		$34.24	$48.28	$62.31	
3,001-4,000 work hours		$36.49	$51.66	$66.81	
Signal man (on sewer & caisson work); air,electric or gasoline tool operator (including concrete vibrator operator,acetylene torch & air hammer operator); scaffold builder, caisson worker	L1076-A-B	$37.88	$53.74	$69.59	H H D H D D D D Y
Lansing Burner, Blaster & Powder Man	L1076-A-C	$38.37	$54.47	$70.57	H H D H D D D D Y
Furnance battery heater tender, burning bar & oxy-acetylene gun, expediter man, top man and/or bottom man (blast furnace work)	L1076-A-D	$38.12	$54.10	$70.07	H H D H D D D D Y
Cleaner/ sweeper laborer, furniture laborer	L1076-A-E	$32.17	$45.17	$58.17	H H D H D D D D Y
Demolition Laborer	L1076-D	$37.62	$53.35	$69.07	H H D H D D D D Y
Plasterer Tender, Plastering Machine Operator	LPT-1	$37.86	$53.96	$70.05	H H D H D D D D N
Apprentice Rates:					
0 - 1,000 hours		$30.91	$43.53	$56.15	
1,001 - 2,000 hours		$32.02	$45.20	$58.37	
2,001 - 3,000 hours		$33.14	$46.88	$60.61	
3,001 - 4,000 hours		$35.37	$50.23	$65.07	

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: Oakland

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Official 2007 Prevailing Wage Rates for State Funded Projects

Issue Date: 7/2/2007

Contract must be awarded by 9/30/2007

Classification Name / Description		Straight Hourly	Time and a Half	Double Time	Overtime Provision
Laborer - Hazardous					
Class A Laborer - performing work in conjunction with site preparation and other preliminary work prior to actual removal, handling, or containment of hazardous waste substances not requiring use of personal protective equipment required by state or federal regulations; or a laborer performing work in conjunction with the removal, handling, or containment of hazardous waste substances when used of personal protective equipment level "D" is required.	LHAZ-Z2-A	$36.48	$51.89	$67.29	H H H H H H H D Y
Apprentice Rates:					
0-1,000 work hours		$30.91	$43.53	$56.15	
1,001-2,000 work hours		$32.02	$45.20	$58.37	
2,001-3,000 work hours		$33.14	$46.88	$60.61	
3,001-4,000 work hours		$35.37	$50.23	$65.07	
Class B Laborer - performing work in conjunction with the removal, handling, or containment of hazardous waste substances when the use of personal protective equipment levels "A", "B" or "C" is required.	LHAZ-Z2-B	$37.48	$53.39	$69.29	H H H H H H H D Y
Apprentice Rates:					
0-1,000 work hours		$31.66	$44.66	$57.65	
1,001-2,000 work hours		$32.82	$46.40	$59.97	
2,001-3,000 work hours		$33.99	$48.15	$62.31	
3,001-4,000 work hours		$36.32	$51.65	$66.97	
Laborer Underground - Tunnel, Shaft & Caisson					
Class I - Tunnel, shaft and caisson laborer, dump man, shanty man, hog house tender, testing man (on gas), and watchman.	LAUCT-Z1-1	$32.54	$43.21	$53.88	H H H H H H H D Y
Apprentice Rates:					
0-1,000 work hours		$27.70	$35.95	$44.20	
1,001-2,000 work hours		$28.67	$37.40	$46.14	
2,001-3,000 work hours		$29.64	$38.86	$48.08	
3,001-4,000 work hours		$31.57	$41.76	$51.94	
Class II - Manhole, headwall, catch basin builder, bricklayer tender, mortar man, material mixer, fence erector, and guard rail builder.	LAUCT-Z1-2	$32.65	$43.38	$54.10	H H H H H H H D Y
Apprentice Rates:					
0-1,000 work hours		$27.79	$36.08	$44.38	
1,001-2,000 work hours		$28.76	$37.54	$46.32	
2,001-3,000 work hours		$29.73	$39.00	$48.26	
3,001-4,000 work hours		$31.68	$41.92	$52.16	

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: Oakland

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Official 2007 Prevailing Wage Rates for State Funded Projects

Issue Date: 7/2/2007

Contract must be awarded by 9/30/2007

Classification Name	Description		Straight Hourly	Time and a Half	Double Time	Overtime Provision
Class III	Air tool operator (jack hammer man, bush hammer man and grinding man), first bottom man, second bottom man, cage tender, car pusher, carrier man, concrete man, concrete form man, concrete repair man, cement invert laborer, cement finisher, concrete shoveler, conveyor man, floor man, gasoline and electric tool operator, gunnite man, grout operator, welder, heading dinky man, inside lock tender, pea gravel operator, pump man, outside lock tender, scaffold man, top signal man, switch man, track man, tugger man, utility man, vibrator man, winch operator, pipe jacking man, wagon drill and air track operator and concrete saw operator (under 40 h.p.).	LAUCT-Z1-3	$32.71	$43.47	$54.22	H H H H H H H D Y
	Apprentice Rates:					
	0-1,000 work hours		$27.83	$36.14	$44.46	
	1,001-2,000 work hours		$28.81	$37.62	$46.42	
	2,001-3,000 work hours		$29.78	$39.07	$48.36	
	3,001-4,000 work hours		$31.73	$42.00	$52.26	
Class IV	Tunnel, shaft and caisson mucker, bracer man, liner plate man, long haul dinky driver and well point man.	LAUCT-Z1-4	$32.89	$43.74	$54.58	H H H H H H H D Y
	Apprentice Rates:					
	0-1,000 work hours		$27.97	$36.36	$44.74	
	1,001-2,000 work hours		$28.95	$37.82	$46.70	
	2,001-3,000 work hours		$29.94	$39.31	$48.68	
	3,001-4,000 work hours		$31.91	$42.26	$52.62	
Class V	Tunnel, shaft and caisson miner, drill runner, keyboard operator, power knife operator, reinforced steel or mesh man (e.g. wire mesh, steel mats, dowel bars)	LAUCT-Z1-5	$33.14	$44.11	$55.08	H H H H H H H D Y
	Apprentice Rates:					
	0-1,000 work hours		$28.16	$36.64	$45.12	
	1,001-2,000 work hours		$29.15	$38.12	$47.10	
	2,001-3,000 work hours		$30.15	$39.62	$49.10	
	3,001-4,000 work hours		$32.14	$42.61	$53.08	
Class VI	Dynamite man and powder man.	LAUCT-Z1-6	$33.47	$44.61	$55.74	H H H H H H H D Y
	Apprentice Rates:					
	0-1,000 work hours		$28.40	$37.00	$45.60	
	1,001-2,000 work hours		$29.42	$38.53	$47.64	
	2,001-3,000 work hours		$30.43	$40.04	$49.66	
	3,001-4,000 work hours		$32.46	$43.09	$53.72	

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: Oakland

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Official 2007 Prevailing Wage Rates for State Funded Projects

Issue Date: 7/2/2007

Contract must be awarded by 9/30/2007

Classification Name / Description		Straight Hourly	Time and a Half	Double Time	Overtime Provision
Class VII - Restoration laborer, seeding, sodding, planting, cutting, mulching and topsoil grading and the restoration of property such as replacing mail boxes, wood chips, planter boxes and flagstones.	LAUCT-Z1-7	$26.75	$34.53	$42.30	H H H H H H H D Y
Apprentice Rates:					
0-1,000 work hours		$23.36	$29.44	$35.52	
1,001-2,000 work hours		$24.04	$30.46	$36.88	
2,001-3,000 work hours		$24.72	$31.48	$38.24	
3,001-4,000 work hours		$26.07	$33.50	$40.94	
Landscape Laborer					
Landscape specialist includes; air, gas, and diesel equipment operator, lawn sprinkler installer.	LLAN-Z1-A	$23.38	$32.46	$41.54	X X H X X X H D Y
Landscape laborer; small power tool operator, lawn sprinkler installer helper, material mover, truck driver.	LLAN-Z1-B	$19.16	$26.13	$33.10	X X H X X X H D Y
Marble Finisher					
Marble Finisher	TT32-MF	$38.37	$48.46	$58.54	H H D H D D D D N
Apprentice Rates:					
Level 1		$18.73	$24.22	$29.71	
Level 2		$19.79	$25.81	$31.83	
Level 3		$23.93	$30.38	$36.83	
Level 4		$25.23	$32.33	$39.43	
Level 5		$26.56	$33.85	$41.14	
Level 6		$27.99	$35.64	$43.28	
Level 7		$29.48	$37.17	$44.85	
Level 8		$30.80	$38.73	$46.65	
Marble Mason					
Marble Mason	TT32-MM	$44.26	$57.29	$70.32	H H D H D D D D N
Apprentice Rates:					
Level 1		$24.21	$31.14	$38.06	
Level 2		$26.93	$34.56	$42.20	
Level 3		$29.70	$37.59	$45.48	
Level 4		$32.10	$40.83	$49.56	
Level 5		$34.18	$43.17	$52.16	
Level 6		$37.52	$48.11	$58.71	
Level 7		$38.55	$49.53	$60.51	
Level 8		$39.18	$50.47	$61.77	
Operating Engineer					
Crane with boom & jib or leads 120' or longer	EN-324-A120	$49.26	$65.97	$82.68	H H D H D D D D Y

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: Oakland

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Official 2007 Prevailing Wage Rates for State Funded Projects

Issue Date: 7/2/2007
Contract must be awarded by 9/30/2007

Classification Name / Description		Straight Hourly	Time and a Half	Double Time	Overtime Provision
Crane with boom & jib or leads 140' or longer	EN-324-A140	$50.08	$67.20	$84.32	H H D H D D D Y
Crane with boom & jib or leads 220' or longer	EN-324-A220	$50.38	$67.65	$84.92	H H D H D D D Y
Crane with boom & jib or leads 300' or longer	EN-324-A300	$51.88	$69.90	$87.92	H H D H D D D Y
Crane with boom & jib or leads 400' or longer	EN-324-A400	$53.38	$72.15	$90.92	H H D H D D D Y
Compressor or welding machine	EN-324-CW	$38.41	$49.70	$60.98	H H D H D D D Y
Forklift, lull, extend-a-boom forklift	EN-324-FL	$45.72	$60.66	$75.60	H H D H D D D Y
Fireman or oiler	EN-324-FO	$37.38	$48.15	$58.92	H H D H D D D Y
Regular crane, job mechanic, concrete pump	EN-324-RC	$48.40	$64.68	$80.96	H H D H D D D Y
Regular engineer, hydro-excavator, remote controlled concrete breaker	EN-324-RE	$47.43	$63.23	$79.02	H H D H D D D Y
Apprentice Rates:					
Period 1		$37.85	$48.90	$59.96	
Period 2		$39.43	$51.28	$63.12	
Period 3		$41.02	$53.66	$66.30	
Period 4		$42.59	$56.01	$69.44	
Period 5		$44.17	$58.39	$72.60	
Period 6		$45.76	$60.77	$75.78	
Operating Engineer - Marine Construction					
Diver/Wet Tender, Engineer (hydraulic dredge)	GLF-1	$49.29	$64.74	$80.19	X X H H H H H D Y
Holidays paid at $95.64 per hour					
Subdivision of county all Great Lakes, islands therein, & connecting & tributary waters					
Crane/Backhoe Operator, Mechanic/Welder, Assistant Engineer (hydraulic dredge), Leverman (hydraulic dredge), Diver Tender	GLF-2	$47.79	$62.49	$77.19	X X H H H H H D Y
Holidays paid $91.89 per hour					
Subdivision of county All Great Lakes, islands therein, & connecting & tributary waters					
Deck Equipment Operator, Machineryman, Maintenance of Crane (over 50 ton capacity) or Backhoe (115,000 lbs. or more), Tug/Launch Operator, Loader, Dozer and like equipment on Barge, Breakwater Wall, Slip/Doc or Scow, Deck Machinery	GLF-3	$44.59	$57.69	$70.79	X X H H H H H D Y
Holidays paid at $83.89 per hour					

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: 1

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Official 2007 Prevailing Wage Rates for State Funded Projects

Issue Date: 7/2/2007

Contract must be awarded by 9/30/2007

Classification Name / Description		Straight Hourly	Time and a Half	Double Time	Overtime Provision
Subdivision of county	All Great Lakes, islands therein, & connecting & tributary waters				
Deck Equipment Operator, (Machineryman/Fireman), (4 equipment units or more), Deck Hand, Deck Engineer, & Crane Maintenance 50 ton capacity and under or Backhoe weighing 115,000 lbs or less, Assistant Tug Operator	GLF-4	$40.19	$51.09	$61.99	X X H H H H H H D Y
Holidays paid at $72.89 per hour					
Subdivision of county	All Great Lakes, islands therein, & connecting & tributary waters				
Operating Engineer Hazardous Waste Class I					
Level A - Fully encapsulating chemical resistant suit w/ pressure demand, full face piece SCBA or pressure demand supplied air respirator w/ escape SCBA. The highest available level of respiratory, skin and eye protection.	EN-324-HWCI-Z1A	$46.22	$61.89	$77.55	H H H H H H H D Y
Apprentice Rates:					
1st 6 months		$36.62	$47.58	$58.55	
2nd 6 months		$38.18	$49.92	$61.67	
3rd 6 months		$39.75	$52.28	$64.81	
4th 6 months		$41.31	$54.62	$67.93	
5th 6 months		$42.89	$56.99	$71.09	
6th 6 months		$44.45	$59.33	$74.21	
Level B & C protection. B - Pressure demand, full face SCBA or pressure demand supplied air respirator w/ escape SCBA w/chemical resistant clothing. C - Full face piece, air purifying canister-equipped respirator w/chemical resistant clothing.	EN-324-HWCI-Z1B	$45.27	$60.46	$75.65	H H H H H H H D Y
Apprentice Rates:					
1st 6 months		$35.95	$46.59	$57.21	
2nd 6 months		$37.48	$48.88	$60.27	
3rd 6 months		$39.00	$51.16	$63.31	
4th 6 months		$40.52	$53.44	$66.35	
5th 6 months		$42.04	$55.72	$69.39	
6th 6 months		$43.56	$58.00	$72.43	
Level D - Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HWCI-Z1D	$43.97	$58.51	$73.05	H H H H H H H D Y
Apprentice Rates:					
1st 6 months		$35.05	$45.23	$55.41	
2nd 6 months		$36.51	$47.43	$58.33	
3rd 6 months		$37.95	$49.58	$61.21	
4th 6 months		$39.42	$51.79	$64.15	
5th 6 months		$40.86	$53.95	$67.03	
6th 6 months		$42.32	$56.13	$69.95	

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: Oakland

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Classification Name / Description		Straight Hourly	Time and a Half	Double Time	Overtime Provision
Level D When Capping Landfill Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HWCI-Z1DCL	$43.72	$58.14	$72.55	H H H H H H H D Y
Apprentice Rates:					
1st 6 months		$34.87	$44.96	$55.05	
2nd 6 months		$36.31	$47.12	$57.93	
3rd 6 months		$37.76	$49.30	$60.83	
4th 6 months		$39.20	$51.45	$63.71	
5th 6 months		$40.63	$53.60	$66.57	
6th 6 months		$42.08	$55.78	$69.47	
Operating Engineer Hazardous Waste Class II					
Level A - Fully encapsulating chemical resistant suit w/ pressure demand, full face piece SCBA or pressure demand supplied air respirator w/ escape SCBA. The highest available level of respiratory, skin and eye protection.	EN-324-HWCII-Z1A	$41.99	$55.54	$69.09	H H H H H H H D Y
Level B & C protection. B - Pressure demand, full face SCBA or pressure demand supplied air respirator w/ escape SCBA w/chemical resistant clothing. C - Full face piece, air purifying canister-equipped respirator w/chemical resistant clothing.	EN-324-HWCII-Z1B	$41.04	$54.12	$67.19	H H H H H H H D Y
Level D - Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HWCII-Z1D	$39.74	$52.17	$64.59	H H H H H H H D Y
Level D When Capping Landfill Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HWCII-Z1DCL	$39.49	$51.79	$64.09	H H H H H H H D Y
Operating Engineer Hazardous Waste Crane w/ Boom & Jib leads 140' or longer					
Level A - Fully encapsulating chemical resistant suit w/ pressure demand, full face piece SCBA or pressure demand supplied air respirator w/ escape SCBA. The highest available level of respiratory, skin and eye protection.	EN-324-HW140-Z1A	$48.87	$65.86	$82.85	H H H H H H H D Y
Level B & C protection. B - Pressure demand, full face SCBA or pressure demand supplied air respirator w/ escape SCBA w/chemical resistant clothing. C - Full face piece, air purifying canister-equipped respirator w/chemical resistant clothing.	EN-324-HW140-Z1B	$47.92	$64.44	$80.95	H H H H H H H D Y
Level D Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HW140-Z1D	$46.62	$62.49	$78.35	H H H H H H H D Y
Level D When Capping Landfill Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HW140-Z1DCL	$46.37	$62.11	$77.85	H H H H H H H D Y

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: Oakland

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Classification Name / Description		Straight Hourly	Time and a Half	Double Time	Overtime Provision
Operating Engineer Hazardous Waste Crane w/ Boom & Jib leads 220' or longer					
Level A - Fully encapsulating chemical resistant suit w/ pressure demand, full face piece SCBA or pressure demand supplied air respirator w/ escape SCBA. The highest available level of respiratory, skin and eye protection.	EN-324-HW220-Z1A	$49.17	$66.31	$83.45	H H H H H H H D Y
Level B & C protection. B - Pressure demand, full face SCBA or pressure demand supplied air respirator w/ escape SCBA w/chemical resistant clothing. C - Full face piece, air purifying canister-equipped respirator w/chemical resistant clothing.	EN-324-HW220-Z1B	$48.22	$64.89	$81.55	H H H H H H H D Y
Level D Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HW220-Z1D	$46.92	$62.94	$78.95	H H H H H H H D Y
Level D When Capping Landfill Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HW220-Z1DCL	$46.67	$62.56	$78.45	H H H H H H H D Y
Operating Engineer Hazardous Waste Regular Crane, Job Mechanic, Dragline Operator, Boom Truck Operator, and Concrete Pump with Boom Operator					
Level D - Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HWRC-Z1D	$44.94	$59.97	$74.99	H H H H H H H D Y
Operating Engineer Hazardous Waste Regular Crane, Job Mechanic, Dragline Operator, Boom Truck Operator, Power Shovel Operator and Concrete Pump with boom					
Level D When Capping Landfill Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HWRC-Z1DCL	$44.07	$58.66	$73.25	H H H H H H H D Y
Operating Engineer Hazardous Waste Regular Crane, Job Mechanic, Dragline Operator, Boom Truck Operator, Power Shovel Operator and Concrete Pump with booms					
Level B & C protection. B - Pressure demand, full face SCBA or pressure demand supplied air respirator w/ escape SCBA w/chemical resistant clothing. C - Full face piece, air purifying canister-equipped respirator w/chemical resistant clothing.	EN-324-HWRC-Z1B	$46.24	$61.92	$77.59	H H H H H H H D Y
Operating Engineer Hazardous Waste Regular Crane, Job Mechanic, Dragline Operator, Boom Truck Operator, Power Shovel Operators and Concrete Pump with booms					
Level A - Fully encapsulating chemical resistant suit w/ pressure demand, full face piece SCBA or pressure demand supplied air respirator w/ escape SCBA. The highest available level of respiratory, skin and eye protection.	EN-324-HWRC-Z1A	$47.19	$63.34	$79.49	H H H H H H H D Y
Operating Engineer Steel Work					
Crane w/ 120' boom or longer	EN-324-SW120	$51.51	$69.80	$88.08	H H D H H H D D Y

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: Oakland

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Official 2007 Prevailing Wage Rates for State Funded Projects

Issue Date: 7/2/2007

Contract must be awarded by 9/30/2007

Classification Name / Description		Straight Hourly	Time and a Half	Double Time	Overtime Provision
Crane w/ 120' boom or longer w/ Oiler	EN-324-SW120-O	$52.51	$71.30	$90.08	H H D H H H D D Y
Crane w/ 140' boom or longer	EN-324-SW140	$52.69	$71.57	$90.44	H H D H H H D D Y
Crane w/ 140' boom or longer W/ Oiler	EN-324-SW140-O	$53.69	$73.07	$92.44	H H D H H H D D Y
Boom & Jib 220' or longer	EN-324-SW220	$52.96	$71.97	$90.98	H H D H H H D D Y
Crane w/ 220' boom or longer w/ Oiler	EN-324-SW220-O	$53.96	$73.47	$92.98	H H D H H H D D Y
Boom & Jib 300' or longer	EN-324-SW300	$54.46	$74.22	$93.98	H H D H H H D D Y
Crane w/ 300' boom or longer w/ Oiler	EN-324-SW300-O	$55.46	$75.72	$95.98	H H D H H H D D Y
Boom & Jib 400' or longer	EN-324-SW400	$55.96	$76.47	$96.98	H H D H H H D D Y
Crane w/ 400' boom or longer w/ Oiler	EN-324-SW400-O	$56.96	$77.97	$98.98	H H D H H H D D Y
Crane Operator & Job Mechanic	EN-324-SWCO	$51.15	$69.26	$87.36	H H D H H H D D Y
Apprentice Rates:					
0-999 hours		$40.04	$52.72	$65.39	
1,000-1,999 hours		$41.85	$55.43	$69.01	
2,000-2,999 hours		$43.66	$58.14	$72.63	
3,000-3,999 hours		$45.48	$60.88	$76.27	
4,000-4,999 hours		$47.28	$63.58	$79.87	
5,000 hours		$49.10	$66.31	$83.51	
Crane w/ Oiler	EN-324-SWCO-O	$52.15	$70.76	$89.36	H H D H H H D D Y
Compressor or Welder Operator	EN-324-SWCW	$43.70	$58.08	$72.46	H H D H H H D D Y
Hoisting Operator	EN-324-SWHO	$50.51	$68.30	$86.08	H H D H H H D D Y
Oiler	EN-324-SWO	$42.29	$55.97	$69.64	H H D H H H D D Y
Tower Crane & Derrick where work is 50' or more above first level	EN-324-SWTD50	$52.24	$70.89	$89.54	H H D H H H D D Y
Tower Crane & Derrick 50' or more w/ Oiler where work station is 50' or more above first level	EN-324-SWTD50-O	$53.24	$72.39	$91.54	H H D H H H D D Y

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: Oakland

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Official 2007 Prevailing Wage Rates for State Funded Projects

Issue Date: 7/2/2007

Contract must be awarded by 9/30/2007

Classification Name / Description			Straight Hourly	Time and a Half	Double Time	Overtime Provision
Operating Engineer Underground						
Class I Equipment		EN-324A1-UC1	$43.72	$58.11	$72.50	H H H H H H H D Y
	Apprentice Rates:					
	0-999 hours		$34.89	$44.97	$55.04	
	1,000-1,999 hours		$36.33	$47.13	$57.92	
	2,000-2,999 hours		$37.76	$49.27	$60.78	
	3,000-3,999 hours		$39.21	$51.45	$63.68	
	4,000-4,999 hours		$40.65	$53.61	$66.56	
	5,000-5,999 hours		$42.09	$55.77	$69.44	
Class II Equipment		EN-324A1-UC2	$38.99	$51.02	$63.04	H H H H H H H D Y
Class III Equipment		EN-324A1-UC3	$38.26	$49.92	$61.58	H H H H H H H D Y
Class IV Equipment		EN-324A1-UC4	$37.69	$49.07	$60.44	H H H H H H H D Y
Master Mechanic		EN-324A1-UMM	$43.97	$58.49	$73.00	H H H H H H H D Y
Painter						
Painter (8 hours of repaint work performed on Sunday shall be paid time & one half rate)		PT-22-P	$38.01	$50.24	$62.47	H H D H D D D D N
	Apprentice Rates:					
	First 6 months		$25.78	$31.89	$38.01	
	Second 6 months		$29.45	$37.40	$45.35	
	Third 6 months		$30.67	$39.23	$47.79	
	Fourth 6 months		$31.89	$41.06	$50.23	
	Fifth 6 months		$33.12	$42.91	$52.69	
	Final 6 months		$34.34	$44.73	$55.13	
Sandblasting & spraywork performed, on highway bridges, overpases, tanks or steel, OR spraywork & sandblasting done with a scaffold height of 40' above the floor level		PT-22-S	$38.81	$51.44	$64.07	H H D H D D D D N

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: Oakland

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Classification Name	Description		Straight Hourly	Time and a Half	Double Time	Overtime Provision
Pipefitter						
Pipefitter		PF-636	$55.06	$74.14	$89.96	H H D H D D D D N
	Apprentice Rates:					
	1st & 2nd periods		$26.28	$34.63	$41.63	
	3rd period		$28.28	$37.63	$45.63	
	4th period		$29.53	$39.51	$48.13	
	5th period		$30.78	$41.38	$50.63	
	6th period		$32.03	$43.25	$53.13	
	7th period		$33.28	$45.13	$55.63	
	8th period		$34.28	$46.63	$57.63	
	9th period		$35.28	$48.13	$59.63	
	10th period		$36.71	$50.27	$62.49	
Plasterer						
Plasterer		BR1P	$41.92	$62.88	$83.84	H H H H H H H D N
	Apprentice Rates:					
	1st 6 months		$21.61	$32.41	$43.22	
	2nd 6 months		$25.00	$37.50	$50.00	
	3rd 6 months		$28.39	$42.59	$56.78	
	4th 6 months		$31.83	$47.75	$63.66	
	5th 6 months		$35.16	$50.94	$67.92	
	6th 6 months		$38.53	$57.80	$77.06	
Plasterer		PL67	$42.87	$58.16	$73.45	H H H X D D D D N
	Apprentice Rates:					
	1st 6 months		$24.52	$30.63	$36.75	
	2nd 6 months		$27.58	$35.23	$42.87	
	3rd 6 months		$30.64	$39.81	$48.99	
	4th 6 months		$33.70	$44.41	$55.11	
	5th 6 months		$36.75	$48.98	$61.21	
	6th 6 months		$39.81	$53.57	$67.33	

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: Oakland

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Official 2007 Prevailing Wage Rates for State Funded Projects

Issue Date: 7/2/2007

Contract must be awarded by 9/30/2007

Classification Name	Description		Straight Hourly	Time and a Half	Double Time	Overtime Provision
Plumber						
Plumber		PL-98	$53.68	$71.45	$87.21	H H D H D D D D Y
	Apprentice Rates:					
	Period 1		$17.11	$23.41	$29.71	
	Period 2		$17.11	$23.41	$29.71	
	Period 3		$26.78	$35.13	$43.47	
	Period 4		$27.41	$36.07	$44.73	
	Period 5		$28.57	$37.81	$47.05	
	Period 6		$29.72	$39.53	$49.35	
	Period 7		$30.87	$41.26	$51.65	
	Period 8		$32.04	$43.01	$53.99	
	Period 9		$33.19	$44.74	$56.29	
	Period 10		$34.35	$46.48	$58.61	
Roofer						
Commercial Roofer Straight time is not to exceed ten (10) hours per day or forty (40) hours per week.		RO-149-WOM	$45.01	$58.72	$72.42	H H D H H H D D N
	Apprentice Rates:					
	Apprentice 1		$29.78	$36.88	$44.64	
	Apprentice 2		$33.80	$41.54	$49.52	
	Apprentice 3		$35.16	$43.50	$52.14	
	Apprentice 4		$36.15	$44.94	$54.06	
	Apprentice 5		$37.33	$46.64	$56.32	
	Apprentice 6		$38.67	$48.58	$58.90	
Sheet Metal Worker						
Sheet Metal Worker		SHM-80	$51.82	$69.04	$86.25	H H D H D D D D Y
	Apprentice Rates:					
	First Year		$34.61	$43.22	$51.83	
	Second Year		$35.98	$45.27	$54.57	
	Third Year		$37.36	$47.34	$57.33	
	Fourth Year		$40.11	$51.47	$62.83	
	Fifth Year		$42.86	$55.59	$68.33	
Siding & Decking		SHM-80-SD	$34.58	$46.03	$57.48	H H H H H H H D Y

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: Oakland

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Official 2007 Prevailing Wage Rates for State Funded Projects

Issue Date: 7/2/2007

Contract must be awarded by 9/30/2007

Classification Name	Description		Straight Hourly	Time and a Half	Double Time	Overtime Provision
Sprinkler Fitter						
Sprinkler Fitter		SP 704	$54.02	$72.89	$91.75	H H D H D D D Y
	Apprentice Rates:					
	1st Period		$31.38	$38.93	$46.47	
	2nd Period		$33.27	$41.76	$50.25	
	3rd Period		$35.15	$44.58	$54.01	
	4th Period		$37.04	$47.41	$57.79	
	5th Period		$38.93	$50.25	$61.57	
	6th Period		$40.81	$53.07	$65.33	
	7th Period		$42.70	$55.91	$69.11	
	8th Period		$44.59	$58.74	$72.89	
	9th Period		$46.47	$61.56	$76.65	
	10th Period		$48.36	$64.39	$80.43	
Terrazzo						
Terrazzo Finisher		TT32-TRF	$38.77	$49.06	$59.34	H H D H D D D N
	Apprentice Rates:					
	Level 1		$19.72	$25.71	$31.69	
	Level 2		$20.39	$26.71	$33.03	
	Level 3		$23.86	$30.27	$36.69	
	Level 4		$25.16	$32.23	$39.29	
	Level 5		$26.49	$33.74	$41.00	
	Level 6		$27.92	$35.33	$42.74	
	Level 7		$29.41	$37.18	$44.96	
	Level 8		$30.73	$38.74	$46.76	
Terrazzo Worker		TT32-TRW	$43.79	$56.59	$69.38	H H D H D D D N
	Apprentice Rates:					
	Level 1		$24.11	$30.98	$37.86	
	Level 2		$26.83	$34.42	$42.00	
	Level 3		$29.60	$37.44	$45.28	
	Level 4		$32.00	$40.68	$49.36	
	Level 5		$34.08	$43.15	$52.21	
	Level 6		$37.34	$47.85	$58.35	
	Level 7		$38.42	$49.33	$60.25	
	Level 8		$39.25	$50.58	$61.91	

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: Oakland

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Official 2007 Prevailing Wage Rates for State Funded Projects

Issue Date: 7/2/2007

Contract must be awarded by 9/30/2007

Classification Name / Description		Straight Hourly	Time and a Half	Double Time	Overtime Provision
Tile					
Tile Finisher	TT32-TF	$38.39	$48.49	$58.58	H H D H D D D D N
	Apprentice Rates:				
	Level 1	$18.63	$24.07	$29.51	
	Level 2	$19.69	$25.66	$31.63	
	Level 3	$23.83	$30.23	$36.63	
	Level 4	$25.13	$32.18	$39.23	
	Level 5	$26.46	$33.70	$40.94	
	Level 6	$27.89	$35.48	$43.08	
	Level 7	$29.38	$37.01	$44.65	
	Level 8	$30.70	$38.57	$46.45	
Tile Layer	TT32-TL	$43.69	$56.44	$69.18	H H D H D D D D N
	Apprentice Rates:				
	Level 1	$24.11	$30.98	$37.86	
	Level 2	$26.83	$34.42	$42.00	
	Level 3	$29.60	$37.44	$45.28	
	Level 4	$32.00	$40.68	$49.36	
	Level 5	$34.03	$42.94	$51.86	
	Level 6	$37.29	$47.77	$58.25	
	Level 7	$37.87	$48.51	$59.15	
	Level 8	$38.70	$49.75	$60.81	
Truck Driver					
on all trucks of 8 cubic yard capacity or less	TM-RB1	$33.66	$35.99		H H H H H H H H Y
of all trucks of 8 cubic yard capacity or over	TM-RB1A	$33.76	$36.14		H H H H H H H H Y
on euclid type equipment	TM-RB1B	$33.91	$36.36		H H H H H H H H Y
Underground Laborer Open Cut, Class I					
Construction Laborer	LAUC-Z1-1	$32.39	$42.99	$53.58	H H H H H H H D Y
	Apprentice Rates:				
	0-1,000 work hours	$27.59	$35.78	$43.98	
	1,001-2,000 work hours	$28.55	$37.22	$45.90	
	2,001-3,000 work hours	$29.51	$38.66	$47.82	
	3,001-4,000 work hours	$31.43	$41.54	$51.66	

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: Oakland

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Classification Name / Description		Straight Hourly	Time and a Half	Double Time	Overtime Provision
Underground Laborer Open Cut, Class II					
Mortar and material mixer, concrete form man, signal man, well point man, manhole, headwall and catch basin builder, guard rail builders, headwall, seawall, breakwall, dock builder and fence erector.	LAUC-Z1-2	$32.50	$43.15	$53.80	H H H H H H H D Y
Apprentice Rates:					
0-1,000 work hours		$27.68	$35.92	$44.16	
1,001-2,000 work hours		$28.64	$37.36	$46.08	
2,001-3,000 work hours		$29.60	$38.80	$48.00	
3,001-4,000 work hours		$31.54	$41.71	$51.88	
Underground Laborer Open Cut, Class III					
Air, gasoline and electric tool operator, vibrator operator, drillers, pump man, tar kettle operator, bracers, rodder, reinforced steel or mesh man (e.g. wire mesh, steel mats, dowel bars, etc.), cement finisher, welder, pipe jacking and boring man, wagon drill and air track operator and concrete saw operator (under 40 h.p.), windlass and tugger man, and directional boring man.	LAUC-Z1-3	$32.55	$43.23	$53.90	H H H H H H H D Y
Apprentice Rates:					
0-1,000 work hours		$27.71	$35.96	$44.22	
1,001-2,000 work hours		$28.68	$37.42	$46.16	
2,001-3,000 work hours		$29.65	$38.88	$48.10	
3,001-4,000 work hours		$31.58	$41.77	$51.96	
Underground Laborer Open Cut, Class IV					
Trench or excavating grade man.	LAUC-Z1-4	$32.63	$43.35	$54.06	H H H H H H H D Y
Apprentice Rates:					
0-1,000 work hours		$27.77	$36.06	$44.34	
1,001-2,000 work hours		$28.74	$37.51	$46.28	
2,001-3,000 work hours		$29.72	$38.98	$48.24	
3,001-4,000 work hours		$31.66	$41.89	$52.12	
Underground Laborer Open Cut, Class V					
Pipe Layer	LAUC-Z1-5	$32.69	$43.44	$54.18	H H H H H H H D Y
Apprentice Rates:					
0-1,000 work hours		$27.82	$36.13	$44.44	
1,001-2,000 work hours		$28.79	$37.58	$46.38	
2,001-3,000 work hours		$29.77	$39.06	$48.34	
3,001-4,000 work hours		$31.72	$41.98	$52.24	

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: Oakland

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Official 2007 Prevailing Wage Rates for State Funded Projects

Issue Date: 7/2/2007

Contract must be awarded by 9/30/2007

Classification Name / Description		Straight Hourly	Time and a Half	Double Time	Overtime Provision
Underground Laborer Open Cut, Class VI					
Grouting man, top man assistant, audio visual television operations and all other operations in connection with closed circuit television inspection, pipe cleaning and pipe relining work.	LAUC-Z1-6	$30.14	$39.61	$49.08	H H H H H H H D Y
Apprentice Rates:					
0-1,000 work hours		$25.90	$33.25	$40.60	
1,001-2,000 work hours		$26.75	$34.52	$42.30	
2,001-3,000 work hours		$27.60	$35.80	$44.00	
3,001-4,000 work hours		$29.29	$38.34	$47.38	
Underground Laborer Open Cut, Class VII					
Restoration laborer, seeding, sodding, planting, cutting, mulching and topsoil grading and the restoration of property such as replacing mail boxes, wood chips, planter boxes, flagstones etc.	LAUC-Z1-7	$26.76	$34.54	$42.32	H H H H H H H D Y
Apprentice Rates:					
0-1,000 work hours		$23.37	$29.46	$35.54	
1,001-2,000 work hours		$24.05	$30.48	$36.90	
2,001-3,000 work hours		$24.73	$31.50	$38.26	
3,001-4,000 work hours		$26.08	$33.52	$40.96	

Official Request #: 848
Requestor: TROY SCHOOL DISTRICT
Project Description: RENOVATIONS

Project Number: International Baccalaureate Academy (Baker MS)
County: Oakland

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

MICHIGAN DEPARTMENT OF LABOR & ECONOMIC GROWTH
WAGE & HOUR DIVISION

OVERTIME PROVISIONS for MICHIGAN PREVAILING WAGE RATE SCHEDULE

1. Overtime is represented as a nine character code. Each character represents a certain period of time after the first 8 hours Monday thru Friday.

	Monday thru Friday	Saturday	Sunday & Holidays
First 8 Hours		4	8
9th Hour	1	5	
10th Hour	2	6	
Over 10 hours	3	7	

Overtime for Monday thru Friday after 8 hours:
the 1st character is for time worked in the 9th hour *(8.1 - 9 hours)*
the 2nd character is for time worked in the 10th hour *(9.1 - 10 hours)*
the 3rd character is for time worked beyond the 10th hour *(10.1 and beyond)*

Overtime on Saturday:
the 4th character is for time worked in the first 8 hours on Saturday *(0 - 8 hours)*
the 5th character is for time worked in the 9th hour on Saturday *(8.1 - 9 hours)*
the 6th character is for time worked in the 10th hour *(9.1 - 10 hours)*
the 7th character is for time worked beyond the 10th hour *(10.01 and beyond)*

Overtime on Sundays & Holidays
The 8th character is for time worked on Sunday or on a holiday

The last character indicates if an optional 4-day 10-hour per day workweek can be worked without paying overtime after 8 hours worked.

2. Overtime Indicators Used in the Overtime Provision:

H - means TIME AND ONE-HALF due
X - means TIME AND ONE-HALF due after 40 HOURS worked
D - means DOUBLE PAY due
Y - means YES an optional 4-day 10-hour per day workweek can be worked without paying overtime after 8 hours worked
N - means NO an optional 4-day 10-hour per day workweek *can not* be worked without paying overtime after 8 hours worked

3. EXAMPLES:

HHHHHHHDN - This example shows that the 1½ rate must be used for time worked after 8 hours Monday thru Friday *(characters 1 - 3);* for all hours worked on Saturday, 1½ rate is due *(characters 4 - 7).* Work done on Sundays or holidays must be paid double time *(character 8).* The N *(character 9)* indicates that 4 ten-hour days is not an acceptable workweek at regular pay.

XXXHHHHDY - This example shows that the 1½ rate must be used for time worked after 40 hours are worked Monday thru Friday *(characters 1-3);* for hours worked on Saturday, 1½ rate is due *(characters 4 – 7).* Work done on Sundays or holidays must be paid double time *(character 8).* The Y *(character 9)* indicates that 4 ten-hour days is an acceptable alternative workweek.

ENGINEERS - CLASSES OF EQUIPMENT LIST

UNDERGROUND ENGINEERS

CLASS I

Backfiller Tamper, Backhoe, Batch Plant Operator, Clam-Shell, Concrete Paver (2 drums or larger), Conveyor Loader (Euclid type), Crane (crawler, truck type or pile driving), Dozer, Dragline, Elevating Grader, End Loader, Gradall (and similar type machine), Grader, Power Shovel, Roller (asphalt), Scraper (self propelled or tractor drawn), Side Broom Tractor (type D-4 or larger), Slope Paver, Trencher (over 8' digging capacity), Well Drilling Rig, Mechanic, Slip Form Paver.

CLASS II

Boom Truck (power swing type boom), Crusher, Hoist, Pump (1 or more 6" discharge or larger gas or diesel powered by generator of 300 amps or more, inclusive of generator), Side Boom Tractor (smaller than type D-4 or equivalent), Sweeper (Wayne type and similar equipment), Tractor (pneu-tired, other than backhoe or front end loader), Trencher (8' digging capacity and smaller).

CLASS III

Air Compressors (600 cfm or larger), Air Compressors (2 or more less than 600 cfm), Boom Truck (non-swinging, non-powered type boom), Concrete Breaker (self-propelled or truck mounted, includes compressor), Concrete Paver (1 drum, ½ yard or larger), Elevator (other than passenger), Maintenance Man, Mechanic Helper, Pump (2 or more 4" up to 6" discharge, gas or diesel powered, excluding submersible pump), Pumpcrete Machine (and similar equipment), Wagon Drill Machine, Welding Machine or Generator (2 or more 300 amp or larger, gas or diesel powered).

CLASS IV

Boiler, Concrete Saw (40HP or over), Curing Machine (self-propelled), Farm Tractor (w/attachment), Finishing Machine (concrete), Firemen, Hydraulic Pipe Pushing Machine, Mulching Equipment, Oiler (2 or more up to 4", exclude submersible), Pumps (2 or more up to 4" discharge if used 3 hrs or more a day-gas or diesel powered, excluding submersible pumps), Roller (other than asphalt), Stump Remover, Vibrating Compaction Equipment (6' wide or over), Trencher (service).

HAZARDOUS WASTE ABATEMENT ENGINEERS

CLASS I

Backhoe, Batch Plant Operator, Clamshell, Concrete Breaker when attached to hoe, Concrete Cleaning Decontamination Machine Operator, Concrete Pump, Concrete Paver, Crusher, Dozer, Elevating Grader, Endloader, Farm Tractor (90 h.p. and higher), Gradall, Grader, Heavy Equipment Robotics Operator, Loader, Pug Mill, Pumpcrete Machines, Pump Trucks, Roller, Scraper (self-propelled or tractor drawn), Side Boom Tractor, Slip Form Paver, Slop Paver, Trencher, Ultra High Pressure Waterjet Cutting Tool System Operator, Vactors, Vacuum Blasting Machine Operator, Vertical Lifting Hoist, Vibrating Compaction Equipment (self-propelled), and Well Drilling Rig.

CLASS II

Air Compressor, Concrete Breaker when not attached to hoe, Elevator, End Dumps, Equipment Decontamination Operator, Farm Tractor (less than 90 h.p.), Forklift, Generator, Heater, Mulcher, Pigs (Portable Reagent Storage Tanks), Power Screens, Pumps (water), Stationary Compressed Air Plant, Sweeper, and Welding Machine.

Regular Crane Operators rate shall include: Mechanics, Crane Operators, Dragline Operators, Boom Truck Operators, Power Shovel Operators and Concrete Pumps with booms.

Revised: 09/07/06

SECTION 00880
REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

B. Specific attention is directed to all applicable building codes, laws, regulations, permits, fees, notices, Equal Employment Opportunity, wage rates, non-segregated facilities and other statutory requirements for the Project.

1.02 STANDARDS, CODES AND REGULATION

A. All Work is to comply with the rules and regulations of governing bodies having jurisdiction.

B. Standards, codes and regulations published by Manufacturer's associations, governmental agencies and other regulatory authorities form a part of these Specifications as minimum requirements. Such references include the latest issue and legal requirements in force.

C. Where differences occur between the Contract Documents and such standards, the strictest requirements shall take precedence.

D. Supply all materials and perform all Work in accordance with the Manufacturer's specifications and installation procedures, and in conformance with published Trade and Manufacturers' association standards, unless specifically noted otherwise in the Contract Documents.

E. **Contractor** shall comply with all applicable requirements of both state and federal Laws regarding discovery, release, transportation, storage, spills, disposal or other handling of Hazardous Materials Refer to Section 00840 in the Project Manual.

1.03 PERMITS

A. Refer to Section 00890 Permits in the Project Manual.

1.04 TAXES

A. Except to the extent specifically described below, this Project is subject to all applicable state Sales Tax and/or Use taxes, and Bidder must include such taxes in its Bid Proposal. All other taxes applicable to the project at the time of the bid are to be included in the bid amount and will be the responsibility of Bidder.

END OF SECTION 00880

SECTION 00890
PERMITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 PERMITS AND FEES

A. Troy School District **will** obtain and pay for the General Building Permit.

B. Other than the general building permit, **Contractor** shall provide and pay for all other permits, assessments, governmental fees, bonds, connection charges, licenses and inspection fees and any other charges necessary for the proper execution and completion of the **Contractor's** Work.

C. **Contractor** is to provide, pay for and coordinate all other permits, fees, inspections, and city, county, state, federal and governing authority approvals required for the successful completion of the Work contained within its respective Bid Category and deliver required certificates of inspection and approvals to Barton Malow Company.

D. This Project is under the jurisdiction of the **MICHIGAN DEPARTMENT OF LABOR FOR MECHANICAL AND ELECTRICAL, STATE OF MICHIGAN FIRE MARSHAL DIVISION, MICHIGAN DEPARTMENT AND OAKLAND COUNTY DEPARTMENT OF PUBLIC HEALTH.**

E. Site water and sewer utilities are under the jurisdiction of the **ROAD COMMISION OF OAKLAND COUNTY** authorities.

END OF SECTION 00890

SECTION 01140
USE OF PREMISES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 SUMMARY

A. This Section describes the following requirements including:
   1. Use of Premises and Deliveries
   2. Use of Existing Elevators
   3. Use of Existing Facilities
   4. Existing Entrances and Drives
   5. Protection of Underground Facilities
   6. No Interruption of Occupancy/Sequencing
   7. Material Storage

PART 2 - USE OF PREMISES

2.01 USE OF PREMISES AND DELIVERIES

A. Contractor and its Subordinate Parties shall be subject to such rules and regulations for the conduct of the Work as the Owner or Barton Malow Company may establish. All employees shall be properly and completely clothed while working. Bare torsos, legs and feet will not be allowed. Possession or consumption of alcoholic beverages or drugs, or other obnoxious behavior on the site is strictly prohibited. Violators shall be promptly removed from the site.

B. Before starting the Work, Contractor shall ascertain from Barton Malow Company what entrances, routes or roadways shall be used for access to the Work, and use only those designated for movement of personnel, materials and vehicles to and from the Project site. Close coordination will be required of Contractor with the Owner, Barton Malow Company, other contractors, the city and others having an interest in the Project to assure that Work on the site, access to and from the site and the general conduct of operations is maintained in a safe and efficient manner, and that disruption and inconvenience to existing streets and property is minimized. Contractor is responsible to review the site and be familiar with all existing conditions within and around the Owner's property including local conditions and requirements. A set of existing drawings, which are considered Resource Drawings, is available for inspection at the Barton Malow Company's Field Office.

C. Contractors shall maintain free access to all buildings and areas of the site for designated vehicles, service vehicles and fire fighting equipment and at no time shall block off or close roadways or fire lanes without providing auxiliary roadways and means of entrance acceptable to the Owner. Fire hydrants must remain accessible at all times. Contractors shall give the Owner and the local fire department at least forty-eight (48) hours notice of any such changes of routes.

D. There is on-site parking for Contractors and their Subordinate Parties' employees. Contractor, Subordinate Parties and their personnel will not be allowed to park in the Owner's parking area. Barton Malow Company will designate parking areas.

E. Contractors and their Subordinate Parties will not be allowed to use any Owner tools or equipment during the course of the Project.

F. Each Contractor shall confine its Work to normal working hours; 8:00 am to 4:30 p.m. OR 7:00 am to 3:30 p.m., Monday through Friday. Contractor may execute the Work during the entire twenty-four (24) hours of any day of the week with the approval of the Barton Malow Company and the Owner, providing that they so conduct their operations as to not create a public nuisance or disturb the peace, and provided such operations are conducted so as to comply with all applicable laws, ordinances, and regulations. Compensation to Barton Malow Company for supervisory staff due to abnormal working hours will at the requesting Contractor's expense.

1. The City of Troy has a noise ordinance which states: **The erection (including excavating), demolition, alteration, or repair of any building, the excavation and/or grading of streets, highways, or private property other than between the hours of 7:00am and 8:00pm on Mondays through Saturdays, unless a permit be first obtained from the Building Department for building work or from the Engineering Department for street work** (Title IX – Police Regulations).
2. **The Troy School District has stated that no construction traffic is allowed to or from the schools between the hours of 7:45am-8:15am and 2:45pm-3:15pm. This is to ensure the safety of their students.**

G. Whenever Contractor intends to depart from normal work hours, it shall notify Barton Malow Company in writing at least forty-eight (48) hours in advance. Failure of Contractor to give such timely notice may result in Barton Malow Company directing the removal or uncovering of the Work performed during such abnormal hours and Contractor's expense. Special arrangements can be made for emergency work or shutdowns as may be required.

H. Use of explosives are not permitted.

I. Each Contractor on behalf of itself and its Subordinate Parties shall be responsible for all damage to the Project including the existing buildings and grounds arising or resulting from its operations under the Agreement. Repair or replacement of damaged items shall be to the satisfaction of the Owner and Barton Malow Company.

J. Each Contractor shall at all times maintain a clean and safe passageway for the Owner's operations and personnel in existing areas and maintain clearances adjacent to and in connection with the Work performed.

K. Each Contractor shall effectively confine dust, dirt and noise to the actual construction area and in compliance with all applicable laws, rules and regulations.

L. All Contractors and their Subordinate Parties shall restrict all Work activities associated with an area undergoing renovation to within the boundaries indicated by the Contract Documents. Any means of access or egress from the stipulated boundaries shall be coordinated with Barton Malow Company and the Owner.

M. Work shall, if required, be constructed in phases to accommodate the Owner's use of the premises during construction and to accommodate installation of equipment. Refer to Section 00230 Schedule and Phasing of the Project Manual.

N. All Contractors shall limit their use of the premises for Work and for storage, to allow for:

* Work by other contractors
* Owner occupancy
* Public use and safety
* Free use of corridors at all times

O. The Owner and Barton Malow Company expect Contractors and their Subordinate Parties to exercise common sense and good judgment, and to conduct themselves in a manner which would be a credit to the

Owner. Without limiting other applicable provisions of the Contract Documents, Contractor shall not engage in the following:

1. Conduct that interferes with Work or work of others.
2. Conduct that interferes with, or is detrimental to good safety and well being.
3. Unauthorized use of confidential information.
4. Discourtesy toward Owner's staff, visitors and the general public (including abusive, vulgar or other language).
5. Soliciting.
6. Disregard of safety, sanitation, or security laws, rules and regulations.
7. Conduct detrimental to the Owner's operations and good reputation.
8. Stealing.
9. Gambling.
10. Possession and/or use of narcotics or intoxicants.
11. Threats or abuse of others.
12. Disorderly conduct or fighting.
13. Playing of loud music.
14. Falsification of information.
15. Unauthorized travel of Subcontractor's employees outside the designated project Work areas.
16. Discriminating Behavior.
17. Sexual of Ethnic harassment.

Willful disregard of the above will be grounds for requiring the offending person(s) to be removed from the Project, and may subject the Contractor to termination under the Agreement.

P. Site contractor shall be responsible for keeping the designated route to the site clean and free of debris. Site contractor will assume responsibility for any of their sub-contractors keeping the designated route to the site clean and free of debris.

P. Each Contractor on behalf of itself and its Subordinate Parties shall not load or permit any part of a structure to be loaded with a weight that will endanger its safety.

Q. Where new temporary partitions are established and located by the Demolition, Carpentry, or Drywall contractor, all existing mechanical, fire protection, plumbing and electrical devices used for life safety purposes shall be relocated by the Contractor installing or relocating same to the new temporary partitions so as to be usable and visible to Owner personnel and activities. Items such as, but not limited to: exit lights, fire protection systems, fire alarm systems, and similar items shall be relocated. In the event that a passageway is blocked or barricaded, visible rerouting directions for traffic flow shall be posted.

1. The Project is under the jurisdiction of the Michigan Department of Labor and Economic Growth.

2. Partition construction shall provide a fire-resistant classification approved by the state Fire Marshall. Openings in such partitions shall be protected by fire doors consistent with the rating of the partition.

R. The Owner shall have the option to curtail or delay any activity that affects its operations. Should a Contractor be asked to stop its Work, the Contractor shall do so immediately and proceed with other activities with no additional cost to the Owner or Barton Malow Company. The Owner may occupy the premises during the entire period of construction for the conduct of its normal operations. All Contractors are to cooperate with the Owner and Barton Malow Company in all construction operations to minimize conflict, and to facilitate Owner usage.

S. Contractors and their Subordinate Parties are prohibited from canvassing, soliciting, posting, or distributing literature or materials for any purpose while on the job site.

T. Contractors and their Subordinate Parties shall be responsible for adhering to the smoking policies and regulations of the Owner and the Owner's facilities.

U. The preservation of existing trees and other vegetation on the site to the maximum extent possible is extremely important. In many cases, trees in close proximity to the site work are to be preserved. Each Contractor must plan its Work and instruct its Subordinate Parties to conduct their operations to avoid damage to trees and vegetation (provide barriers as required). Indiscriminate driving about the site, disposing of waste, storage of materials upon or against trees or any other activity which is harmful to trees or vegetation that are to be preserved will not be tolerated. Parking areas, storage areas, and access to the buildings will be confined to areas designated and approved by Barton Malow Company.

V. Any case of damage to any tree shall be reported to Barton Malow Company immediately so that professional repairs can be made. The cost of such required repairs or treatment shall be charged to the responsible Contractor. Willful disregard of the above will be grounds for requiring the offending person(s) to be removed from the Project, and may subject the Contractor to termination under the Agreement.

2.02 USE OF EXISTING ELEVATORS

A. Each Contractor, subject to the approval of Barton Malow Company and Owner may not, use the existing elevator(s) designated by the Owner within the contract boundaries for movement of personnel and materials to a construction area.

B. In those cases where an elevator is to be shared with Owner services, the Owner's employees and services take priority over construction activities. Each Contractor is responsible for proper conduct of its Subordinate Parties with regard to the use of the elevator. Any damage to the elevator due to oversize load, excess weight or other conditions is the individual Contractor's responsibility.

C. Use of the elevator(s) at times other than normal working hours shall be coordinated with Barton Malow Company and Owner.

2.03 USE OF EXISTING FACILITIES

A. Contractors shall limit their and their Subordinate Parties' usage of the occupied areas of the facility to that which is absolutely necessary for the installation of their Work. Parts of the facility not in the construction area are "off limits" unless a specific work task is being performed as designated by Barton Malow Company.

B. Contractors and their Subordinate Parties will not be allowed the use of the Owner's cafeteria, parking, telephones, toilet facilities, tools, equipment, or any other item or facility belonging to the Owner, unless specifically authorized by Owner and Barton Malow Company. Contractor's Subordinate Parties shall not use the Owner's facilities for personal use such as lunchrooms and similar areas for coffee breaks, clothing changes or similar uses. The Owner's complex shall be off-limits to all construction personnel without prior approval of Barton Malow Company and the Owner.

2.04 EXISTING ENTRANCES AND DRIVES

A. Contractor and construction delivery access to the worksite shall be as designated by Barton Malow Company. Selected entrances to the Project site will remain open during normal working hours for the use of all Contractors. Contractors shall utilize specific entrances for material deliveries, equipment deliveries and worker access to the Project site as directed by Barton Malow Company.

B. At no time are ANY vehicles to be parked, whether attended or not, in the Owner's entrances or drives. Any material delivery which will tie up the Owner's entrances or drives in excess of 15 minutes shall be pre-scheduled with the Owner through Barton Malow Company. In scheduling construction deliveries the Contractor agrees that the Owner's deliveries, and operations will take precedence.

2.05 PROTECTION OF UNDERGROUND FACILITIES

A. Each Contractor shall provide and maintain proper shoring and bracing for existing underground utilities, sewers, and building foundations, encountered during its excavation Work, to protect from collapse or movement, or other type of damage until such time as they are to be removed, incorporated into the new Work or can be properly backfilled upon completion of new Work. All such disruptions of services shall be limited to a maximum of FOUR (4) hours. Prior to beginning any excavation, Contractor shall contact MISS DIG and utility companies for the location of all existing underground services and provide, if requested, documentation of such contact to Barton Malow Company. If necessary, Contractor shall pay for appropriate layout and locating of existing utilities.

B. Utilities and/or other services which are shown, or not shown but encountered, shall be protected by the Contractor from any damage arising or resulting from Work, unless or until they are abandoned. If the utilities or services are damaged from Contractor's Work Contractor shall immediately repair any damage and restore the utilities and services to an equal or better condition than that which existed prior to the damage. Contractor will be responsible for all liabilities, expenses, lawsuits or claims arising or resulting from such damage and will defend, hold harmless and indemnify Owner and Barton Malow Company from any claims or lawsuits or other expenses.

C. Each Contractor on behalf of itself and its Subordinate Parties shall be responsible for all damage to the Project including the existing building and grounds arising out of or resulting from their performance of the Work. Repair or replacement of damaged items shall be to the satisfaction of the Owner and Barton Malow Company.

2.06 NO INTERRUPTION OF OCCUPANCY/SEQUENCING

A. Each Contractor is responsible to plan, coordinate and execute its Work in such a manner that there will be no disruption of the Owner's operations. If an interruption of operations is unavoidable, then this Work will be scheduled with the Owner through the Barton Malow Company prior to beginning such Work.

B. Due to the nature of the Owner's existing areas, the sequence of Work must be scheduled and coordinated with the Owner's ongoing operations to minimize disruptions and/or disturbances to the Owner's Work and at all times remain as secondary to the Owner's operations. Each segment of the Work shall be coordinated with the Barton Malow Company and the Owner prior to proceeding.

C. Work that interrupts the Owner's services will be accomplished during the time periods when it is least inconvenient to the Owner and completed in the shortest possible time frame. Contractors may be requested to work split shifts, weekends, off peak Owner loading periods, etc., to accommodate Owner's utility and service requirements, such as, but not limited to, medical gas systems, electrical power, HVAC systems, storm and sanitary lines. The cost for premium time labor, which may be required, is the Contractor's responsibility and is to be included in the base bid.

D. Contractors are responsible to provide any temporary alternate supply and/or return conditions to maintain services to the facility while Work is being performed for each Bid Category. Place safety stages or markers to indicate location of disconnected services.

E. No interruptions to Owner's power, lighting, signal, or alarm circuits will be permitted without the express written permission of the Owner. Arrangements for interruptions shall be made with the Owner at least forty-eight (48) hours prior to the interruption and shall be made at such time and duration as authorized by them. Temporary feeders, transformer jumpers, connections, circuits, etc., shall be used as required to accomplish the above at no additional cost to the Owner and Barton Malow Company.

F. Contractors shall construct the Work in stages to provide for public convenience. Contractors shall not close off public use of facilities until completion of one stage of construction will provide alternative usage, or until other means have been provided.

G. These provisions shall apply to all Contractors and are applicable whether a Contractor is either directly or indirectly affected.

2.07 MATERIAL STORAGE

A. Each Contractor shall provide suitable storage trailers on site as required. These are to be relocated and removed when directed by Barton Malow Company.

B. Temporary storage of materials in the building and on the site will be limited to the same areas immediately under construction for materials intended for that particular portion of the Work. Material, equipment and tools shall not be stored on site in excess of five (5) working days prior to installation or use without Barton Malow Company's approval. Contractors shall stock the job with sufficient materials to maintain progress and schedule and without interfering with the Work or storage of others. Each Contractor assumes full responsibility for the protection and safekeeping of products under its control which are stored on the site. Contractors must move any stored products, under their control, which interfere with operations of the Owner or separate contractors as directed by Barton Malow Company. All Contractors are to cooperate with Barton Malow Company and other contractors in this regard.

C. Each Contractor shall provide sufficient protection for its materials and equipment from damages by weather or construction work or other hazards.

D. During progress of Work and upon completion of the Work, Contractor shall remove all debris and leave the area in a clean and orderly condition.

E. Each Contractor shall submit a receipt of shipment for all equipment stored on site or off-site to the Barton Malow Company. No materials or equipment shall be removed from the site without the permission of Barton Malow Company.

F. Storage of combustible materials within or adjacent to the building is prohibited.

END OF SECTION 01140

SECTION 01210
ALLOWANCES

The following is a list of the allowances for the Troy School District **International Academy East BP #9444** project, as taken from the work scopes (section 00220).

WORK SCOPE SECTION	DESCRIPTION	AMOUNT
1.1 - Demolition	-	N/A
2.1 - Sitework	To be used as directed by Barton Malow	$3,000
3.1 - Concrete	To be used as directed by Barton Malow.	$2,000
4.1 – Masonry	To be used as directed by Barton Malow.	$3,000
5.1 – Structural Steel	To be used for miscellaneous steel as directed by Barton Malow.	$1,000
6.1 – Carpentry and Acoustical Ceilings	To be used on miscellaneous items as directed by Barton Malow.	$4,000
7.1 – Roofing	-	N/A
8.1 – Aluminum Doors, Window and Glazing	-	N/A
9.1 – Painting	To cover the cost of touch-up painting needed following owner move in, or as directed by Barton Malow.	$3,000
9.2 –Ceramic Tile	-	N/A
9.3 – Carpet, Resilient Tile and Base	To be used as directed by Barton Malow.	$4,000
15.1 – Mechanical	-	N/A
15.2 – Temperature and Lighting Controls	-	N/A
16.1 – Electrical	To be used as directed by Barton Malow.	$10,000

END OF SECTION 01210

SECTION 01250
CHANGES IN THE WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

B. Various forms of field communications will be used to document communication between the **Contractor** and Barton Malow Company as described in Section 01320 Communications. Field Communications are interpreted to be within the scope of the Agreement and as such are not authorizations for Work beyond the scope of the Agreement.

1.02 SUMMARY

A. This section identifies an effective method of identification of changed work and provides an efficient method of modification of Contract Documents.

B. This section describes the following requirements including:
1. Types of Change Documentation
2. Compensation of Overhead and Profit for Changes in the Work
3. Itemization of Cost of Changed Work

PART 2 - TYPES OF CHANGE DOCUMENTATION

2.01 ARCHITECT INSTRUCTIONS

A. There are two forms of Architect Instructions used on the Project, namely the Architect's Supplemental Instruction ("ASI"), AIA Document G710, and the Proposal Request ("PR"), AIA Document G709. These documents will be issued by the Architect and distributed by the Barton Malow Company to affected Contractors.

1. ASI's are used by the Architect to issue supplemental instructions or interpretations involving minor changes in the Work that will not affect the contract price or schedule.

2. PRs, often termed "Bulletins" are used by the Architect to identify changes in the Contract Documents which may affect the Contractor's contract price or schedule. An itemized write-up narrative and corresponding "bubbled" change on the drawings or specifications usually accompanies this document.

B. PRs or "Bulletins" sent to Contractors which may involve a change in the contract price or schedule will be accompanied by –the Barton Malow form entitled "PCO- Quotation Only". In the event that the timing does not allow the For Quote Only process, then Barton Malow Company will issue its form entitled "PCO - Notice to Proceed" to the Contractor.

2.02 PCO- NOTICE TO PROCEED AND FOR PCO- QUOTATION ONLY FORMS

A. A PCO- Notice to Proceed is used when Work must be performed with swiftness and authorization to proceed by Change Order is inappropriate due to time restrictions. A PCO-Notice to Proceed may be issued for changes in schedule or contract price. In order for a PCO- Notice to Proceed to be valid, it must be signed by Barton Malow Company and Owner. The terms for establishing the additional cost and processing of the PCO- Notice to Proceed into a Change Order shall be identified prior to its release by Barton Malow Company.

B. If a change issued by the Architect, through Barton Malow Company, may result in an additional cost to the Contractor, Barton Malow Company will issue a PCO- Quotation Only with the Architect's documents. The PCO- Quotation Only will describe the change or reference the appropriate documents and will have attached the detailed descriptions, sketches and plans required for the Contractor to quote the change.

C. Barton Malow Company will send the PCO– Quotation Only to all potentially affected Contractors.

D. Once the Contractor receives the PCO– Quotation Only or the PCO- Notice to Proceed, it shall prepare a detailed cost estimate for the change. This estimate shall include an itemized takeoff of labor, equipment and material with a unit cost for each item. Under no circumstances will a PCO- Quotation Only or a PCO- Notice to Proceed be processed unless accompanied by a complete cost breakdown. The PCO- Quotation Only must be returned no later than the date indicated on the PCO– Quotation Only or at the direction of Barton Malow Company.

E. Once completed, the Contractor shall sign and date the PCO- Quotation Only and submit it with proper backup to Barton Malow Company. Barton Malow Company will then review, evaluate, possibly negotiate and then when acceptable, process the PCO- Quotation Only through the Owner's Representative and Architect's Representative. Once the quote for the work under the PCO- Notice to Proceed is submitted to Barton Malow Company, it will review, evaluate, possibly negotiate, and then, when acceptable, process the resulting Change Order through Owner's Representative and Architect's Representative.

F. The PCO- Quotation Only is a document used for processing Contractor's quotations and is not a Change Order. Therefore, completion of the PCO- Quotation Only does **not** release the Work to begin.

G. PCO- Quotation Only and the PCO- Notice to Proceed will precede a Change Order. Contractors shall receive an approved PCO- Notice to Proceed or an executed Change Order before starting Work. Any changed Work performed by Contractor without a properly executed PCO- Notice to Proceed or a properly executed Change Order is at Contractor's sole risk and expense. BILLINGS AGAINST CHANGES WILL NOT BE ACCEPTED AFTER A PCO- NOTICE TO PROCEED OR FOR QUOTE ONLY IS ISSUED, BUT ONLY AFTER A CHANGE ORDER HAS BEEN PROCESSED AND SIGNED BY ALL PARTIES.

2.04 CHANGE ORDER

A. Change Orders will be written and issued by Barton Malow Company. Barton Malow Company will first issue the Change Order to the Contractor for signature. The Change Order will then be returned to Barton Malow Company. Once all appropriate signatures are secured, an executed copy will be sent to the Contractor.

B. Once the Change Order has been processed and signed by all parties, the Contractor. may invoice for payment on the completed portion of Work.

C. Agreement on any Change Order, shall constitute a final settlement of all matters relating to the changed Work that is the subject of the Change Order, including, but not limited to, all direct and indirect costs associated with such change, any impact such change may have on the unchanged Work, including but not limited to claims for acceleration, stacking, inefficiency, ripple effect, disruption, compression, interference, delay and cumulative impact, and any and all adjustments to the contract price and the schedule.

PART 3 - COMPENSATION OF OVERHEAD AND PROFIT FOR CHANGES IN THE WORK

3.01 CONTRACTOR'S OVERHEAD AND PROFIT

A. When changed Work is performed by a Contractor itself and not by its Subordinate Party, the Contractor's charge for overhead and profit shall in no event exceed fifteen percent (15%) of the approved cost of the changed Work. When changed Work is performed by a Contractor's Subordinate Party, the Contractor's charge for overhead and profit shall in no event exceed five percent (5%) of the approved cost of the changed Work.

B. When changed Work is performed by the Contractor's Subordinate Party, the Subordinate Party's charge for overhead and profit shall in no event exceed fifteen percent (15%) of the approved cost of the changed Work when such Work does not involve the Subordinate Party's subcontractors; or five percent (5%) of the approved cost of the changed Work when such changed Work is performed by the Subordinate Party's subcontractors.

C. Contractor and Subordinate Party overhead and profit shall include cost (at the Project Site, home office and otherwise) of supervision, telephone, travel, copying, administrative services, office, power, light, tools, jobsite vehicles, and all other general expenses including bond premiums. In no event shall these be charged as cost of the Changed Work.

PART 4 - ITEMIZATION OF COST OF CHANGED WORK

4.01 CORRELATION WITH CONTRACTOR'S SUBMITTALS

A. **Contractors** shall revise the Schedule of Values and Request for Payment forms to record each Change Order as a separate item of Work, and to record the adjusted contract price.

B. **Contractors** shall revise the Construction Schedule to reflect each change in Contract Time approved by a Change Order.

1. **Contractor's** shall revise sub-schedules to show changes for other items of Work affected by the changes.

C. Upon completion of Work under a Change Order, enter pertinent changes in Record Documents (Refer to Section 01720 – Project Record Documents).

4.02 COST OF THE CHANGED WORK

A. The "Cost of the Changed Work" shall be approved by the Barton Malow Company and shall mean the costs necessarily incurred by the **Contractor** in the proper performance of the Changed Work Such rates shall not be higher than those customarily paid at the place of the Project. The Cost of the Changed Work shall only include those items set forth below.

WAGES OF LABOR	Wages of construction workers directly employed by **Contractor** to perform the construction of the changed Work at the site
PAYROLL MARKUP	The amount approved by Barton Malow Company and Owner which covers the costs paid by the **Contractor** for taxes, insurance, contributions, assessments, and benefits required by law or collective bargaining

	agreements and for personnel not covered by such agreements, customary benefits such as sick leave, medical and health benefits, holidays vacations and pensions, provided that such costs are based on the wages and salaries of labor performing the changed Work.
COST OF EQUIPMENT, MATERIALS, AND SUPPLIES	Costs of materials, equipment and supplies to be incorporated into the changed Work less all savings, discounts, rebates and credits accruing to the **Contractor**.
RENTAL CHARGES FOR EQUIPMENT NOT OWNED BY CONTRACTOR	Rental charges for equipment not owned by **Contractor** that is necessary for completion of the Changed Work. Rates and quantities rented must be approved in advance by Barton Malow Company.
TAXES	Sales or use taxes imposed by a governmental authority which are directly attributed to the changed Work and for which the **Contractor** is liable.
SUBCONTRACTOR COSTS	Payments made to the Subcontractors for proper execution of Changed Work, subject to the limits set forth in Subparagraph 3.01 B. above for overhead and profit.

B. In no event shall the Cost of Changed Work include:

1. Salaries or wages of persons other than those directly performing the changed Work, including **Contractor's** personnel stationed at the principal office;

2. Expenses of the **Contractor's** principal office and offices other than the site office, except as provided in section 3.01 A. above;

3. Overhead and general expenses of any nature, except as set forth in sections 3.01 A and 3.01 B.;

4. Capital expenses of **Contractor**, including interest on the **Contractor's** capital employed for the Changed Work;

5. Rental costs for machinery or equipment, except as allowed under section 4.02 A above, or tools of any kind, unless specifically identified and approved in advance in writing by Barton Malow Company;

6. Costs due to the negligence or failure to perform of the **Contractor** or its Subordinate Parties;

7. Costs designated in section 3.01 C as being included in Overhead and Profit; or

8. Any cost not specifically described under section 4.02 A above, or otherwise approved in advance and in writing by Barton Malow Company and Owner.

4.03 QUOTATION FORMAT

Based on the above, the following formula will be utilized by all of the Contractors.

Number of PCO - Quotation Only, F.O _____
Date of PCO - Quotation Only, F. O. _____
Description of Change _____

_____

_____

Cost of Changed Work				
Labor:				
Carpenter	(No. of Hrs. x Rate)	xxx.xx		
Labor	(No. of Hrs. x Rate)	xxx.xx		
Ironworker	(No. of Hrs. x Rate)	xxx.xx		
		xxx.xx	xxx.xx	
Mark-up on labor @ ____%		xxx.xx		
Equipment, Materials, Supplies:				
Ace Hardware xxx.xx				
Acme Products xxx.xx				
Concrete Supplier		xxx.xx		
		xxx.xx		
	Subtotal		xxx.xx	
	OH&P @ **[15]** %		xxx.xx	
	Subtotal (1)			xxx.xx
Subcontractor Costs				
ABC Welding xxx.xx				
XYZ Resteel		xxx.xx		
		xxx.xx		
Overhead Cost @ **[5]** %		xxx.xx		
	Subtotal (2)			xxx.xx
TOTAL QUOTATION AMOUNT				
Work by Own Forces		xxx.xx (1)		
Work by Subcontractors		xxx.xx (2)		
	Total Quotation	xxx.xx		

Contractor/Subcontractors are to provide backup and breakdown documentation of all work items and costs to the satisfaction of Barton Malow Company so that it may accurately approve and recommend payment of same to Owner.

END OF SECTION 01250

SECTION 01290
PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 SUMMARY

A. This Section describes the following requirements including:
   1. Schedule of Values
   2. Application for Payment Process
   3. Reduction of Retention
   4. Payment for Materials Stored Off-site
   5. Waivers of Lien and Sworn Statements

PART 2 - PAYMENT PROCEDURES

2.01 SCHEDULE OF VALUES

A. Once the Agreement is awarded, each Contractor must submit a Schedule of Values for its entire Work to Barton Malow Company for approval. This Schedule of Values must be submitted either within fifteen (15) days of award or fifteen (15) days prior to the first payment application deadline (per the Application for Payment Schedule), whichever comes first. The Schedule of Values must include labor and material line items for each portion of the Work (larger portions of Work such as concrete, curtainwall, drywall, mechanical, and electrical shall be broken down by elevation, floor, and areas appropriate), the Contractor shall separate bond costs, and general conditions line items as appropriate.

B. The Schedule of Values will be submitted in a format as prescribed by, and to the level of detail specified by, Barton Malow Company.

   1. The sum of the parts of the Schedule of Values shall equal the contract price.

   2. The minimum level of breakdown and order on the application for payment will be:
      a. Bond costs, if applicable
      b. General conditions line item(s)
      c. Division 1 cost breakdown as required
      d. Costs associated with preparation of closeout paperwork and documentation
         a. The following line items shall be included:
            i. Closeout – equal to 2% of contract value, not to exceed $25,000
            ii. Cleanup – equal to 2% of contract value, not to exceed $2,000
      e. Major portions of the Work shall be broken down into **labor** and **material** line items for specific areas of the facility

   3. Schedule of Values items shall have a direct and understandable relation to the Project master construction schedule.

   4. Overhead and profit shall be listed as a separate line item on the schedule of values.

C. The Schedule of Values, unless objected to by Barton Malow Company, Owner or Architect, shall be the basis for the Contractor's application for payments.

D. Barton Malow Company shall have the right to require the Contractor to alter the value or add/delete categories listed on the Schedule of Values at any time for the following reasons:

1. The Schedule of Values appears to be incorrect or unbalanced.

2. A revision of the Schedule of Values is required due to the Contractor revising the sequence of construction or assembly of building components that in turn invalidates the Schedule of Values.

3. Change Orders are issued to the Contractor and shall be incorporated into the Schedule of Values as a separate line item at the bottom of the Schedule of Values.

E. The Contractor is required to correlate the documentation for payment of stored materials requested in the application for payment against the agreed upon breakdown of the Schedule of Values as described in Part 3 Payment for Stored Materials. Barton Malow Company reserves the right to not process the application for payment if this correlation has not been submitted in conjunction with the application.

2.02 APPLICATION FOR PAYMENT PROCESS

20TH OF MONTH - ROUGH DRAFTS DUE
25TH OF MONTH - FINAL APPLICATION CUT-OFF DATE

A. Step 1 JOB-SITE INSPECTION - DRAFT PAYMENT REQUEST

On or before the twentieth (20th) of the month, according to Barton Malow Company's Application for Payment Schedule, the Contractor shall have a representative visit the Project site. The Contractor's representative will walk the Project site with Barton Malow Company's representative. The Contractor is to invoice for Work from the twentieth (20th) of last month to the twentieth (20th) of the present month. The Contractor shall submit during the review, the itemized rough draft of the Application and Certificate for Payment (AIA Documents G702 and G703 Continuation Sheet) identifying the Work completed, if any, during the current calendar month; shall review same with Barton Malow Company and obtain a preliminary approved copy of the draft for official submission (See Step 2). Contractor's pay application shall only reflect Work completed through the date of submission. In no event will payments be authorized for forecasted Work. If the walk through occurs before the last day of the payment cycle, Barton Malow Company shall determine, in its sole discretion, the amount Contractor may invoice, if any, for Work scheduled to be in place by the last day of the payment cycle.

NOTE: No payment shall be issued to a Contractor for materials stored off-site unless supported by proper documentation as required by Barton Malow Company (upon advance notification of such requests only) as described in Part 3 Payment for Stored Materials.

Step 2 PAYMENT REQUEST PREPARATION/SUBMISSION

With the information agreed upon in Step 1, the Contractor will prepare a formal application for payment request. Four (4) originals of the request and four (4) originals of the sworn statements (see Part 4) must be submitted to Barton Malow Company's Site office on or before the twenty-fifth (25th) of the month, or as scheduled (see Section 01600 Application for Payment Schedule). Late or incomplete application packets will not be accepted. The payment request will be made on an Application and Certificate For Payment form (AIA documents G702 and G703). Copies of these forms are included in Section 01600 Forms. Before submitting these documents to Barton Malow Company, each request for payment must be signed by a duly authorized agent of the Contractor and notarized. The Contractor must include with each request for progress payment a waiver of lien for all previous payments, Contractor's sworn statement and any necessary backup data as described in Part 4, Waivers of Lien and Sworn Statements.

In addition, at submission of the final pay application Contractor shall provide unconditional final waivers of lien for all Subordinate Parties, as well as all documentation required under Section 01700 of the Project Manual – Contract Closeout and all additional back up data described in Part 4, Waivers of Lien and Sworn Statements. In requests for payment which follow the execution of a Change Order in excess of twenty-five percent (25%) of the Agreement price, Contractor must present a bond rider evidencing that the penal sum of any required payment and performance bonds have been increased to one hundred percent (100%) of the adjusted Agreement price, or such other percentage as set forth in Section 00200 of the Project Manual, Instructions to Bidders. Submission of the required back-up data is a condition precedent to payment.

Step 3 CHECK DISTRIBUTION

A. Barton Malow will issue individual checks to each Contractor. The Contractor will receive the waiver of lien and will be required to sign the waiver before receipt of the check each month (see Part 4).

B. The Contractor shall provide all supporting documentation substantiating the Contractor's right to payment as the Owner, Barton Malow Company and the Architect may require.

2.03 REDUCTION OF RETENTION

A. Barton Malow Company shall be entitled to withhold ten (10%) percent of each payment due to a Contractor until Substantial Completion of the Contractor's Work. When fifty (50%) percent of the value of the Work has been satisfactorily completed, the Contractor may submit a **written request** to Barton Malow Company that no additional retainage be held throughout the balance of the Agreement. Barton Malow Company may grant or deny the request in its sole discretion, based upon its opinion of the progress and performance of the Contractor through the date of the request. If the request is granted and the Contractor's Work subsequently fails to meet contracted requirements, does not conform to Contract, or the Contractor does not meet its schedule commitments, the ten (10%) percent retainage shall be reinstated.

B. The Contractor, when requesting a reduction of retention, shall submit to Barton Malow Company, an AIA G707, Consent of Surety to Reduction In or Partial Release of Retention form in Section 01600 Forms.

C. Within thirty (30) days after Certificate of Substantial Completion has been issued for all portions of its Work, the Contractor's retention may be reduced to a sum as Barton Malow Company may determine is suitable to protect Barton Malow Company and the Owner for all incomplete Work and any unsettled claims.

D. Notwithstanding the foregoing, payment of retention shall be subject to all other conditions precedent that apply to payment as set forth in the Contract Documents.

PART 3 - PAYMENT FOR MATERIALS STORED OFF-SITE

3.01 PAYMENT FOR MATERIALS STORED OFF-SITE

A. The Contractor, if intending to use an off-site storage area or facility for stored materials, shall submit a written request to the Barton Malow Company and obtain approval prior to submitting the first application for payment as described in Part 2 Applications for Payment.

B. Payments will be made for materials properly stored off site. Properly stored shall mean in an insured warehouse with the Owner and Barton Malow Company being named as insureds, and all material identified as property of the Owner. The Contractor is responsible for all associated off site storage costs, transportation, insurance, including insurance coverage for stored material, while in transit, unless Contractor obtains written documentation that the material is covered during transit under a Builder's Risk Policy applicable to the Project. Contractor shall provide Barton Malow Company and the Owner verification in writing for all material so stored.

Such materials shall be protected from diversion, destruction, theft, and damage to the satisfaction of Barton Malow Company, Owner and the Lender (if any), specifically marked for use on the Project, and segregated from other materials at the storage facility. The Contractor bears all risk of loss to materials and equipment stored off site.

C. Contractors are to provide supporting documentation in the form of invoices, insurance policies, and any other pertinent documentation as requested by Barton Malow Company or Owner for items the items stored off-site. Documentation shall include the following:

1) Detailed description of the material including quantities that will serve as a material description for the billing and as information to file a claim with an insurance company.

a) Stored Materials - Each item must be identified as to manufacturer, model number, and serial number, if applicable, or other identifiers should be listed for each item. Each listing must be accompanied by invoices, shipping tickets, consent of surety, and any other applicable supporting documentation.

b) Stored Manufactured Building Materials - Each item must be identified as to type, manufacturer's number or designation, and should also list the number of cartons and the contents therein storage. Each listing must also be accompanied by supporting documents including all invoices, shipping tickets and consent of surety.

c) Stored Fabricated Materials - A listing specifying the number of pieces, items, and marks as may be applicable to the particular type of items. Photographs should accompany the request.

2) Individual itemized costs of materials and the total cost value, which shall not exceed the Contractor's subcontractor or material supplier cost. The total cost value shall be supported by the Contractor's subcontractor or material supplier invoices for the stored material.

3) Estimated cost value for those materials that are fabricated by the Contractor's subcontractor or material supplier.

4) The location where the material is physically stored, including the warehouse address and storage location within the warehouse, such as bin number, aisle number or other designation. All material shall be segregated and marked.

5) Copies of the insurance policies that cover the stored materials and that names Barton Malow Company and the Owner as insureds. The limit of the insurance policy shall be equal to or greater than the replacement value of the stored materials.

D. When Applications for Payment include products stored off the Project Site or stored on the Project Site but not incorporated in the Project, for which no previous payment has been requested, a complete description of such product shall be attached to the application.

E. Contractor shall submit a certificate of title listing the Owner's and Barton Malow Company's ownership in the off-site stored materials equal to the amount paid effective at the time funds are delivered.

F. If the size, quantity, and/or type of material or product are such that a bonded warehouse is deemed unsuitable, then, with Barton Malow Company's approval, the Contractor may elect to pre-pay its subcontractor or supplier for certain material and products which are to remain on and be stored on that subcontractor/supplier's premises until needed by the Project. In such event, the Contractor shall enter into a security agreement with the subcontractor/supplier under which the Contractor shall be granted a security interest in and to all such material and products fabricated and/or to be supplied by the subcontractor/supplier for this Project and stored on the subcontractor/supplier's premises.

This Security Agreement shall be a part of the financing statement, which shall be presented to a filing officer for filing pursuant to the Uniform Commercial Code. All expenses incurred in obtaining this security agreement shall be at Contractor's sole cost and expenses, and shall not accrue to the Owner, Barton Malow Company, Architect, nor the Project. A copy of each and every security agreement shall be filed with Barton Malow Company with the first Application for Payment which requests payment for such material or products.

G. All payment requests for off-site stored materials must be accompanied using the "Payment Request for Stored Materials" and a "Subcontractor Affidavit for Stored Materials" form in Section 01600 Forms. Payment requests for stored materials not complying with the foregoing requirements will not be approved. Contractors are to notify the Barton Malow Company in ample time to conduct verification procedures.

H. Contractors may not apply the cost of materials stored off-site towards a reduction in the retention amount.

I. Representatives of Barton Malow Company, Owner and the Lender (if applicable) shall have the right to make inspections of the storage areas at any time.

PART 4 - WAIVERS OF LIEN AND SWORN STATEMENTS

4.01 WAIVERS OF LIEN

A. The Contractor's first Application for Payment (see Part 2 Applications for Payment) will be based upon 100 percent of the value of Work installed. The first payment, amounting up to 90 percent of application, will be made to the Contractor without supporting documentation. Subsequent Applications for Payment must be accompanied by lien waivers from the Contractor, its Subordinate Parties or receipted invoices covering payment to the Contractor for previous calendar month period. Lien waivers must be unconditional and must show the amount paid.

B. An "Acknowledgment of Payment and Partial Unconditional Release" (see Section 01600 Forms) will be printed and distributed with the check to each Contractor by Barton Malow Company for payment of the previous month's application. The Waiver of Lien is to be signed by an authorized representative of the Contractor. Under no circumstances will payment be released until the completed "Acknowledgment of Payment and Partial Unconditional Release" has been submitted and signed by the Contractor from the previous month.

C. Final payment will not be made until a "Final Release Subcontractor/Material-man" (see Section 01600 Forms) has been submitted. This will also be distributed by the Barton Malow Company for Contractor signature and must be returned by the Contractor. The Final Release must be signed by an authorized representative of the Contractor must be notarized.

D. Final unconditional waivers will be required for all of Contractor's Subordinate Parties listed on Contractor's sworn statement. These final waivers must be submitted along with the final release, before payment can be made.

4.02 SWORN STATEMENTS

A. The appropriate number of original "Sworn Statements" (see Section 01600 Forms) must be completed to the satisfaction of Barton Malow Company, signed and notarized by an authorized representative of the Contractor and submitted with the Contractor's Application for Payment (see Part 2) monthly to the Barton Malow Company.

B. The Contractor's Subcontractor's sworn statements, waivers and other supporting documentation will be required with each pay application.

END OF SECTION 01290

SECTION 01310
MEETINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION OF REQUIREMENTS

A. The Barton Malow Company shall schedule, chair, and administer all periodic meetings throughout the progress of the work for the purpose of coordinating and expediting the Work. Such meetings shall be held at the job site bringing together responsible representatives of active Contractors for the purpose of planning, assessing progress and discussing problems of mutual concern. Each Contractor, and its Subordinate Parties' representative attending the meetings shall be authorized to act on behalf of and make decisions/commitments for the entity each represents, the decisions made at the meetings and each Contractor who should be in attendance will be held responsible for information and directions given at the meeting.

B. The Barton Malow Company will prepare and distribute the minutes of all meetings, if Barton Malow Company determines minutes are required. If the attendees do not object in writing to any part of the meetings within ten (10) days of distribution of the minutes, the minutes shall be accepted as written.

B. The scope of meetings include, but are not limited to:
   1. Preconstruction Meeting
   2. Job Progress/Coordination Meetings
   3. Other Meetings

PART 2 - TYPES OF MEETINGS

2.01 PRE-CONSTRUCTION MEETING (KICK-OFF)

A. A Preconstruction (kick-off) meeting will be conducted with representatives of all the Contractors within thirty (30) days after the Agreement is awarded at the jobsite or as designated by the Barton Malow Company. The agenda may include:

   a. Discussion on major subcontracts and suppliers
   b. Major and/or critical work sequencing regarding the project schedule
   c. Project coordination and designation of responsible personnel
   d. Procedures and processing of field instructions, requests for proposal, submittals, change orders, applications for payment, etc.
   e. Quality assurance/control issues
   f. Adequacy of distribution of contract documents
   g. Procedures for maintaining record documents
   h. Use of premises, office, work and storage areas and other Barton Malow Company requirements
   i. Construction facilities/temporary utilities
   j. Safety and security procedures
   k. Other administrative procedures
   l. Review of Owner expectations

2.02 JOB PROGRESS/COORDINATION MEETINGS

A. On-site project coordination/progress meetings will be held on a bi-weekly basis or as appropriate throughout the life of the Project. The Barton Malow Company will set the agenda for the Project progress meeting. At a minimum, each Contractor shall be prepared to discuss the following:

a. Actual vs. scheduled progress for the prior two-week period
b. Planned construction activities for the next four weeks
c. Problems with, revisions to and corrective measures and procedures to regain the construction schedule, if required
d. Review of off-site fabrication, delivery schedules
e. Document clarification requests
f. Coordination items with other Contractors
g. Changes in the work affecting cost and/or time
h. Submittals and shop drawings
i. Field observations, problems, and conflicts
j. Quality control issues and non-conformance resolutions
k. Safety issue

2.03 OTHER MEETINGS

A. QUALITY ASSURANCE MEETINGS - Barton Malow Company may conduct quality assurance/quality control meetings as necessary during the progress of the Work. Barton Malow Company will set the agenda for the quality meeting. At a minimum, the Contractor shall be prepared to discuss the following:

a. Testing and inspection procedures
b. Tolerance requirements
c. Quality samples
d. Reporting of non-conformance items
e. Corrective actions assigned
f. Disposal of non-conforming items
g. Job procedures

B. SAFETY MEETINGS - Refer to Section 00810 Safety and Loss Control Program for more information.

C. INSPECTIONS TOURS - Formal inspections/tours may be made of the Project progress by the Owner, Architect, local, state or federal officials, insurance representatives, or others as the occasion warrants and as scheduled by Barton Malow Company. If requested by Barton Malow Company, each Contractor shall be prepared to show and explain Work throughout the building to the inspecting parties, in addition to providing Work in compliance with these inspections.

D. CHANGE REQUEST MEETINGS - Upon issuance of a major Proposal Request (a.k.a. bulletin), Barton Malow Company may conduct a meeting as necessary with all significant Contractors to review its contents and determine cost, delivery and schedule impacts. At a minimum, the Contractor shall be prepared to discuss the following:

a. Impact of out-of-sequence work
b. Identification of pertinent long-lead material and system impact
c. Alternative recommendations
d. Evaluation of approximate cost magnitude
e. Evaluation of impact on completion
f. Alternate sequencing
g. Due date for Contractor pricing and scheduling impact

END OF SECTION 01310

SECTION 01320
COMMUNICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 SUMMARY

A. This Section describes the following requirements including:
   1. Contractor Correspondence
   2. Contractor's Daily Report
   3. Request for Information (RFI)

1.03 SUBMITTALS

A. Submittals shall be submitted based on each technical specifications section. Submittals containing information about more than one specification section will be returned for re-submittal. When the specifications call out specific materials, products or devices with model numbers, which the Contractor intends to use for the work, the Contractor can submit the Material Compliance Submittal form (found at the end of Section 01330). This form is to be signed by an officer of the company and notarized by a Certified Notary Public in the State of Michigan within fifteen (15) days of award of the contract. List all specified materials, products, etc. (with specific model numbers, series, type, etc.) certifying that the Contractor commits to using these products or materials as specified for their scope of work. **No Substitutions!** This certification letter will negate the need to provide individual submittals for these materials, products, devices. Contractor will provide information to allow proper coordination including electrical, mechanical connections and size, weight data.

PART 2 - METHODS OF COMMUNICATION

2.01 CONTRACTOR CORRESPONDENCE

A. All field and/or construction correspondence and/or communications must be directed through Barton Malow Company **1301 Boyd, Troy, MI 48083** and should list the following as appropriate:

Project: **Troy School District, 2004 Bond Program**
International Academy East
Bid Package # 9444

Additional Project Designations required on some forms:
Barton Malow Company Project Number: **041049**
Architect's Project Number: **#2643-22**
Bid Package and Category Number **Bid Pack #9444**

Subject: Clearly indicate subject matter of correspondence

2.02 CONTRACTOR'S DAILY REPORT

A. Each **Contractor** will prepare and distribute daily to Barton Malow Company a comprehensive daily report and maintain it during the entire project period. The daily report shall be submitted to Barton Malow Company's superintendent by the end of the day for that day's Work.

A. Each **Contractor** is responsible for specifically alerting Barton Malow Company to items which could result in claims or delays. **The daily report shall include the following as a minimum:**

* **Manpower by trade**
* **Weather**
* **List of visitors**
* **Detailed description of work being performed with specific location, floor, and all other pertinent information**
* **Situations or circumstances which could delay work or give causes for delays or claims for extension or added costs**
* **Instruction of information requested**
* **Accidents, injuries, and incidents**
* **Materials received with attached material receipts**
* **Major equipment arrivals/departures**

B. Each **Contractor** may provide its own daily report if it covers the same issues as addressed in Barton Malow Company's Contractor Daily Report form. The suggested Contractor Daily Report form will be provided to the **Contractor** and is in Section 01600 - Forms.

2.03 REQUEST FOR INFORMATION (RFI)

A. The Request for Information (RFI) is in Section 01600 Forms.

B. In the event that a clarification is required due to a question raised by the **Contractor** pertaining to the Contract Documents, the **Contractor** shall submit a Request for Information (RFI) to the Barton Malow Company, which will be forwarded to the Architect.

C. The Architect will return the RFI to Barton Malow Company as expeditiously as possible with its reply. In some instances, the Architect may issue its reply to the RFI on other documents, in which case, the RFI will simply reference these documents.

D. The RFI will be returned to the **Contractor** by Barton Malow Company. The **Contractor** is responsible to give proper notice as set forth in the Contract Documents if a response will cause the **Contractor** to incur additional expense or expend additional time which could impact the schedule. If extra work or an additional cost may exist due to the clarification, Barton Malow Company may issue a PCO- Quotation Only or PCO- Notice to Proceed to the **Contractor** as described in Section 01250 Changes in the Work of the Project Manual.

END OF SECTION 01320

SECTION 01330
SUBMITTALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Specific attention is directed to all Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section and relate to various submittals required to be submitted to Barton Malow Company for the Project.

B. Submit to Barton Malow Company: Shop Drawings, Certifications, Product Data, Samples, Tests, and all other submissions required by the Architect's technical specifications. Refer to each specification section for specific submittal requirements.

1.02 SUMMARY

A. This Section describes the following requirements including:
   1. Scope
   2. Submittal Register
   3. Submittal Requirements
   4. Submittal Process and Responsibilities
   5. Re-submission Requirements

1.03 SCOPE

A. Where requirements of this Section vary from the requirements of the General Conditions, this Section's requirements shall take precedence.

B. Barton Malow Company will prepare and submit a submittal register/schedule for Contractor's use in preparing submittals required for the Project. Contractors shall complete the submittal schedule/register showing the dates for submission, lead times required and their expected delivery dates. Submittals received on the date scheduled will be processed as specified. Contractor is responsible to provide all submittals required under the Contract Documents, whether or not listed in the submittal register. Barton Malow Company/Owner/Architect **will not** be held responsible for delays due to receiving submittals after the date indicated in the Contractor's submittal schedule.

C. The Architect will review the submittals within (10) working days after receipt in the Architect's office. Submittals that must be reviewed by the Architect's consultants will be reviewed within fifteen (15) working days. The Architect or his consultant will be checking only for conformance with the design compliance of the Project and compliance with information given in the Contract Documents. Submissions that are large or of multiple submissions or requires detailed or lengthy review by the Architect or his consultant may require additional time. Submissions for products or material that require a long lead time for delivery shall be noted as such and marked "Top Priority" so the architect may expedite the process.

D. Submittals shall be submitted based on each technical specification section. Submittals containing information about more than one specification section will be returned for re-submittal. When the specifications call out specific materials, products or devices with model numbers, which the Contractor intends to use for the work, the Contractor can submit the Material Compliance Submittal form (found at the end of Section 01330). This form is to be signed by an officer of the company and notarized by a Certified Notary Public in the State of Michigan within **fifteen (15)** days of award of the contract. List all specified materials, products, etc. (with specific model numbers, series, type, etc.) CERTIFYING THAT THE Contractor commits to using these products or materials as specified for their scope of work. **No Substitutions!** This certification letter will negate the need to provide individual submittals for these

materials, products or devices. Contractor will provide information to allow proper coordination including electrical, mechanical connections and size, weight data.

D. Compliance Certificate: Refer to the attached Compliance Certificates (immediately following this section) for submissions document to be used by the contractor to indicate the product/devices intended for use in this project without the need for a formal shop drawings submittal. Items listed on this certificate are to be approved products indicated in the specifications. With the submission and approval of this document **NO FURTHER SUBMITTALS ARE REQUIRED** for the indicated specification section on the certificate.

The following specification sections are subject to this certificate:

DIVISION 4 – MASONRY
04810 UNIT MASONRY ASSEMBLIES

DIVISION 5 - METALS
05400 COLD-FORMED METAL FRAMING

DIVISION 6 - WOOD AND PLASTICS
06105 MISCELLANEOUS CARPENTRY

DIVISION 7 - THERMAL AND MOISTURE PROTECTION
07210 BUILDING INSULATION
07412 METAL WALL PANELS
07710 MANUFACTURED ROOF SPECIALTIES
07720 ROOF ACCESSORIES
07841 THROUGH-PENETRATION FIRESTOP SYSTEMS
07842 FIRE-RESISTIVE JOINT SYSTEMS
07920 JOINT SEALANTS

DIVISION 8 - DOORS AND WINDOWS
08111 STANDARD STEEL DOORS AND FRAMES
08211 FLUSH WOOD DOORS
08311 ACCESS DOORS AND FRAMES
08411 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
08520 ALUMINUM WINDOWS

DIVISION 9 - FINISHES
09111 NON-LOAD-BEARING STEEL FRAMING
09250 GYPSUM BOARD
09511 ACOUSTICAL PANEL CEILINGS
09651 RESILIENT FLOOR TILE
09653 RESILIENT WALL BASE AND ACCESSORIES
09911 EXTERIOR PAINTING
09912 INTERIOR PAINTING

DIVISION 10 – SPECIALTIES
10101 VISUAL DISPLAY SURFACES
10155 TOILET COMPARTMENTS
10520 FIRE-PROTECTION SPECIALTIES
10801 TOILET AND BATH ACCESSORIES

DIVISION 16 - ELECTRICAL

16050 BASIC ELECTRICAL MATERIALS AND METHODS
16060 GROUNDING AND BONDING
16075 ELECTRICAL IDENTIFICATION
16120 CONDUCTORS AND CABLES
16130 RACEWAYS AND BOXES
16491 FUSES

E. No shop drawings, product data, or samples will be accepted by Barton Malow Company until Subordinate Parties have been approved.

F. Coordination: Each Contractor shall coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. The Contractor, by providing the submittal assures the Owner, Architect and Barton Malow Company that the product or system submitted is available and deliverable in accordance with the schedule requirements.

2. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.

3. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.

4. Barton Malow Company reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

5. Coordinate each submittal as required with all trades and with all public agencies involved.

6. Secure all necessary approvals from public agencies and others; signify by stamp or other means that all required approvals have been obtained.

G. Category Format Process: Submittals for this Project will be classified and managed using the following categories.

Category 1 - A submittal that establishes a level of quality by complying with the manufacturer and manufacturer's designated identifier as called for in the Contract Documents. Provide a "Letter of Compliance" committing to the use of specified components.

For record purposes, as part of the Letter of Compliance (or subsequently providing) a listing of those components will actually used or to be used. The Architect will only respond to the Letter of Compliance if something is wrong. This letter of compliance is contractually binding.

Category 2 - A submittal that represents a number of components assembled to represent a specific project need, or standard components that require modification to also meet a specific Project need. Individual submittals that completely represent their intent of the Contract Documents are required for this category. This type of submittal will be processed in a manner through the typical circle. A Contractor to Barton Malow Company or Architect to Barton Malow to Contractor.

Category 3 - A submittal that confirms compliance with governmental, industry or otherwise specified standard and/or requirements. Required is a Letter of Compliance committing the Contractor to obtain for record and/or otherwise be responsible for meeting the requirements of the contract documents. The Architect will only respond to the Letter of Compliance if something is wrong. This letter of compliance is contractually binding.

After the Award of Agreement, Barton Malow Company will provide the Contractor with a listing of submittal items.

Designation of Category 1 or 3 does not relieve the Contractor from providing the appropriate detailed documentation to Barton Malow Company and to other trades for the purpose of coordination of Work.

PART 2 - SUBMITTAL REGISTER

2.01 SUBMITTAL REGISTER/SCHEDULE

A. Barton Malow Company shall prepare and submit a listing of all items requiring submission, organized by specification section number, including the required close-out document submission recipients.

B. Submittal listings may include such items as:

1. Contractor's, or Subordinate Parties shop drawings.

2. Descriptive submittal types including, but not limited to:
   a. catalog cuts/product data
   b. diagrams
   c. operation charts or curves
   d. test reports
   e. samples
   f. operations and maintenance manuals, including parts list
   g. certifications
   h. warranties/guarantees
   i. other close-out documentation required

3. The Contractor's submittal register returned to Barton Malow Company shall include as a minimum:
   a. Submittal type and breakdown by specification section number of how the Contractor intends to submit the individual submittals for review (according to an intended sequence, area, etc.)
   b. Scheduled date for initial submittal of item
   c. Days required after return of approved submittal(s) to fabricate and deliver the specific item to the site (if applicable).

4. Barton Malow Company shall have the right to require the Contractor to add and/or delete items on the submittal register at any time.

5. Adequate time (approximately 3 weeks) shall be allowed for review and approval and possible re-submittal of any item subject to approval. No delay damages or time extensions will be allowed for time lost in late submittals or re-submittals.

6. The submittal register shall be coordinated with the schedule of values to insure delivery and payment requests are projected accurately. The Barton Malow Company will not be responsible for failure of the Contractor to properly schedule the process of material/product design, submittal, review, fabrication, delivery, storage and installation.

C. **The submittal register will become a part of the Agreement and the Contractor will be subject to requirements thereof.**

D. Each Contractor shall carefully coordinate preparation and processing of submittals to the performance of the Work so the Work will not be delayed by submittals. Coordinate and sequence different categories of submittals for the same Work and for interfacing units of Work, so that one will not be delayed by the

coordination of the Architect's review with another. Drawings of component items forming a system or that are interrelated shall be correlated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled.

E. Furnish approved copies of shop drawings, diagrams, templates, catalog cuts, technical data, etc. to other Contractors in other related Work designated by Barton Malow Company for the purposes of coordination of this Work.

F. If a Contractor does not submit the required submittal by the date marked on the submittal register, the Contractor will be subject to a $20/hr engineering fee back charge. This fee is established ONLY to ensure timely submission of submittals.

PART 3 - SUBMITTAL REQUIREMENTS

3.01 GENERAL

A. Each submittal shall show Contractor's review stamp, with handwritten signature, certifying review of the submittal, verification of field measurements and compliance with the Contract Documents.

B. Each submittal shall be accompanied with a Barton Malow Company Submittal Transmittal Form. A Submittal Transmittal Form will be provided to the Contractor See Section 001600 Forms. The following information shall be furnished by the Contractor on the submittal transmittal form:

1. Date
2. Project name and Architect's and the Barton Malow Company's project number
3. Names and Address of:
   a. Architect
   b. The Barton Malow Company
   c. Contractor
   d. Subcontractor (if applicable)
   e. Supplier
   f. Manufacturer
4. Identification of product or material
5. Technical Section number, clearly identified. On multiple submittals, a separate transmittal should be completed for each specification section on items being submitted.
6. Reference to construction drawings by drawing number
7. The quantity of each Shop Drawing, Product Data or Sample submitted
8. Notification of deviations from Contract Documents
9. Other pertinent data
10. LEED Requirements, including Post Consumer Recycling Content, Post-Industrial Recycled Content, Material Cost, and Distance from manufacturing point to jobsite, of Rapidly Renewable Content.

Submittals not so transmitted will be returned un-reviewed. Re-submissions shall be so noted on the transmittal.

C. Unless noted otherwise on the submittal, all submissions will be considered to be "as specified."

3.02 REQUIRED QUANTITIES OF SUBMITTALS

A. The following number of originals and copies will be required for each type of submittal:

Submittal Type	Submit
1. Manufacturer's, supplier's or Contractor's shop drawings	5 Sets

2. Manufacturer's catalog sheets, product data, brochures, diagrams, schedules, performance charts, etc.	5 Copies
3. Samples	4 Samples (unless a specific number is required by specification)
4. Certifications	2 Copies
5. Warrantees/Guarantees	2 Copies
6. Test Reports	2 Copies
7. Operating and Maintenance Manuals/Data	2 Copies

B. Following review by the Architect, documents will be distributed as follows:

1. One copy to be retained by the Architect
2. One copy to be sent to Owner/Architect
3. One copy each of original and reviewed submittal to be retained by Barton Malow Company
4. Sepias and all remaining copies to be returned to Contractor

3.03 SUBMITTAL IDENTIFICATION

A. This paragraph is included to explain the method for submittals identification using Section 08710. Finish Hardware and the Finish Hardware Schedule as an example.

B. The Contractor shall assign submittal designations utilizing the following format and system.

C. The number for the first shop drawing submitted under that Section would be 08710-1A, the "1" designating that this is the first submittal under Section 08710; and the "A "signifying" that it is the first time a "finish hardware" schedule has been submitted to the Architect's office. If this "finish hardware" submittal is marked "rejected-resubmit", the re-submittal would retain the 08710-1 but "A" would be changed to 08710-1"B" to designate re-submittal; the next re-submittal 08710-1"C", etc. until this "finish hardware" item is approved.

D. The second "finish hardware" submittal (door alarms) sent to the Architect's office for the first time would be 08710-2A, etc.

PART 4 - TYPES OF SUBMITTALS

4.01 SHOP DRAWINGS

A. Submit Shop Drawings as single copies in the form of positive printing reproducible transparencies (commonly called sepia prints) suitable for reproduction use on dry print diazo type machines and the required number of blue lines. Sepia prints which cannot be reproduced will be returned to the Contractor for re-submittal.

B. Provide Shop Drawings as complete submittals (no partial sets) on original drawings or information prepared solely by the fabricator or supplier. In no instance shall the Contract Drawings be reproduced for Shop Drawing submittals.

C. Sheet sizes shall not exceed the size of the Contract Drawings or smaller than 8-1/2" X 11".

D. Each sepia print shall have blank spaces large enough to accept two (2) 3" x 6" review stamps of the Contractor, the Barton Malow Company, and the Architect.

E. Each sepia print shall carry the following information:

1. Project name, Architect's and Barton Malow Company's project number.
2. Date and Revision Dates.
3. Names of and Address' of:
   a. Contractor
   b. Supplier
   c. Manufacturer
4. Identification of product or material.
5. Relation to adjacent structure or materials.
6. Field dimensions, clearly stated as such.
7. Technical Section number.
8. Applicable standards such as ASTM or Federal Specification.
9. Identification of deviations from Contract Documents.
10. Reference to construction drawings by drawing number and/or detail number.

F. Submit sepia prints without folds either as flat sheets if size permits, or rolled in tubes.

4.02 PRODUCT DATA

A. Product Data such as catalog cuts, brochures or manufacturer's preprinted sheets may be submitted in lieu of sepia prints if adequately identified. Submit the required number of copies of product data to the Barton Malow Company.

B. Modify Product Data sheets to delete information that is not applicable to the Project. Provide additional information if necessary to supplement standard information.

C. Product Data Sheets that are submitted with extraneous information not deleted and/or modified will be returned without review to the Contractor for re-submittal.

4.03 SAMPLES

A. Provide physical Samples to illustrate materials, equipment or workmanship, and to establish standards by which completed work may be judged as required by the technical section.

B. Provide Office Samples in sufficient size and quantity to clearly illustrate full range of colors, textures, etc. available and the functional characteristics of the product or material.

C. Erect Field Samples or mock-ups as required by the technical sections and/or Barton Malow Company at the Project site in a designated location by Barton Malow Company. Construct field samples complete, including Work of all trades required in finishing the Work. Provide Field Samples at the request of the Architect and/or Barton Malow Company where construction materials and/or methods deviate from the requirements of the intent of the Contract Documents or conventional construction practice.

4.04 CERTIFICATIONS

A. Provide certifications as required by various technical sections on the Contractor's letterhead stationary. (See item D of Section 1.03 SCOPE.)

B. Certifications shall clearly identify the materials in reference and shall state that the material and the intended installation methods, where applicable, are in compliance with the Contract Documents for this project. Attach manufacturer's affidavits where applicable.

4.05 WARRANTEES/GUARANTEES

A. Provide warrantees and/or guarantees as required by the various technical sections and other Contract Documents on the Contractor's letterhead in accordance with the requirements in Section 01740.

4.06 OPERATING AND MAINTENANCE MANUALS

A. Provide operating and maintenance manuals/data as required by the various technical sections in accordance with the requirements in Section 01730.

PART 5 - SUBMITTAL PROCESS AND RESPONSIBILITIES

5.01 CONTRACTOR'S RESPONSIBILITIES

A. Before making submittals to Barton Malow Company, review each submittal, make changes or notations as necessary to conform to the Contract Documents, identify such review with review stamp and forward reviewed submittal with comments to Barton Malow Company for review. Return submittals not meeting contract requirements to Subordinate Parties and do not forward such submittals to Barton Malow Company.

B. Verify field measurements and product catalog numbers or similar data.

C. Notify the Barton Malow Company and Architect, in writing at time of submission, of deviations in submittals from the requirements of the Contract Documents.

D. After the Barton Malow Company's and Architect's review, within one (1) week of receipt distribute copies to other Contractors and supplier/fabricators with one copy to be maintained at the Project Site for reference use.

E. Do not begin Work which requires submittals until return of submittals with Barton Malow Company's and Architect's stamp and initials indicating review.

F. Contractor's responsibility for errors and omissions in submittals is not relieved by Barton Malow Company's or Architect's review of submittals.

G. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Barton Malow Company's or Architect's review of submittals unless Barton Malow Company and Architect give written acceptance of specific deviations.

5.02 BARTON MALOW COMPANY'S RESPONSIBILITIES

A. Barton Malow Company will administratively review all submittals and coordinate them with information contained in related documents. Barton Malow Company's review is for general administrative purposes only and neither this review, nor any subsequent approval by Barton Malow Company of a submittal, shall relieve Contractor from its obligations to comply fully with the Contract Documents.

B. Barton Malow Company will return to the Contractor, without review, all submittals not bearing the Contractor's review stamp or not showing it has been reviewed by the Contractor.

C. Barton Malow Company will make changes or notations directly on the submittals, identify such review with its review stamp, sign and forward acceptable submittals to the Architect.

D. After the Architect's review, Barton Malow Company will forward submittals to the Contractor and retain one copy. Contractor shall distribute copies with one copy to be maintained at the Project Site for reference use and other copies distributed to suppliers/fabricators. Contractor shall supply copies of reviewed submittals to Barton Malow Company in sufficient quantity to allow proper coordination of the Work.

5.03 ARCHITECT'S RESPONSIBILITIES

A. Architect will review submittals within ten (10) working days after receipt in the Architect's office. Submittals that must be reviewed by the Architect's consultants will be reviewed within fifteen (15) working days. The Architect or his consultant will be checking only for conformance with the design compliance of the Project and compliance with information given in the Contract Documents. Submissions that are large or of multiple submissions or required detailed or lengthy review by the Architect or his consultant may require additional time. Submissions for products or material that require a long lead time for delivery shall be noted as such and marked "Top Priority" so the architect may expedite the process.

B. Architect will return to Barton Malow Company without review any submittals not bearing the Contractor's or Barton Malow Company's review stamp or not showing that it has been reviewed by the Contractor and Barton Malow Company.

C. Architect will make changes or notations directly on the submittal, identify such review with its review stamp, obtain and record Architect file copy and return the submittal to Barton Malow Company.

D. Submittals shall be identified and submitted by individual technical specification sections only.

E. Kingscott Associates, Inc. will provide, for a fee, electronic data files compatible with AutoCAD 2000 for contractors' convenience and use in the preparation of shop drawings. Immediately following this section is the Request Form for electronic data. This request shall be directed to Barton Malow. Prior to the release of electronic files, the Architect will require a signed waiver of release and payment of the fee.

Approximate Fee Schedule: Fee varies depending on size, type of work, and discipline. Please contact Penny Mitchell at Kingscott (269-381-9440).

5.04 RE-SUBMISSION REQUIREMENTS

A. For Shop Drawings:

1. Review initial drawings as required and submit as specified for initial submittal.

2. Indicate on drawings all changes which have been made other than those requested by Barton Malow Company or Architect.

B. For Product Data and Samples:

1. Resubmit new data and samples as required for initial submission.

END OF SECTION 01330

Material Compliance Form

Kingscott
229 East Michigan Suite 335
Kalamazoo, MI 49007-6403
269-381-4880 Fax 381-9110

Name of Building: _____

Owner: _____

Bid Package #: _____

A/E #: _____

Cc: _____

Material Compliance Submittal Section: _____

This document is to be used by this contractor to indicate the products/devices intended for use in this project without the need to a formal shop drawing submittal. Items listed are approved products in the specifications. No substitutions allowed. Select one (1) source for each category, sign this sheet, and submit as the contractor's commitment to use products required by the contract documents. **No further submittals are required for this section.**

As contractor for work specified under the section named above, I agree to use only the products/devices listed below that were listed in the specification section.

Contractor: _____

Date: _____

Print Name: _____

Title: _____

Signature: _____

Notary: _____

County: _____

Date Commission Expires: _____

Print Name: _____

Signature: _____

Reviewed By: _____

Construction Manager: _____

Date: _____

Print Name: _____

Signature: _____

Reviewed By: Kingscott Associates, Inc.

Date: _____

Print Name: _____

Signature: _____

LIST MANUFACTURES NAME AND MODEL NUMBER

Electronic Data Distribution Authorization Form

Kingscott
229 East Michigan Suite 335
Kalamazoo, MI 49007-6403
269-381-4880 Fax 381-9110

Project Name/#: _____

Name: _____

Company: _____

Address: _____

_____

Phone #: _____

Fax #: _____

E-mail: _____

AutoCadd Version: _____

Date of Request: _____

Date Needed By: _____

Cost: _____

Mailing Media:

☐ Zip Disk ☐ 3.5 Floppy ☐ CD ☐ E-mail

Electronic Data Needed:

_____

_____

_____

Comments:

_____

_____

_____

_____ _____

Project Manger Authorization *Cad Manager Authorization*

SECTION 01360
COORDINATION (GENERAL)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 COORDINATION OF WORK/COOPERATION

A. Each **Contractor** shall recognize the complex nature of the Project, the sequential nature of contracts and the concurrent and ongoing operations of the Owner and other **contractors** with the Work of this Project. All **Contractors** are required to review, discuss and coordinate their Work with the Work of other **contractors** as well as Barton Malow Company with regard to sequence, timing, built-in Work and equipment, layout, location, compatibility of materials and sizes and required clearances prior to beginning the work to avoid construction delays which impact the Owner's occupancy of the facility. Since the Work of each **Contractor** will depend upon interface with the Work of other **contractors**, changes in the scheduling, procedures, Work or Project conditions of a **Contractor** may affect the scheduling procedures, Work or Project conditions of other **contractors**.

B. Each **Contractor** shall coordinate construction operations in various sections of the technical specifications to assure efficient and orderly installation of each part of the Work that depends on each other for proper installation, connection, fit and operation. Each **Contractor** shall:

1. Schedule operations in the sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

3. Make provisions to accommodate items scheduled for later installation.

4. Provide to all other trades all information (drawings, diagrams, templates, embedments, etc.) necessary for the coordination of the Work.

C. The completion of the Project within the prescribed time is dependent upon the close and active cooperation and open discussions of all those involved, therefore, it is expressly understood and agreed that each **Contractor** shall layout and install its Work at such time and in such manner as not to delay or interfere with the carrying forward of the Work of other **contractors**. Observation of the Work by others shall not relieve **Contractor** from its responsibility for coordination, supervision, or scheduling and direction of the Work.

D. **Contractors** are to report in a prompt manner any interferences, discrepancies or incompatibilities discovered to Barton Malow Company, whose decision as to the **Contractor** at fault and as to the manner in which the matter may be resolved, shall be binding and conclusive on **Contractors** involved. Barton Malow Company may direct layout/ location changes as required to make the entire work fit together. Reasonable changes of this nature will not entitle any **Contractor** to an increase in contract price.

E. Failure of a **Contractor** to notify other **contractors** and Barton Malow Company of a potential interference, incompatibility, or discrepancy and any failure to coordinate Work with that of other contractors prior to installation and/or fabrication shall be at the **Contractor's** risk.

F. Due to the nature of the Owner's existing areas, the sequence of Work must be scheduled and coordinated with the Owner's ongoing operations to minimize disruptions and/or disturbances to the Owner's Work and at all times shall remain as secondary to the Owner's Work. Each segment of the Work shall be coordinated with Barton Malow Company prior to proceeding.

END OF SECTION 01360

SECTION 01400
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

B. Specific attention is directed to the requirements described in Section 01450 Testing and Inspection Services.

1.02 DOCUMENT CONTROL PROCEDURE

Each Contractor is to provide Barton Malow Company its document control procedure to include drawing submittals and surveillance. In the absence of such a procedure, the Contractor will use the following procedure for document control.

"A log is maintained identifying the drawing revision status, issue date and distribution (internal and external). The transmittal issuing the changed documents will indicate what changes are made and indicate that the documents are approved for use. Contractor meetings include a review of approved drawings. The review is documented in the meeting minutes. Superintendent surveillance activities include monitoring Contractor drawing use."

1.03 QUALITY CONTROL

A. Each Contractor is responsible to provide the Owner with a completed quality product for its Work. Each Contractor shall be responsible for any costs associated with re-testing and re-performing the Work as a result of the Contractor's poor performance or workmanship or other failure to comply with the Contract Documents.

B. All Work shall be done by persons qualified in their respective trades, and the workmanship shall be first-class in every respect. Each Contractor is responsible for ensuring employees are appropriately trained. All materials and equipment furnished shall be the best of their respective kinds for the intended use and unless otherwise specified, same shall be new and of the latest design.

C. The Contractor shall provide Barton Malow Company, Owner and Architect access to the Work in preparation and progress wherever the Work is located at all reasonable times.

D. Barton Malow Company and the Architect will have the authority to reject Work that does not conform to the Contract Documents or may require special inspection or testing, whether or not such Work is to be then fabricated, installed or completed. The Architect shall make all decisions with respect to questions concerning the quality or fitness of materials, equipment and workmanship.

E. Failure by a Contractor to conduct its operations, means and methods and coordinate proper sequencing of the Work may cause the Barton Malow Company to withhold payment or any other means deemed necessary to correct non-conforming Work.

F. The Barton Malow Company may/will employ without cost to the Contractors, a testing firm to perform such engineering laboratory services and on-site inspection as deemed necessary by the Owner, Barton Malow Company and/or the Architect to determine compliance with the requirements of the Contract Documents. This Work will not be a service to the Contractors for the performing of tests and checking of materials required of the Contractors.

G. The testing firm will report directly to the Barton Malow Company. Copies of test and inspection reports will be furnished to the appropriate Contractors. The laboratory and its representatives will be instructed to promptly call to the attention of the Contractor, any instance of non-compliance with the requirements of the Contract Documents. Failure to so notify the Contractor shall not relieve the Contractor of any of its responsibilities for compliance or making good workmanship or materials, which are not in compliance with the requirements of the Contract Documents.

H. Each Contractor shall cooperate with the testing firm and provide labor to assist with sample preparations where applicable.

1.04 NOTICE OF NON-CONFORMANCE

A. Barton Malow Company may conduct observations/evaluations of the Contractor's Work. Barton Malow Company and/or Architect's reviews do not relieve the Contractor from compliance with the Contract Documents or necessary corrections for deficiencies thereof. Contractors whose Work does not meet the standards set by the Contract Documents will be notified by representatives of the Barton Malow Company using a Notice of Non-Conformance Form. The Contractor, upon receipt of the Notice of Non-Conformance, shall complete and return the form and provide the corrective actions necessary in a timely manner as outlined on the Notice of Non-Conformance.

B. Control of nonconforming product: The Contractor shall establish and maintain documented procedures to ensure that product that does not conform to specified requirements is prevented from unintended use or installation. This control shall provide for identification documentation, evaluation, segregation (when practical), disposition of nonconforming product, and for notification to the functions concerned.

C. Review and disposition of nonconforming Work: Nonconforming product shall be reviewed in accordance with documented procedures. It may be

a) reworked to meet the specified requirements,
b) accepted with or without repair by concession,
c) regraded products for alternative applications, or
d) reject or scrap and dispose of nonconforming work and replace

D. The **Corrective Action Report (CAR) (CON 18.2)** is in Section 01600 Forms.

1.05 CONTRACTOR PERFORMANCE EVALUATION

A. Barton Malow Company will be evaluating Contractor's performance and will provide feedback during the life of the Project, on Contractor's performance, for the purpose of improving Barton Malow Company's Contractor selection process for future project endeavors.

B. Contractors will be requested to evaluate and provide feedback to Barton Malow Company on ways for improve on processes affecting the Contractors. None of these evaluations or feedback shall form part of the Agreement or Contract Documents.

C. This Contractor Performance Evaluation form is generated by the CPS Database.

END OF SECTION 01400

SECTION 01450
TESTING AND INSPECTION SERVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

B. Except as indicated in this Section, refer to the various technical specification sections for specific testing requirements.

1.02 SCOPE OF INDEPENDENT TESTING LABORATORY SERVICES

A. The Barton Malow Company will employ and pay for the services of an Independent Testing and Inspection Laboratory to perform the following testing (unless additional testing is required in the specifications).

- Soils
- Concrete
- Steel
- Paving
- Roofing
- Masonry

B. Testing Laboratory inspection, sampling and testing is required as identified in the technical specifications.

1.03 QUALIFICATION OF TESTING AND INSPECTION LABORATORY

A. Meet "Recommended Requirements for Independent Laboratory Qualification", published by AMERICAN COUNCIL OF INDEPENDENT LABORATORIES.

B. Meet basic requirements of ASTM E-329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used In Construction" and ASTM D3740.

C. Authorized to operate in the State in which the Project is located.

D. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of NATIONAL BUREAU OF STANDARDS during the most recent tour of inspection, with memorandum of remedies of any deficiencies reported by the inspection.

E. Testing Equipment:

1. Calibrated at reasonable intervals by devices of accuracy traceable to either:

   a. NATIONAL BUREAU OF STANDARDS.

   b. Accepted values of natural physical constants.

1.04 CONTRACTOR'S RESPONSIBILITIES

A. Each Contractor shall be responsible to provide and pay for all other testing associated with its scope of Work. Tests shall be made by a qualified independent testing agency approved by the Owner and

Architect. Coordinate selection of the testing agency through the Barton Malow Company. The Contractor shall arrange and pay for the following services:

1. Inspections and tests specified as the Contractor's responsibility in the various sections of the Specifications.

2. Inspections and tests required by the General Conditions including those tests required by codes, ordinances, or the approval authority of regulatory agencies.

3. Inspection and tests performed for the Contractor's convenience.

B. Contractor shall cooperate with the laboratory to facilitate the execution of its required services. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the Work.

C. Contractor testing shall as a minimum comply with the requirements of this section.

D. The Contractor is responsible to pay the cost of additional testing in the event that additional testing of the Contractor's materials, installation, and other Work is required by the independent testing laboratory because of test results not in compliance with the Contract Documents and/or additional testing required as a result of Contractor's negligence or poor workmanship.

PART 2 - EXECUTION

2.01. TESTING AND INSPECTION LABORATORY DUTIES

A. Unless otherwise noted, the testing agency shall provide all required personnel and equipment as required for inspections and tests, for obtaining specimens and samples, and for delivery of specimens and samples to the laboratory when required.

B. The Testing Laboratory shall cooperate with Barton Malow Company to provide qualified personnel after due notice.

C. The Testing Laboratory shall perform specified inspections, sampling and testing of materials and methods of construction in accordance with specified standards and shall ascertain compliance of materials with the requirements of the Contract Documents.

D. The Testing Laboratory shall promptly notify Barton Malow Company of observed irregularities or deficiencies of work or products.

E. The Testing Laboratory shall promptly submit written report(s) of each test and inspection; submit one copy of report each to the Architect, Barton Malow Company, Owner, and Contractor with the following:

1. Date issued.
2. Project title and number.
3. Testing laboratory name, address and telephone number.
4. Name and signature of laboratory inspector.
5. Date and time of sampling or inspection.
6. Record of temperature and weather conditions.
7. Date of test.
8. Identification of product and specification section.
9. Location of sample or test in the Project.
10. Type of inspection or test.
11. Results of tests and compliance with Contract Documents.
12. Interpretation of test results, when requested by Architect.

2.02 LIMITATIONS OF AUTHORITY OF TESTING AND INSPECTION LABORATORY

A. Laboratory is not authorized to:

1. Release, revoke, alter or enlarge on requirements of Contract Documents.

2. Approve or accept any portion of the Work, but may provide an expert opinion whereby the Owner, Architect and Barton Malow Company may make an informed decision as to acceptance or rejection.

3. Perform any duties of the Contractor.

4. Stop the Work.

PART 3 – CONTRACTOR RESPONSIBILITIES

3.01 CONTRACTOR SHALL:

A. Cooperate with laboratory personnel, provide access to Work, to Manufacturer's operations.

B. Secure and deliver to Barton Malow Company adequate quantities of representative samples of materials proposed to be used of which require testing.

C. Provide to Barton Malow Company the preliminary design mix proposed to be used for concrete, and other materials mixes which require control by testing laboratory.

D. Furnish copies of Products test reports as required.

E. Furnish incidental labor and facilities as follows:

1. To provide access to Work to be tested.

2. To obtain and handle samples at the Project site or at the source of the product to be tested.

3. To facilitate inspections and tests.

4. For storage and curing of test samples.

F. Notify Barton Malow Company sufficiently in advance of operations (24 hours minimum) to allow for laboratory assignment of personnel and scheduling of tests.

1. When tests or inspections cannot be performed after such notice, reimburse Barton Malow Company for laboratory personnel and travel expenses and all of Barton Malow Company's other expenses incurred arising out of or resulting from Contractor's negligence.

G. Employ and pay for the services of testing laboratory to perform additional inspections, sampling and testing required:

1. For the Contractor's convenience.

2. When initial tests indicate Work does not comply with Contract Documents.

H. When the Contractor is providing the testing and prior to start of Work, submit testing laboratory name, address, and telephone number, and names of full time registered engineer and responsible officer.

Submit copy of report of laboratory facilities inspection made by Materials Reference Laboratory of National Bureau of Standards (NBS) during most recent tour of inspection, with memorandum of remedies of any deficiencies reported by the inspection.

3.02 RE-TEST RESPONSIBILITY

A. Where the results of required inspections, tests, or similar services prove unsatisfactory and do not indicate compliance with the requirements of the Contract Documents, the re-tests shall be the responsibility of the Contractor regardless of whether the original test was the Contractor's responsibility.

B. Re-testing of Work revised or replaced by the Contractor is the Contractor's responsibility where required tests were performed on original Work. All costs and fees for re-testing shall be paid by the Contractor.

C. Schedule delays and costs which are the result of non-conforming work or remedy will be the responsibility of the offending Contractor.

END OF SECTION 01450

SECTION 01510
FIRE PRECAUTIONS AND PROTECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 SUMMARY

A. This Section describes the following requirements including:
   1. Fire Precautions and Protection/Noxious Odors and Fumes
   2. (Temporary) Fire Standpipe System
   3. Noxious Odors and Fumes

PART 2 - FIRE PRECAUTIONS AND PROTECTION

2.01 FIRE PRECAUTIONS AND PROTECTION

A. All **Contractors** and their Subordinate Parties shall assume full responsibility and take all necessary precautions to guard against and eliminate all possible fire hazards and to prevent damage to any construction work, building materials, equipment, temporary field offices, storage sheds, and all other property, both public and private. The location of the nearest corporation or public fire alarm box and the telephone number of the local fire department shall be conspicuously posted by **Contractor** throughout the field offices and in the building structure adjacent to its Work and it shall take precautions to prevent fire hazards in accordance with all fire protection and prevention laws and codes.

B. Each **Contractor's** superintendent in charge at the Project, shall review the entire Project at least once a week to make certain the **Contractor** has adhered to the conditions and requirements set forth herein.

C. No open fires shall be permitted. **Contractors** and their Subordinate Parties shall not be allowed to start fires with gasoline, kerosene or other highly flammable materials.

D. Welding, flame cutting, or other operations involving the use of flame, arcs, or sparking devices will not be allowed without adequate protection and shielding without prior permission of the Owner through the Barton Malow Company. All combustible and flammable material shall be removed from the immediate area. Material shall be protected with a fire resistant tarpaulin to prevent sparks, flames, or hot metal from reaching materials. **Contractor** shall provide the necessary personnel and fire fighting equipment to effectively control incipient fires resulting from welding, flame cutting, or other operations involving the use of flame, arcs or sparking devices. Each **Contractor** performing Work involving welding or open flame shall provide its own fire extinguishers in the immediate area of the Work.

E. Not more than a one day supply of flammable liquids such as oil, gasoline, paint or paint solvent shall be brought into any building at any one time. All flammable liquids having a flash point of 110 degrees F or below, which must be brought into any building, shall be confined to Underwriter's Laboratories' labeled safety cans. The bulk supply of all flammable liquids shall be detached at least 75 feet from the building and from yard storage of building materials. Spigots on drums containing flammable liquids are prohibited on the project site. Drums are to be equipped with approved vent pumps.

F. Combustible materials shall not be stored or left overnight within the confines of the permanent building. This includes all internal combustion engines using gas or fuel oil. Hoisting of flammable or combustible materials to the roof shall only be in quantities as needed for immediate use.

G. Only fire resistant tarpaulins shall be used on this Project.

H. The permanent fire protection water supply, fire extinguishing equipment, shut down and tie-ins between new and existing fire protection system shall be coordinated with the Owner and Barton Malow Company and be installed at the earliest possible date. Shut down of an existing fire protection system shall be for a minimum period of time. As each sprinkler system is completed and placed in service, the control valve shall be sealed. Permission to break seals and close sprinkler valves shall be given only by Barton Malow Company with approval of the Owner.

I. Barton Malow Company will provide and maintain in working order at all times during construction not less than four (4) fire extinguishers conveniently located for each floor area having 50,000 square feet or less. One (1) additional fire extinguisher will be provided for each additional 15,000 square feet of floor area.

J. Fire extinguishers provided by Barton Malow Company and Contractors shall be "all purpose", and not a water type, to meet the approval of the Fire Underwriter's Laboratory, and will be inspected at regular intervals and recharged if necessary.

K. In areas of flammable liquids, asphalt or electrical hazards, extinguishers of the 15 lb. carbon dioxide type or 20 lb. dry chemical type shall be provided by the **Contractor** creating such hazard.

L. Each **Contractor** agrees that, in the event of fire, all its workers and all Subordinate Parties workers anywhere on site will assist in extinguishing the fire.

M. **Contractor's** and their Subordinate Parties' shanties of combustible construction shall not be placed inside of any structure. Such shanties shall be detached at least seventy-five (75) feet from the building or as directed by the Barton Malow Company with approval of the Owner. Totally incombustible shanties may be, if approved in writing by Barton Malow Company, located inside of the structure.

N. Use of only Underwriter's Laboratory approved heaters and/or stoves is permitted in field offices or storage sheds and they shall have fire resistive material underneath and at the sides near partitions and walls. Pipe sleeves and covering shall be used where stove pipe runs through walls or roof.

O. Flammable portions of construction shanties inside the structure must be painted inside and outside with "ALBI" fire retardant paint or other fire retardant paint of equal quality as approved by the Owner.

2.02 (TEMPORARY) FIRE STANDPIPE SYSTEM

A. Permanent risers shall be installed as floor slabs are cast, with capped 2 1/2 inch hose valves on each floor and temporary cap or plug on top. One riser at a time shall be extended up so that remainder are available for use at all times.

B. Provide permanent cross connections or provide temporary cross connections.

2.03 NOXIOUS ODORS AND FUMES

A. All Contractors are notified that combustion engine equipment, tar kettles and any other items causing noxious odors or fumes will NOT be allowed in the building or near air intake louvers. If intake louver locations are in doubt, consult with Barton Malow Company.

END OF SECTION 01510

SECTION 01520
TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 SUMMARY

A. This Section describes the following requirements including:
   1. Project Signage
   2. Snow Removal
   3. Security
   4. Temporary Field Office, Facilities and Parking
   5. Temporary Fencing
   6. Temporary Toilet Facilities
   7. Drinking Water/Temporary Water
   8. Roof Protection
   9. Scaffolding
   10. Water Control
   11. Temporary Material Hoist/Elevator
   12. (Temporary) Fire Standpipe System (see Section 01510 Fire Precautions and Protection)
   13. Temporary Stairs, Ladders, Ramps, Runways, and Barricades
   14. Temporary Electrical Power and Light
   15. Temporary Heating , Cooling and Weather Protection
   16. Temporary Enclosures

PART 2 - CONSTRUCTION FACILITIES

2.01 PROJECT SIGNAGE

A. The **Barton Malow Company** shall provide a project sign. No other signs or advertising shall be displayed on the premises without the approval of the Architect, Owner, and Barton Malow Company. This does not exclude the posting of required trade notice and cautionary signage by **Contractor's**.

2.02 SNOW REMOVAL

A. **Contractors** performing Work under exposed conditions shall remove snow and ice for the protection and execution of their Work. Keeping public traffic areas and circulation routes free of snow shall be the responsibility of the **Barton Malow Company.**

2.03 SECURITY

A. The services of a security guards **will not** be provided by **either the Owner or Barton Malow Company**.

B. Each **Contractor**, at its own cost and expense, may provide security guard, protective service or other means of site security as it deems necessary.

C. **Contractors** shall advise Barton Malow Company of any theft or damage which might delay the execution of the Work and furnish the Owner and Barton Malow Company with a copy of any theft report filed with local, county or state agencies.

D. Neither Barton Malow Company nor Owner assumes any responsibility for loss, theft or damage to the **Contractor**'s materials or for damage to Work in place before the completion of the construction. In the instance of any such loss, theft or damage, the **Contractor** shall be responsible to renew, restore or remedy the Work, tools, equipment and construction in accordance with requirements of the Contract Documents without additional cost to Barton Malow Company.

E. Barton Malow Company is not responsible for damage, liability, theft, casualty or other hazard to the automobiles or other vehicles, nor to injury, including death, to occupants of automobiles or other vehicles on the Owner's property.

F. Barton Malow Company may establish additional security policies and procedures. All **Contractors** will be required to cooperate with Barton Malow Company in implementing these procedures.

G. Site-parked equipment, operable machinery and hazardous parts of the new construction subject to mischief and accidental operation shall be inaccessible, locked or otherwise made inoperable when left unattended.

2.04 TEMPORARY FIELD OFFICE, FACILITIES AND PARKING

A. The Owner **shall** designate **an area** for construction trailers. Placement and scheduled duration shall be coordinated by Barton Malow Company. Each **Contractor** is responsible to verify that all field offices, trailers and storage sheds shall be in accordance with the local Fire Marshal having jurisdiction. Each **Contractor** shall arrange and pay for its own telephone hookup and use. Each **Contractor** shall arrange and pay for its own temporary electrical hook-up, water and toilets. The **Contractor** shall pay for all power used for the **Contractor**'s temporary field office and temporary electrical service. Construction personnel **will** be allowed to use the existing Owner parking facilities. Designated **Contractors will** be allowed to have on-site construction trailers. Construction trailers shall be limited to **10' x 30'** or smaller.

B. **Contractors** shall maintain the use of designated space for offices and sheds. This includes removal of weeds, debris, trash and clean-up of the area after removal of such temporary structures.

C. Temporary field offices and sheds shall not be used for living quarters. .

D. Offices and sheds shall be of suitable design, maintenance and appearance, and meet the approval of Barton Malow Company and all applicable local codes and ordinances.

E. All temporary offices and sheds including foundations, must be removed within ten (10) days of written notice from Barton Malow Company including restoration of grade. Structures not removed in a timely manner will be removed by Barton Malow Company at **Contractor**'s expense.

PART 3 - TEMPORARY CONSTRUCTION CONTROLS

3.01 TEMPORARY FENCING

A. The **Barton Malow Company shall** provide temporary fencing with gates for required access and remove same at the completion of the Project.

B. The **Contractors** shall repair or replace fencing damaged as a result of its operation. **Contractors** shall remove and replace fencing and gates required to provide access for oversized items.

C. **Contractor's personnel are not allowed to work outside of the construction fence without permission of the Barton Malow Company.**

3.02 TEMPORARY TOILET FACILITIES

A. The **Barton Malow Company** shall provide and maintain temporary toilet facilities for the construction of the Project. The use of the Owner's existing permanent facilities is as described in Section 01140 Use of Premises.

B. **During renovation activities, Barton Malow Company may obtain, through the Owner, permission to use designated toilet facilities within the contract boundaries for construction use. The use of the Owner's existing permanent facilities outside the construction boundaries is strictly not allowed.**

3.03 DRINKING WATER/TEMPORARY WATER

A. The Owner **will** pay for water used on this Project.

B. Immediately after award of the Agreement, the **Mechanical Contractor** shall furnish, install, maintain and subsequently remove a temporary hookup to the Owner's potable water system where directed by Barton Malow Company for construction purposes. The **Contractor** shall provide all temporary piping and approved backflow prevention as necessary for distribution from the source. Distribution of temporary water will be paid for by **Contractors** requiring same. A minimum of One **(1)** hose bibs shall be provided **within the fenced construction area** by the **Contractor** as directed by Barton Malow Company.

3.04 ROOF PROTECTION

A. **Contractors** and their Subordinate Parties, shall be responsible for damages to roofing, sheet metal and roof structure while performing Work. The Roofing **Contractor** will perform the repair Work at the expense of the **Contractor** responsible for the damage.

B. **All Contractors will protect adjacent existing roof surfaces while performing their Work. No construction materials will be allowed to be placed on existing roof surfaces without prior approval of the Owner through the Barton Malow Company.**

3.05 SCAFFOLDING

A. Each **Contractor** is responsible for providing and maintaining any and all ladders, scaffolds and other staging as required to complete its Work. All such ladders, scaffolds and staging equipment shall be erected, maintained and subsequently removed by each **Contractor** in accordance with all applicable safety laws, rules and regulations.

3.06 WATER CONTROL

A. All pumping, bailing or well point equipment necessary to keep excavations and trenches free from the accumulation of water during the entire excavating and backfilling progress of the Work shall be the responsibility of the **Contractor** performing said excavations and trenches due to its scope of Work.

B. **The Sitework Contractor** shall be responsible for keeping the building at grade and below free from water from the time the building backfill is completed until the building is watertight.

C. Dispose of water in such a manner as will not endanger public health or cause damage or expense to public or private property. Abide by the requirements of any public agencies having jurisdiction.

3.07 TEMPORARY MATERIAL HOIST/ELEVATOR

A. **Each Contractor is responsible for its own hoisting and material equipment movement costs as required to complete the Work under its Agreement.**

3.07 TEMPORARY MATERIAL HOIST/ELEVATOR (Cont'd)

B. Barton Malow Company may operate and maintain a permanent elevator until such time as all material hoisting requirements have been met. Elevator requirements in excess of the capacity or size of this elevator shall be provided by each **Contractor** at its expense. This elevator shall not be used for the placement of concrete, the transporting of workers, or other means inconsistent with its use as directed by Barton Malow Company. The operating cost for all overtime use of the elevator shall be paid by the **Contractor** requiring such services.

C. The Elevator **Contractor** shall be obligated to extend warranty and guarantee periods on any permanent equipment used prior to Substantial Completion.

D. Transportation of construction materials through the Owner's facility shall be accomplished in accordance with the requirements described in Section 01140 Use of Premises in such a manner so as to:

1. Not damage any of the existing facility.

2. Not impair the Owner's use of the facility.

3. Not create any type of mess or additional cleaning requirements in Owner occupied areas.

3.08 TEMPORARY STAIRS, LADDERS, RAMPS, RUNWAYS, AND BARRICADES

A. Each **Contractor** is to provide and maintain all necessary temporary stairs, ladders, ramps, and runways to facilitate conveyance of workers, materials, tools, and equipment for proper execution of its Work. All protection and safety barricades, devices, covers, and all other necessary items shall be provided by each **Contractor** as it relates to the safe conduct of its Work and protection of people and property in its Work area in accordance with applicable law.

B. Any **Contractor** or Subordinate Party performing excavation Work shall be responsible to furnish, install and maintain temporary barricades and/or fencing of all open excavations until such time as the backfilling is complete. Flasher lights shall be provided on barricades and fencing by the **Contractor** as requested by Barton Malow Company and in accordance with applicable law. As a minimum, all barricades across roads and walks shall have lights on them in working condition.

C. The Structural Steel **Contractor** shall provide temporary guardrails at the building floor perimeters, interior shafts, all roof areas, or other openings, immediately after the erection of the **steel** frame and with the installation of **metal** decking. Protection shall be OSHA 29 CFR Part 1926.502 (B) "Guardrail Systems" and shall include but not be limited to two line rails and toe boards. This temporary protector shall be left in place after completion of the **steel** frame for the use of all other **Contractors**. The Structural Steel **Contractor** shall maintain and remove said guardrails and patch concrete. Each **Contractor** that disturbs any temporary protection for its Work is responsible to protect the area during its Work and to reinstall to its original condition the guardrail or barricade system for the protection of the workers and others until final construction of perimeter exterior wall and/or shaft openings is completed. All other protection and safety barricades, devices, covers, etc. shall be provided by this **Contractor** as it relates to the safe conduct of its Work in accordance with all local, state and federal regulations and the requirements of the Contract Documents, and shall be in accordance with the most stringent requirements.

D. Each **Contractor** and its Subordinate Parties shall provide and maintain in good repair barricades, overhead protection, guard rails, etc., as required by law or necessary for the protection of the public and personnel engaged in the Work from hazards incidental to performance of the Work. **Contractor** shall do everything necessary to protect the Owner's employees, the public and workers from injuries and to protect vehicles and other property from damage.

3.09 TEMPORARY ELECTRICAL POWER AND LIGHT

A. Electrical Energy Costs

1. The Owner **will** pay for electrical energy to operate temporary electrical power and lighting for the duration of the project at designated locations. Temporary power **will** be provided free of charge.

B. Power Source

1. The Electrical **Contractor** shall provide, install, and pay for labor, equipment and materials required to make connections to **the local utility company** and to provide temporary electrical power and light distribution. The Electrical **Contractor** shall coordinate the location of the electrical power and lighting as directed by Barton Malow Company.

2. The Electrical **Contractor** will provide for **each** construction trailer(s) a 120/208 volt (or 120/240 volt), 100 ampere single phase power source to which the **Contractor** who occupies the trailer may connect. The cost of hook up and removal of temporary electrical service to trailer shall be each **Contractor**'s responsibility.

3. Protection shall be provided for the power supply source complete with disconnect switch and other required electrical devices.

C. Rules and Regulations:

1. All temporary equipment and wiring for power, lighting and distribution requirements shall conform to OSHA requirements and be in accordance with applicable provisions of governing laws, codes, and ordinances.

2. All temporary wiring and distribution equipment shall be maintained so as not to constitute a hazard to persons or property.

3. Each **Contractor** is responsible to provide an assured grounding program in accordance with OSHA regulations for their own electrical power requirements.

D. Temporary Power Distribution:

1. The Electrical **Contractor** will provide and maintain temporary power distribution as follows:

   Construction power shall be 120/208 volts, 3 phase, 4 wire plus ground. Provide the following outlets together with feeders, grounding, protective devices and ground fault interrupting devices.

   a. Power centers - on each floor of the new building, provide a minimum of two (2) power centers or not less than one (1) per 10,000 s.f. rated not less that 100 amperes at 120/208 volt, 3 phase. 4 wire plus ground. Locate the power centers such that each will serve approximately equal areas and as far as possible, each be in the center of the respective area served.

   b. 120 volt duplex outlets - Provide weatherproof, G.F.I. protected, 20 ampere grounded outlets at a minimum rate equal to 1 - duplex outlet per 400 square feet. Outlets may be grouped in clusters of up to six duplex types with corresponding pro-rated increase in area served, provided that every portion of the construction and remodeled premises can be reached from the nearest outlet using a flexible cord no more that 50 feet in length.

2. As partitions are erected, locations of power distribution points shall be added or relocated.

3.09 TEMPORARY ELECTRICAL POWER AND LIGHT (Cont'd)

3. Ground Fault Circuit Interrupter (GFCI) protection will be provided on all temporary power receptacles and, where possible, directly on the circuit breaker supplying temporary power as referenced in NEC 305-6(a).

4. The assured equipment grounding conductor program is only to be used on circuits greater than 20 amps as referenced in NEC 305-6(b).

E. Temporary Electrical Light Distribution:

1. The **Electrical Contractor** shall provide and maintain temporary electrical light distribution as follows:

a. Lighting shall be achieved using 120 volt guarded incandescent fixtures, or other suitable fixture types, to OSHA required minimum levels of illumination.

b. 120 volt temporary lighting as required in interior work areas. In addition to these minimum requirements provide adequate security lighting at guarded entrances outside storage areas, parking areas, and in areas of **Contractor**'s and Architect's field offices and sheds.

2. As partitions are erected or other interferences which hamper achieving the minimum levels of illumination, locations of lighting distribution points shall be added or relocated.

3. Task lighting in addition to OSHA required lighting shall be provided by each **Contractor**.

F. Temporary Power and Light for Special Conditions:

1. Special conditions for temporary electrical power and lighting required by others shall be provided as follows:

a. Each **Contractor** requiring service of capacity or characteristics other than specified must make arrangements with the Electrical **Contractor** and pay for their own installation, removal, and service.

b. Where 3 phase power is required, the **Contractor** must pick up service at the distribution panel located outside the building addition.

c. The necessary grounded portable cords, lamps, light-stands, and fuses from the distribution outlets to points of use shall be provided by each **Contractor** to suit its own requirements.

G. Servicing of Temporary Power and Lighting:

1. The Electrical **Contractor** shall be responsible for the following:

a. Servicing, repairing and rearrangement of service equipment, temporary power, temporary lighting, and re-lamping.

b. Removal and disposal of temporary electrical power and lighting at completion of the Project or when so directed by Barton Malow Company and repair of damage caused by installation or removal.

H. Permanent Electrical Power and Lighting:

1. When permanent electrical power and lighting systems are in operating condition, they may be used for temporary power and lighting for construction purposes provided the Electrical **Contractor**:

a. Obtains the approval of the Architect and/or Owner through Barton Malow Company.

b. Assumes full responsibility for operation of the entire power and lighting systems.

c. Verifies that warranty dates are established prior to usage of equipment and lamps.

d. Pays costs for operation, maintenance, and restoration of the systems.

2. As permanent power and lighting becomes available, these systems will generally supplant the appropriate portions of the temporary installation.

3.10 TEMPORARY HEATING AND WEATHER PROTECTION

A. Temporary heating requirements during the course of construction shall be divided into two categories as follows:

1. Cold weather protection.

2. Temporary heating.

B. Cold Weather Protection:

1. Heating required during the construction period prior to enclosure of the building shall be classified as "cold weather protection."

2. Each **Contractor** shall provide temporary heating and protection, necessary to allow its Work to continue during cold weather to meet the project milestone dates prior to building enclosure, including:

a. The heating of materials (such as water and aggregate) as well as space heating for protection of newly placed or built construction at required temperatures (but not lower than 50 degrees F) and for the time specified.

b. Flame-proofed tarpaulins and other materials used for temporary enclosures.

3. **Contractor** shall provide plan to allow Work to continue without regard to temperature.

4. Heat shall be provided by smokeless UL approved portable unit heaters, using fuel of types and kinds approved by Underwriter's Laboratories, Factory Mutual, and the Fire Marshal.

a. The **Contractor** shall provide fuel, power, maintenance, and attendance required for operation of portable heaters.

b. Interior or exterior surfaces damaged by the use of portable heating units shall be replaced with new materials at the responsible **Contractor**'s expense.

5. It shall be the responsibility of each **Contractor** to protect its own Work.

C. Temporary Heating:

1. Daily construction heat required after the building is enclosed shall be classified as "temporary heating" and will be the responsibility of the Owner to install and maintain.

2. The building or buildings or any portions thereof shall be considered enclosed when in the opinion of Barton Malow Company:

a. The exterior wall system and temporary interior wall enclosures are in place.

b. Openings in exterior walls are covered to provide reasonable heat retention.

c. The building is ready for interior drywall, masonry and plastering operations.

d. The permanent roof is substantially installed.

The **Barton Malow Company** shall provide and maintain the temporary interior wall enclosures. If the exterior wall system is not complete in time to provide building enclosure of a portion of the new structure as scheduled, the **Barton Malow Company** shall provide and maintain temporary exterior wall enclosures of polyethylene and, in addition to exercising all other rights and remedies under the Contract Documents and law, Barton Malow Company shall be entitled to deduct the cost of such enclosures from the moneys due or to become due the **Contractor**(s) responsible for failure to meet said schedule.

3. In areas of the building or buildings where Work is being conducted, the temperature shall be maintained as specified in the various sections of the specifications, but not less than 50 degrees F for interior rough-in and not less than 60 degrees F during finishes installation. The temperature shall not be allowed to reach a level that will cause damage to any portion of the Work, including materials stored in the building, which may be subject to damage by low temperatures.

4. Until the permanent heating system, or suitable portion thereof, is in operating condition, provide sufficient and UL approved space heaters of suitable capacity to maintain required temperatures in areas where work is being conducted and materials are stored. Include all necessary maintenance, venting and attendance for this temporary heating to meet all applicable laws, rules and regulations.

5. When the permanent heating system, or a suitable portion thereof, is in operating condition, the system may be used for temporary heating, provided the **MECHANICAL Contractor**:

   a. Obtains approval from Barton Malow Company in writing for its use and any special provisions required for its temporary operation.

   b. Assumes full responsibility for the entire heating system until final acceptance of the system by the Owner.

   c. Uses supply only, not return if temporary heating utilizes the building's ductwork system.

   d. Pays all costs for maintenance, attendance and restoration to "like new" condition of the system including final cleaning of equipment and ductwork and all necessary touch-up painting.

   e. Turns over satisfactory evidence to Barton Malow Company showing the extended warranties from manufacturers and proper maintenance procedures.

   f. Provides and maintains temporary filters, boxes and other parts used for the temporary condition and replaces same with the new permanent filters at time of occupancy consistent with the warranty provisions. The **MECHANICAL Contractor** shall pay the cost of extending warranty and guarantee periods on any permanent equipment used prior to substantial completion.

6. Electrical power required for temporary heating **will** be furnished free of charge. The installation and service of the necessary temporary electrical feeders will also be the responsibility of the Electrical **Contractor**.

3.11 TEMPORARY ENCLOSURES

A. **Contractor** shall provide temporary (insulated) weather-tight closures of openings in exterior surfaces to provide acceptable working conditions and protection for materials, to allow for temporary heating, and to prevent entry of unauthorized persons. Provide doors with self-closing hardware and locks.

B. **Contractor** shall provide temporary roofing as required to provide and maintain a watertight enclosure during construction.

C. **Contractor** shall provide temporary partitions and ceilings as required to separate Work areas from Owner occupied areas, to prevent penetration of dust and moisture into Owner occupied areas and to prevent damage to Owner's facilities and equipment.

END OF SECTION 01520

SECTION 01530
FIELD ENGINEERING AND LAYOUT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 LAYOUT OF THE WORK

A. **Each Contractor shall be responsible for the layout and engineering of its own Work from the established points and lines given by a registered surveyor employed by Barton Malow Company and to coordinate with all other trades.**

B. Each **Contractor** is responsible for detailed and accurate layout of its own and its Subordinate Parties' Work to dimension from the principal lines, grades and levels set forth in the Contract Documents or the principal lines, grades and levels provided by a registered surveyor hired by **Barton Malow Company**. Each **Contractor** shall make provisions to preserve all control points, such as monuments, stakes, bench marks or other datum points and shall replace at its own cost any of these which might be lost or displaced through its neglect.

C. **Contractors** shall examine the conditions under which the Work is to be installed, shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the **Contractor** with the Contract Documents before commencing activities. Any errors, inconsistencies, omissions, discrepancies or conditions detrimental to proper performance of the Work that are discovered shall be reported to Barton Malow Company at once. **Contractors** are not to proceed until the required corrections are accomplished.

D. The exactness of grades, elevations, dimensions, or locations given on any Drawings issued by Architect or the work installed by other contractors, is not guaranteed by Owner or Barton Malow Company. The **Contractor** shall, therefore, satisfy itself as to the accuracy of all grades, elevations, dimensions, and locations. In all cases of interconnection of its Work with existing or other Work, it shall verify at the site all dimensions relating to such existing or other Work. Any errors due to the **Contractor**'s failure to verify all such grades, elevations, dimensions, or locations shall be promptly rectified by the **Contractor** without any additional cost to the Owner or Barton Malow Company.

E. As the Work progresses, the **Contractor** shall prepare lay out drawings showing the exact locations of Work under its Contract as a guide to all trades. Prior to any installation, the separate **Contractors** shall exchange layout drawings and coordinate the Work and be subject to verification by all subsequent **Contractors**.

F. As Work under each Agreement commences, the condition of preceding Work under other agreements shall be verified and accepted by each subsequent **Contractor** when appropriate. Verification may, at Barton Malow Company's discretion, include a joint review by the subsequent **Contractor**, previous contractor(s), and Barton Malow Company to note any corrective Work required, damage to previous Work, verification of elevations, tolerances, levels and plumbness, critical dimensions, surface conditions, and similar items affecting the Work under the Contract Documents and particularly items which prevent acceptance by the subsequent contractors. The verification review procedures and findings shall be documented in writing by subsequent Contractors, signed by all parties, and copies provided to the Barton Malow Company. Any corrective work necessary to satisfy requirements of the Contract Documents shall be performed promptly by the previous **Contractor** to prevent delay to the work under the subsequent Contracts. After corrective work is accomplished the subsequent **Contractor** shall furnish written acceptance of the work as noted above. Barton Malow Company's participation in a joint review under this paragraph shall in no event be

deemed to constitute approval of any layout or other Work that fails to comply with the **Contract Documents**.

G. Each **Contractor** shall be responsible to take such field measurements as may be required to determine the size of ordered material. In the event "guaranteed dimensions" are required, the **Contractor** shall promptly advise other **Contractors** through Barton Malow Company by use of drawings, templates or mock-ups of the required conditions.

H. All Work, and in particular, piping, ducts, conduit and similar items, shall be neatly and carefully laid out to provide the most useful space utilization and the most orderly appearance. Except as otherwise indicated or directed piping and similar Work shall be installed **as close to above ceiling floor slabs and walls** as conditions reasonably permit, located to prevent interference with other Work or with the use of the spaces. Before **Contractor** installs a valve in an exposed location, it must make all efforts to install it in an accessible, concealed location. **Contractors** shall carefully plan the layout and review any questionable installations with Barton Malow Company.

I. The Owner or Barton Malow Company may utilize a registered land surveyor to verify alignment and layout of certain portions of the Work. If that Work is out of tolerance or incorrect, the installing **Contractor** will be responsible for prompt correction of the Work to comply with the Contract Documents, along with all expenses incurred by Owner or Barton Malow Company in such verification process, including, but not limited to, the cost for the surveying services, as well as the additional time expended by Barton Malow Company personnel at standard billing rates.

END OF SECTION 01530

SECTION 01540
CUTTING AND PATCHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 INSPECTION

A. Before cutting existing surfaces, examine surfaces to be cut, including elements subject to damage or movement during cutting and patching work. Report any unsatisfactory or questionable conditions to Barton Malow Company in writing.

B. Before proceeding, meet at the site with Barton Malow Company and the parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference, conflict and possible effects on the Owner's existing operations. Coordinate procedures, temporary support, methods of dust and water protection, etc. and resolve potential conflicts before proceeding.

C. When working in and around existing buildings, if any hazardous material is encountered or is suspected to be present, Barton Malow Company must be notified and Work in the affected area is to stop as described in Section 00840 Hazardous Materials until further direction is given by Barton Malow Company or the Owner.

1.03 PREPARATION

A. Provide adequate temporary support as necessary to assure the structural value and integrity of the affected portion of the work. Where specified or required, submit temporary support methodologies to the Architect for approval.

B. Provide devices and methods to protect adjacent areas or other portions of the Project from damage including dust protection, water protection, and exposure. Maintain excavations free of water, and all other devices and methods as necessary to provide protection from the elements.

1.04 EXECUTION

A. The use of **gasoline powered equipment, jackhammers or power actuated tools, explosives** is prohibited on this Project. **The use of electric and pneumatic impact hammers must be first authorized and coordinated by the Barton Malow Company prior to usage.**

B. Each **Contractor** on behalf of itself and its Subordinate Parties is responsible for the cutting of all holes and openings through existing walls, partitions, ceilings, floors and roofs as necessary for the installation of its Work as specified in the Contract Documents. Holes and openings shall be neatly cut and of minimum size to allow the Work to be installed. Execute cutting and demolition by methods which will prevent damage to other Work, and will provide proper surfaces to receive installation of repairs.

C. Execute work in such a manner as to minimize disruptions to or interference with the Owner's normal operations or functioning in the existing buildings and provide all means necessary to provide safety and convenience of those employed in and about the premises.

D. Each **Contractor** is responsible for patching of all holes and openings it makes. Fit work should be airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces. Patching is to match adjacent surfaces in materials and finish. Each **Contractor** is to utilize only tradesmen skilled in the specific finish

and material involved in making the patches. All patching is to be done in a neat and workmanlike manner to the satisfaction of Barton Malow Company. Defective Work shall be corrected at no cost to the Owner and Barton Malow Company.

E. Where new Work connects with existing Work, **Contractor** shall do all necessary cutting and fitting required to make a satisfactory connection with the Work to be performed so as to leave the entire Work in finished and workmanlike condition. Furnish all labor and materials to this end, whether or not shown or specified. All measurements must be verified at the site.

F. Employ the original installer and fabricator, when possible, to perform cutting and patching for:

1. Weather-exposed or moisture-resistant elements.

2. Sight-exposed finished surfaces.

G. Execute fitting and adjustment or products to provide a finished installation to comply with the specified products, functions, tolerances and finishes.

H. **Contractor** shall restore Work which has been cut or removed and shall install new products to provide completed Work in accordance with the Contract Documents. Each **Contractor** will be responsible to pay the appropriate **contractor** as designated by Barton Malow Company for restoring any portion of the Project that is disturbed, including but not limited to, slabs, walls, ceilings, fire rated partitions, spray-on fireproofing, and finishes, to their original state as a result of **Contractor**'s action.

I. Refinish entire surfaces as the **Contractor**'s Work scope requires to provide an even finish to match adjacent surfaces and finishes.

1. For continuous surfaces, refinish to nearest intersection.

2. For an assembly, refinish the entire unit.

J. Removal and replacement of ceilings not scheduled to be replaced shall be the responsibility of the **Contractor** requiring access.

K. **Contractor** shall be held responsible for reckless cutting of holes in slabs, walls or other finishes, or for scraping off areas of fireproofing larger or greater than that which is necessary for installation of its Work.

END OF SECTION 01540

SECTION 01550
CLEAN-UP AND FINAL CLEANING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 SUMMARY

A. Execute final cleaning at completion of the Work, as required by this Section. For **Contractor**'s daily clean-up, dust control and rubbish removal operations during construction, refer to Section 01520 Temporary Construction Controls.

1.03 DISPOSAL REQUIREMENTS

A. Conduct final cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on Project site.
2. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.

PART 2 - BARTON MALOW SITE CLEAN-UP/RUBBISH REMOVAL PROCEDURE

2.01 PURPOSE

A. An effective and efficient clean-up procedure on the Project site contributes to both the productivity and safety of all those involved. The following requirements are intended to provide a satisfactory and equitable method to manage and accomplish project clean up.

2.02 REQUIREMENTS

A. General: Each **Contractor** shall be responsible for daily, weekly and final clean-up of its Work and the work of its Subordinate Parties as defined herein. The cost of this requirement shall be included in the **Contractor**'s Bid Proposal. **Contractor** is required to comply with applicable labor agreements and jurisdictional rules in the hiring of laborers to perform its clean up obligations under the Contract Documents. Each **Contractor** will be responsible for control of dust generated by its operations on a daily basis. Roadways must be maintained clear of all debris at all times. **Contractors** shall only use cleaning materials which will not create hazards to health or property and which will not damage surfaces. Only those cleaning materials and methods recommended by the manufacturer of the surface material to be cleaned shall be used. Any sweeping compounds used in cleaning operations shall not leave residue on concrete floor surfaces that may affect installation of finish flooring materials.

B. Dumpsters: The **Owner** will provide and maintain the job site dumpsters for unidentifiable debris for use as specified below. Each **Contractor** and its Subordinate Parties shall be responsible for daily clean-up, removal and placement in dumpsters of all debris and waste resulting from its operations. No overfilling of dumpsters will be allowed. All adjacent areas are to be kept clean. Excavation, demolition, masonry, drywall and hazardous waste materials are NOT to be placed in Barton Malow Company's dumpster. Each **Contractor** will be responsible for removing its own excavation, demolition, masonry, drywall and Hazardous Materials from the site in strict accordance with applicable laws and regulations regarding disposal. **Contractor** shall indemnify, defend and hold harmless the Owner and Barton Malow Company from claims, damages, suits, costs, or expenses of

any kind (including attorney's fees and costs) arising out of, resulting from or in connection with **Contractor**'s misuse of dumpsters furnished by **Owner.**

C. Daily Clean Up: Each **Contractor** shall be responsible, DAILY for the clean-up, transport and removal from the site of identifiable debris including but not limited to, bulky debris, packaging, containers, unused materials and equipment, (i.e. masonry and concrete materials, drywall, steel, crates, carton, demolition debris, other packaging, and combustible items). No piles of debris shall be left in the building overnight. The cost of any overtime premium required to remove debris immediately at the end of each workday shall be included in the **Contractor**'s Base Bid.

Each **Contractor** must handle materials in a controlled manner during clean-up and all other operations so that dust and other contaminants resulting from the cleaning or disposal process will not affect the Owner's operations or equipment or the work or equipment of any other **Contractor** on the site. Each **Contractor** is responsible to leave its Work and work area in a clean condition. This includes, but is not limited to, removal of all grease, dust, dirt, stains, labels, fingerprints and other foreign matter.

D. Weekly Clean Up: Each **Contractor**, while on site, shall provide to Barton Malow Company one (1) person for each five tradesmen (or portion thereof) employed at the site, one day per week, for up to four (4) hours, for the exclusive purpose of performing overall project weekly clean-up of unidentifiable debris. The cost of this (these) person(s) shall be included in **Contractor**'s bid. The weekly clean-up Work shall include sweeping, loading and disposal of miscellaneous debris such as mud tracked through the building, drinking cups, bottles, lunch wrappers and other unidentifiable debris. Trash and debris from this operation shall be placed in the dumpster(s) provided by the Owner. Barton Malow Company will furnish sweeping compound to hold down dust during the weekly clean up.

E. Final Clean Up: Final clean-up, will be done at a time designated by Barton Malow Company. Normally, Final Clean Up will occur before punchlist inspection or prior Owner Occupancy turnover. The [Contractor/Subcontractor(s)] duties for Final Cleaning are set forth in Part 3.01 below.

F. Use of Owner's Facilities: The Owner's facilities are not to be used by **Contractor** for the disposal of trash or debris from its Work.

G. Failure to perform Clean Up: If any **Contractor** or its Subordinate Parties fails to maintain a satisfactory clean-up program, Barton Malow Company will issue written notice, to the responsible **Contractor**, that the necessary clean-up must be performed within twenty-four (24) hours after the notice is given. The establishment of a definite deadline for the removal of debris and rubbish will supersede the necessity for any formal notification that such work must be done. If **Contractor**(s) fail to perform the clean-up, by the deadline, Barton Malow Company may perform clean-up on the Project and back charge the responsible **Contractor**(s) for the costs. If necessary in order to remove unidentifiable debris beyond what is removed during weekly clean up, Barton Malow Company will perform such clean-up and shall pro-rate the cost among the **Contractors** in its discretion, based on **Contractor**(s) type of work and manpower on site. The minimum amount for any back charge by Barton Malow, if implemented, will be **$500.00**. Back charges may be deducted from the monthly invoices of the [Contractor/Subcontractor(s)] and/or final payment.

H. Hazardous Materials: **Contractors** or Subordinate Parties must dispose of Hazardous Materials in strict accordance with applicable federal, state, and local laws and regulations. Hazardous Materials may not be placed in dumpsters and/or containers not so designated for such placement.

PART 3 - EXECUTION

3.01 FINAL CLEANING

A. The **CONTRACTOR** will employ an adequate number of personnel for final cleaning. Final Cleaning consists of the following Work:

1) Removal of grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and all other foreign materials from sight-exposed interior and exterior surfaces.

2) Vacuuming all carpets and spot cleaning any stains. Cleaning and waxing VCT floors.

3) Washing and shining glazing and mirrors.

4) Polishing glossy surfaces to a clear shine.

5) Dusting cabinet work and removing foreign markings.

6) Broom cleaning exterior paved surfaces and raking clean other surfaces of the grounds.

B. In addition to the tasks set forth above, each **Contractor** shall be responsible for the following for its Work.

1) Prior to final completion or Owner occupancy, whichever occurs first, **Contractor** shall conduct an inspection of sight-exposed interior and exterior surfaces, and all Work areas, to verify that the entire Work is left in a broom clean condition and that all Final Cleaning as set forth above has been performed.

2) Tunnels and closed off spaces shall be cleaned of packing boxes, wood frame members and other waste materials used in the construction.

3) The entire system of piping and equipment shall be cleaned internally. **Contractors** installing piping or equipment shall open all direct pockets and strainers, completely blowing down as required by the technical specifications and the manufacturers' instructions, and shall clean strainer screens of all accumulated debris.

4) Tanks, fixtures and pumps shall be drained and proved free of sludge and accumulated matter.

5) Temporary labels, stickers and similar items shall be removed from fixtures and equipment. Unless otherwise directed in the technical specifications, **Contractors** shall not remove permanent name plates, equipment model numbers, ratings, or other items intended to be permanently affixed to the fixture or equipment.

6) Heating and air conditioning equipment, tanks, pumps and traps shall be thoroughly cleaned and new filters or filter media installed.

7) Before being placed in service, domestic water distribution systems, including those for cold water, drinking water and the hot water system shall be chlorinated. Review Technical Specifications for Products and Procedures.

END OF SECTION 01550

SECTION 01600
FORMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Specific attention is directed to all Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section and relate to various forms referenced for the project.

1.02 USE OF FORMS

A. Upon award of the Agreement, the various forms described and referenced in the Project Manual will be provided by Barton Malow Company and therefore are bound in the Project Manual.

1. Copies of forms are available for inspection at Barton Malow Company, 1301 Boyd, Troy, MI 48083.

00620 Insurance
- Certificate of Insurance (ACORD) Form

00810 Safety and Loss Control Program
- Trade Contractor Safety Certificate **(CON.7.9)**

01290 Payment Procedures
- Application and Certificate for Payment **(CON.27.1)** and Continuation Sheet **CON.27.2 – Draft Included**
- Consent of Surety to Reduction In or Partial Release of Retainage **(CON.26.6) – Draft Included**
- Payment schedule **(PSI.10.1)**
- Payment Request for Stored Materials Form **(CON.26.5)**
- Acknowledgment of Payment and Partial Unconditional Release Form **(CON.26.3)**
- Unconditional Final Release and Waiver Subcontractor/Materialman Form **(CON.26.4)**
- Sworn Statement Form **(CON.26.2)**

01250 Changes in the Work
- PCO- Notice to Proceed
- PC0- Quotation Only
- Change Order Form **(CMS.9.1 or CMS.9.2)**

01320 Communications
- Trade Contractor's Daily Report Form **(CON.14.4)**
- Request For Information Form **(CON.25.2)**

01330 Submittals
- BMC Submittal Transmittal Form **(CON.9.6)**

01400 Quality Requirements
- **Corrective Action Report (CAR)/Notice of Non-Conformance (NCR) (CON.18.2)**

01700 Contract Close-out
- Consent of Surety Company to Final Payment Form **(CON.26. 7) – Draft Included**
- Consent of Surety to Reduction in or Partial Release of Retainage Form **(CON.26.6) – Not Included**
- **Certificate of Contract Completion Form (CLO.7.5)**

01720 Project Record Documents
- **Closeout Submittal (CLO.7.2)**

01740 Warranties and Guarantees
- **Contractor's Guarantee (CLO.7.3)**

01750 Systems Demonstration, Training and Start-up
- **Equipment/Systems Acceptance Form (CLO.2.1)**
- **Owner Training Register (CLO.2.2)**

END OF SECTION 01600

BARTON MALOW COMPANY

TRADE CONTRACTOR SAFETY CERTIFICATE

Contractor Name _____

Project Name International Academy East

Project Number 041049 - BP #9444

Nature of work (e.g., masonry, drywall) _____

1. Does Contractor have a written safety plan applicable to this Project?
   ☐ Yes (attach copy); or ☐ Will be provided before on-site work begins.

2. Contractor agrees to follow on this Project (for itself and its subs at any tier):
   a. All applicable legal standards for safety, including OSHA regulations;
   b. Any Site Specific Safety Rules furnished for this Project;
   c. 100% fall protection at elevations over six feet;
   d. NCCCO certification for all crane operators;
   e. Job Hazard Analysis to plan for safety before each work task begins;
   f. Prompt reporting of all OSHA recordable and lost time injuries, plus monthly reports of work hours and incident rates;
   g. Commitment of adequate management and financial resources to assure safety compliance and enforcement.

   ☐ Yes (no other alternative).

3. Contractor expects to encounter the following potential hazards on this Project, and its written safety plan contains appropriate provisions to address them:

	Potential Hazard	***Yes***	***No***	***Name the Competent Person****
1	Work from heights (ladders, edges, etc.)	☐	☐	
2	Scaffold erection or use	☐	☐	
3	Aerial work platforms	☐	☐	
4	Energized equipment (electrical, etc.)	☐	☐	
5	Respirator use	☐	☐	
6	Confined space work	☐	☐	
7	Trenching/excavation	☐	☐	
8	Cranes, fork trucks, or heavy equipment	☐	☐	
9	Environmental hazards	☐	☐	
10	Fire or explosion hazards	☐	☐	
11	Aircraft or watercraft use	☐	☐	
12	Other (specify):	☐	☐	

** Where applicable, properly qualified and trained individual who will assure compliance with pertinent standards, procedures, and/or training requirements.*

4. Contractor has established procedures for handling first aid and other occupational injuries including medical and fire emergencies.

Name of person certified in first aid and CPR: _____

I certify that the above information is correct, and I accept responsibility for implementing and enforcing the safety plan on this Project.

Contractor's Representative	***Phone Number***	***Date***

DRAFT

AIA® Document G702/CMa™ – 1992

Application and Certificate for Payment *Construction Manager-Adviser Edition*

TO OWNER:	Troy School District 4400 Livernois Troy, MI 48098	**PROJECT:**	International Baccalaureate Academy East (Existing Baker Middle School) - BP #9444 1291 Torpey Troy, Michigan 48083	**APPLICATION NO:** 001 **PERIOD TO:**	**Distribution to:** OWNER: ☐ CONSTRUCTION MANAGER: ☐ ARCHITECT: ☐ CONTRACTOR: ☐ FIELD: ☐ OTHER: ☐
FROM CONTRACTOR:		**VIA CONSTRUCTION MANAGER:**	Barton Malow Company	**CONTRACT DATE:**	
CONTRACT FOR:	General Construction	**VIA ARCHITECT:**	Kingscott, Architecture, Engineering, Interiors Design	**PROJECT NOS:** 2643-22 / / BP #9444	

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM		$ 0.00
2. Net change by Change Orders		$ 0.00
3. CONTRACT SUM TO DATE (Line 1 ± 2)		$ 0.00
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)		$ 0.00
5. RETAINAGE:		
a. 0 % of Completed Work (Column D + E on G703)	$ 0.00	
b. 0 % of Stored Material (Column F on G703)	$ 0.00	
Total Retainage (Lines 5a + 5b or Total in Column I of G703)		$ 0.00
6. TOTAL EARNED LESS RETAINAGE (Line 4 Less Line 5 Total)		$ 0.00
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate)		$ 0.00
8. CURRENT PAYMENT DUE		$ 0.00
9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6)	$ 0.00	

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$ 0.00	$ 0.00
Total approved this Month	$ 0.00	$ 0.00
TOTALS	$ 0.00	$ 0.00
NET CHANGES by Change Order	$ 0.00	

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of:

County of:

Subscribed and sworn to before me this day of

Notary Public:

My Commission expires:

CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Construction Manager and Architect certify to the Owner that to the best of their knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED $ 0.00

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

CONSTRUCTION MANAGER:

By: _____ Date: _____

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract

AIA Document G702/CMa™ – 1992. Copyright © 1992 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:19:24 on 07/02/2007 under Order No.1000286251_1 which expires on 2/29/2008, and is not for resale.
User Notes: (2380253250)

DRAFT

AIA® Document G703™ 1992

Continuation Sheet

AIA Document G702, APPLICATION AND CERTIFICATION FOR PAYMENT,
containing Contractor's signed certification is attached.
In tabulations below, amounts are stated to the nearest dollar.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO: 001
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO: 2643-22

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED FROM PREVIOUS APPLICATION (D + E)	WORK COMPLETED THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G ÷ C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
	GRAND TOTAL	$ 0.00	$ 0.00	$ 0.00	$ 0.00	$ 0.00	0.00 %	$ 0.00	$ 0.00

AIA Document G703™ – 1992. Copyright © 1963, 1965, 1966, 1967,1970, 1978, 1983 and 1992 by The American Institute of Architects. **All rights reserved.** WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:20:33 on 07/02/2007 under Order No.1000286251_1 which expires on 2/29/2008, and is not for resale.
User Notes:

(260238835)

CONSTRUCTION PAYMENT SCHEDULE

(1) For work in place through the 20th of the month
(2) If required documentation is complete and performance is justified for release

YEAR/ MONTH	TRADE CONTRACTOR ROUGH DRAFT (1) PAYMENT APPLICATION (Due Date)	TRADE CONTRACTOR FORMAL PAYMENT (1) APPLICATION DUE DATE (To BMC - 1301 Boyd Rd Troy, MI)	DISTRIBUTE CHECKS (2) TO TRADE CONTRACTORS
2007			
January	19	25	TBD
February	20	23	TBD
March	20	23	TBD
April	20	25	TBD
May	18	25	TBD
June	20	25	TBD
July	20	25	TBD
August	20	24	TBD
September	20	25	TBD
October	19	25	TBD
November	20	26	TBD
December	20	26	TBD
2008			
January	18	25	TBD
February	20	25	TBD
March	20	25	TBD
April	18	25	TBD
May	20	23	TBD
June	20	25	TBD
July	18	25	TBD
August	20	25	TBD
September	19	25	TBD
October	20	24	TBD
November	20	25	TBD
December	19	26	TBD

Barton Malow Company

PAYMENT REQUEST FOR STORED MATERIAL

To: _____

Project: International Academy East

BID PACK #9444

From _____
(Name of Contractor)

Contract No. _____

Payment Application No. _____

Period: From _____ To: _____

In accordance with the provisions of the payment to contractor section of the contract general conditions, request is made for payment as "stored materials" for the following materials.

ITEM NO.	QTY.	MATERIAL DESCRIPTION	VALUE	TYPE OF SUBSTANTIATING EVIDENCE OF PURCHASE ATTACHED	WHERE STORED (*)

AFFIDAVIT:

The materials listed above have been purchased exclusively for use on the above referenced project. The material is separated from other like materials and is physically identified as our property for use only on contract no _____
The owner or owner authorized representative may enter upon the premises for the purpose of inspection, checking or auditing, or for any other purpose as it considers necessary. It is expressly understood and agreed that this information and affidavit is furnished to the owner for the purpose of obtaining payment of the above materials before they are delivered to, or incorporated into the project described above. A revised form showing the current status of the value of materials for which payment is being requested will be submitted each estimate period.

_____ signed _____ date _____

name of contractor _____

State of _____ county of _____

Subscribed and sworn to before me this _____ day of _____ 20

_____ _____
(Notary Public) (Commission Expires)

* when stored at a location other than on the jobsite or at a fabricator's yard, bonded warehouse receipt for the material and a certificate of insurance showing coverage of materials stored issued in the name of the owner, shall accompany the request for payment. In case the storage location (other than the jobsite or fabricator's yard) is the contractor's property, the area containing the material within the fence area is the property of the owner. The responsibility for protecting the materials remains that of the contractor.

Instruction to contractor

Submit this form with each required copy of aia document g702. Attach evidence of purchase (and warehousing receipts when required), along with proof of insurance of bonded warehouse to original.

ACKNOWLEDGEMENT OF PAYMENT AND PARTIAL UNCONDITIONAL RELEASE

JOB NO.: 041049 - BP #9444

FOR WORK INVOICED THROUGH: **DATE:** _____

In consideration of the payment of the below referred to check and other good and valuable consideration, the receipt of which is hereby acknowledged, the undersigned subcontractor warrants that all labor, material or equipment and any associated taxes, wages or fringe benefits furnished by subcontractor in and for the erection, construction ornamentation or improvement of a building and/or structure described as: as situated at has been fully paid for by subcontractor and that there are no amounts unpaid in favor of its subcontractors or material suppliers or any other persons furnishing labor, equipment or material to subcontractor and utilized in the performance of the contract(s) of the above described project. Subcontractor does hereby acknowledge that payment to the undersigned has been received for all such supervision, services, supplies, labor and/or materials directly and indirectly supplied for such improvement by the undersigned to the extent of that amount stated below and relinquishes and waives its rights to all construction or mechanic's liens, claims of liens, or liens or claims of any nature and all labor and material bond rights, and forever release and discharge Barton Malow Company, its successors and assignees to the extent of this amount and regarding activities on the noted contract to this date. This certificate is required in your contract(s).

Contract No.: _____ with _____

Amount of this Payment: _____

Check Number _____

Accumulated Payment to Date: _____

Company: _____

:

By: _____

Title _____

Date _____ Phone No. _____

Witnessed By: _____

Barton Malow Company

UNCONDITIONAL FINAL RELEASE AND WAIVER TRADE CONTRACTOR/SUBCONTRACTOR/MATERIALSUPPLIER

VENDOR NO. _____

CONTRACT/SUBCONTRACT/ORDER NO. _____

JOB NO. 041049-BP #9444

TOTAL CONTRACT AMOUNT

AMOUNT OF FINAL CHECK _____

The Contractor/Subcontractor/Material Supplier, _____, on behalf of itself, its successors and assigns (collectively, the "Contractor"), in consideration of payment in full of the Contract Amount listed above and other valuable consideration, receipt of which is hereby acknowledged, hereby waives, releases and forever discharges Owner, Barton Malow Company, and Barton Malow Company's surety providing a payment bond for the Project (if applicable), and their respective officers, agents, employees, representatives, affiliates, successors and assigns (the "Released Parties"), from any and all claims, actions, causes of action, debts, liens, stop notice or bond rights, demands, suits, liabilities, judgments, damages, or expenses, whether known or unknown, which the Contractor now has or may have in the future, arising out of or in connection with work performed and/or materials, supplies or equipment furnished for the improvement of the Project.

Project Name _____
Project Address _____

under its Contract/Subcontract/Order with either Owner or Barton Malow Company dated _____, including any additional work or labor performed and/or materials, supplies or equipment provided at the written or oral request of, or with the express or implied consent of Owner and/or Barton Malow Company, except for the disputed claims that are noted on the reverse side of this waiver, in the aggregate amount of $_____.

The Contractor, on behalf of itself, its successors and assigns, further agrees to defend, indemnify and hold harmless the Released Parties, from and against any and all claims, actions, causes of action, debts, liens, stop notice or bond rights, demands, suits, liabilities, judgments, damages or expenses ("Claims"), including all attorneys fees and costs, whether arising out of injury or damage to person or property in connection with the work performed on the Project, or whether arising from claims by the Contractor's subcontractors, material suppliers, laborers, or their unions or union benefit plans for non-payment of materials, services, labor, or equipment, except for Claims caused by the sole negligence of a Released Party.

The Contractor certifies the following: (1) there has been no assignment or other transfer of its interest arising from the Contract/Subcontract; (2) the work performed by the Contractor has been completed in full accordance with the terms and conditions set forth in the Contract/Subcontract/Order; and (3) all the Contractor's subcontractors, laborers and material suppliers, have been paid in full for their work under the Contract/Subcontract/Order, including, but not limited to taxes, wages and fringe benefits for which previous payments were received by the Contractor.

The obligations of the Contractor under this Unconditional Final Release and Waiver are in addition to, and not in lieu of, the Contractor's continuing obligations under the Contract/Subcontract/Order and nothing in this Unconditional Final Release and Waiver shall be construed to modify such obligations.

The person executing this Unconditional Final Release and Waiver on behalf of the Contractor represents and warrants that he/she is duly authorized and empowered to sign and execute this Unconditional Final Release and Waiver on his/her own behalf and on behalf of the Contractor.

Signed this _____ day of _____ 20 Company _____

State of _____ by: _____
(signature)

County of _____ its _____
(corporate or company officer)

On this _____ day of _____ 20 before me came _____

to me known, who being by me duly sworn did depose and say that he/she resides in _____

and that he/she is the _____ of the corporation described herein and which executed the above instrument.

_____
(notary public)

_____
(notary seal)

_____
(expiration date)

*strike through titles not applicable

SWORN STATEMENT

STATE OF: _____)
)ss.
COUNTY: _____)

_____ Being duly sworn, deposes and says or affirms that _____

is the (contractor) (subcontractor) for an improvement to the following described real property situated in _____ county, _____
described as follows (insert legal description)

_____

_____

_____

_____

_____ Contract # _____

That the following is a statement of each subcontractor and supplier and laborer (for which laborer the payment of wages and/or fringe benefits and withholdings may be due), with whom the (contractor) (subcontractor) has (contracted) (subcontracted) for performance under a contract for the benefit of an owner or lessee, and that the amounts due to the persons as of the date hereof are correctly and fully set forth opposite their names as follows:

* (Some columns are not applicable to all persons listed)

Name of Subcontractor supplier, or laborer (list items over $1000 only)	MC*	Type of improvement or material furnished	Total Contract Price	Amount previously paid	Amount currently owing	Balance to complete	Amount of laborer wages due but unpaid	Amount of laborer fringe benefits and withholdings due but unpaid
All items that are not specifically listed are under $1000 and have been paid in full.								
		TOTAL	$ -	$ -	$ -	$ -	$ -	$ -

Contractor states that all supplies used, except those specifically provided for this project and listed above, have been taken from inventory and payments to these suppliers are current.

Contractor further states that the following are paid in full to date ☐ union contributions all ☐ obligations

*MC= Minority Code: 1) Enter one of the following codes: 1=African American 2=Hispanic 3=Asian American 4= Native American 5=WBE
2) Also enter one of the following to describe how company determined its MBE/WBE status: A=Self-declared B=Certified by one of the affiliates of NMSDC C= Certified by public entity.
3) Example: 1A means company is a self-declared African American entity

Barton Malow Company

Change Order

PROJECT
(Name and address)

TO CONTRACTOR:
(Name and address)

CHANGE ORDER NUMBER:
DATE:
ARCHITECT'S PROJECT NUMBER:
CONTRACT DATE:
CONTRACT FOR:

OWNER ☐
ARCHITECT ☐
CONTRACTOR ☐
FIELD ☐
OTHER ☐

THE CONTRACT IS CHANGED AS FOLLOWS:

(Include, where applicable, any undisputed amount attributable to previously executed Construction Change Directives)

The original (Contract Sum) (Guaranteed Maximum Price) was $
The net change by previously authorized Change Orders $
The (Contract Sum) (Guaranteed Maximum Price) prior to this Change Order was $
The (Contract Sum) (Guaranteed Maximum Price) will be (increased) (decreased) (unchanged) by this Change Order in t
the amount of $
The new (Contract Sum) (Guaranteed Maximum Price) including this Change Order will be $
The Contract Time will be (increased) (decreased) (unchanged) by ( ) days
The date of Substantial Completion as of the date of this Change Order therefore is

NOTE: This Change Order does not include changes in the Contract Sum, Contract Time or Guaranteed Maximum Price which has been authorized by Construction Change Directive for which the cost or time are in dispute as described in Subparagraph 7.3.8 of AIA Document A201.

Not valid until signed by the Architect, Contractor and Owner.

ARCHITECT *(Typed Name)*	**CONTRACTOR** *(Typed Name)*	**OWNER** *(Typed Name)*
(Signature)	*(Signature)*	*(Signature)*
BY	**BY**	**BY**
DATE	**DATE**	**DATE**

Sample Generated by Company Approved Software

Barton Malow Company

TRADE CONTRACTOR DAILY REPORT

DATE _____ **PROJECT NUMBER:** 041049-BP#9444

PROJECT NAME/SITE: International Academy East

ROUTING *To:* Barton Malow Superintendent
From: Contractor Name/Field Rep
Scope Description

WEATHER CONDITIONS

External (Check appropriate box)

Sunny☐ Cloudy☐ Rain☐ Windy☐ Snow☐

Ground (Check appropriate box)

Dry☐ Wet☐ Muddy☐ Frozen☐

Temperature Range

Hig ° Low °

SAFETY ISSUES

Accidents / Incidents	*No*	*Yes*	*If yes, explain*
Personnel	☐	☐	
Equipment	☐	☐	
Property	☐	☐	

CHECK ONE THAT APPLIES:

☐ **No Exceptions Noted Today**

☐ **Non-Conformance Report Written**

VISITORS ON SITE

MAJOR MATERIAL RECEIVED

CLEAN-UP

Have you accumulated and properly disposed of the spoils from today's work activities? ☐ Yes ☐ No

EQUIPMENT ARRIVAL / DEPARTURE

DESCRIPTION OF DAILY CONTRACTOR ACTIVITIES	WORKFORCE TRADE	WORKFORCE TOTAL
New Work Started	Clerical/Office	
	Supervision/Mgt	
	Carpenters	
Work Activities In Progress	Communications/Data	
	Concrete Finishers	
	Electricians	
	Elevator	
Work Completed	Flooring, Res/Carpet	
	Glaziers	
	Insulators	
Information Requested	Iron Workers	
	Laborers	
	Masons/Stone	
Is your work on schedule? ☐ Yes ☐ No	Millwrights/Riggers	
	Operators	
	Painters	
Impacts to Work In Progress	Pipefitters	
	Plasterers	
	Plumbers	
Additional Work	Re-Steel	
	Roofing/Waterproofing	
	Sheet Metal	
Coordination Issues	Sprinkler Fitters	
	Surveyors	
	Terrazzo/Tile Setters	
Quality Issues	Truck Drivers	
	Others:	
Information included on this form shall not constitute the required notification of delay, disruption, or claim.		
And requests for additional costs and/or time shall be submitted in accordance with the terms of the contract.	TOTAL	

Barton Malow Company

Barton Malow

Design/Construction Services

BARTON MALOW COMPANY
1301 Boyd
Troy, MI 48083
Phone: 248-823-4631
Fax: 248-823-4672

RFI

Date: _____ RFI #: _____

To: _____ Contractor's Reference #: _____

_____ Project Troy School District

_____ International Academy East

VIA Barton Malow Company BMC Project #: 041049

_____ A/E Project #: 2643-22

_____ Bid Package #: 9444

Bid Category #: _____

From: _____ Return to: _____

Reference Specs: _____ Reference Drawings: _____ Rev. _____

Request: _____

_____ _____ _____

Contractor or Subcontractor | Submitted By | Date

_____ _____ _____

Barton Malow Company | Reviewed By | Date

Reply: _____ Attachments:

This clarification is interpreted to be within the scope of referenced contracts issued in accordance with the Contract Documents, and without change in Contract Sum or Contract Time, and, as such, is not an authorization for work beyond the scope of the contract.

_____ _____ _____

Architect/Engineer | Reply By | Date

RFI Response Posted on Drawings _____

Contractors Copied _____

SUBMITTAL TRANSMITTAL FORM

To be filled out by **CONTRACTOR**

Date: _____ Project Name: International Academy East

Contractor _____ Contract for: BP#9444

By: _____ Phone: _____

Check Type of Submittal: Spec. Section _____

☐ Transparency

☐ Non-Transparency Reproducible Contractor

☐ Other Submittal No. _____

(To be filled in by Barton Malow)

Copies/Type	Sheet Number	Submittal Description (include manufacturer)

To be filled out by **BARTON MALOW**

Date: _____ Remarks: _____

To: _____

Attn: _____

From: _____

☐ Copy to Owner

To be filled out by **ARCHITECT/ENGINEER**

Date: _____ Remarks: _____

To: _____

Attn: _____

From: _____

☐ Approved ☐ Approved as Noted

☐ Not Approved/Resubmit ☐ Reviewed

BARTON MALOW COMPANY

CORRECTIVE ACTION REPORT (CAR)

Project: _____ Date _____

Company/Location: _____ CAR No. _____

Initiated By: _____ Tag No./Hold Area: _____ (as applicable)

Previous CAR # / Date: _____

CAR Designation: ☐ Audit Deficiency Report ☐ Site Level–NCR ☐ Customer Satisfaction ☐ Corporate Procurement ☐ Tech / FF&E - NCR

FINDING/NONCONFORMITY: Deficiency Classification: ☐ Major ☐ Minor ☐ OFI

Location: _____

Requirement (Standard or Specification): _____

Finding / Nonconformity: _____

Date: _____

Recommended Disposition: ☐ Use-As –Is ☐ Rework ☐ Reject ☐ N/A

Statement of Disposition: _____

Expected Completion Date: _____

Disposition Submitted By: _____ Date: _____

Disposition Reviewed/Approved By: _____ Date: _____

Owner/Customer Representative: _____ Date: _____

(NOTE: If contractually required, Owner/Customer concurrence required for USE-AS-IS or Rework Disposition)

ROOT CAUSE / CORRECTIVE ACTION: _____

Company Representative: _____ Expected Completion Date: _____

Date: _____

REVIEW OF CORRECTIVE ACTION: ☐ Accepted ☐ Accepted/Need Verification ☐ Rejected

Reason for Rejection _____

BMC Representative: _____ Date: _____

Owner/Customer Representative: _____ Date: _____
(as required)

Distribution: Lead Auditor – Process Improvement Department (excludes Site Level – NCR)

CERTIFICATE OF CONTRACT COMPLETION

Project: International Academy East

Contractor:

Contract for:

Contract Date: Contract Amount: $

Construction Manager's Affidavit

I solemnly swear and affirm: That the work under the above named contract and all amendments thereto has been completed in accordance with the requirements of said contract; that all costs incurred for equipment, materials, labor, welfare and fringe benefits, insurance, and services against the project have been paid; that no liens have been attached against the project; that no suits are pending by reason of work on the project under the contract; that all Workmen's Compensation claims are covered by Workmen's Compensation insurance as required by law; that all public liability claims are adequately covered by insurance, and that the Contractor shall save, protect, defend, indemnify, and hold the Owner harmless from and against any and all claims which arise as a direct or indirect result of any transaction, event or occurrence related to performance of the work contemplated under said contract.

Construction Manager: _____

Title:

State of:

County of:

Personally appeared before me this day of 20

known (or made known) to me to be the

(Owner) (Partner) (Corporate Officer Title)

of

Contractor(s) who, being by me duly sworn, subscribed to the foregoing affidavit in my presence.

Notary Public:

Commission expires:

CLOSEOUT SUBMITTAL

Project International Academy East Contractor: _____

_____ Contract #: _____

Location: _____ Bid Package #: 9444

Description _____

The above named contractor is submitting the following for Barton Malow, Architect and Owner approval and use. *Check all appropriate:*

- ☐ As-Built Drawings
- ☐ Operation and Maintenance Manuals
- ☐ Maintenance Stock/Spare Parts
- ☐ Keys
- ☐ Contract Guarantee
- ☐ Special Guarantee/Warranty
- ☐ Other (Specify) _____

Reference:

Specifications _____ Section: _____ Page _____

Description: _____

_____

_____

_____

Contractor: _____

Submitted by: _____

Barton Malow:

Received/Reviewed By: _____ Date: _____

Architect: _____ **(Specify Name)**

Received/Reviewed By: _____ Date: _____

Owner: _____

Received/Reviewed By: _____ Date: _____

CONTRACTOR'S GUARANTEE

STATE OF _____) Project: _____

) SS Project No.: _____

County of _____) Owner: _____

TO ALL WHOM IT MAY CONCERN:

_____ of the City of _____ County of _____ and State of _____ being duly sworn, deposes and says that s/he is _____ of _____ (the "Contractor") and, being duly authorized, makes this statement and guarantee on its behalf; that the Contractor, in completing the performance of a certain (check one) ☐ Subcontract Order # _____ with Barton Malow Company or ☐ Contract with Owner (the "Contract") for the Project, warrants that all of its Work under the Contract is of good quality and new, unless otherwise required or permitted by the Contract, and that the Work is free of defects and that the Work complies with the requirements of the Contract, including all documents incorporated into the Contract by reference. If within **2 TWO** year[s] after the date of Substantial Completion of the Project or designated portion of the Project, any of Contractor's Work is found to be defective or not otherwise in accordance with the requirements of the Contract, Contractor shall correct the Work at its sole expense promptly after receipt of written notice from the Owner or Barton Malow Company, including any other Work affected in correcting such defective or nonconforming Work (the "Correction Period"). The Correction Period shall be extended with respect to portions of the Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of Contractor's Work, and for an additional Correction Period following any correction. This obligation shall survive acceptance of the Work and termination of the Contract.

This Guarantee shall be in addition to the terms of any other warranty or longer period of obligation specified in the Contract, including all documents incorporated therein, or the terms of any general warranty, and is not in lieu of any of them. This Guarantee shall not be construed to establish a period of limitation with respect to other obligations, which the Contractor might have under the Contract and has no relationship to the time within which the obligation to comply with the Contract may be sought to be enforced or to the time, which any proceeding may be commenced.

Trade or Work	Guarantee Period Commencement Date
_____	_____
_____	_____
_____	_____

_____
Subcontractor

By: _____
Title

Subscribed and sworn to before me this

_____ day of _____ A.D. 20__

_____
Notary Public

in and for _____ County _____

My commission expires: _____

EQUIPMENT/SYSTEMS ACCEPTANCE

International Academy East - BP#9444
(Name of Project and Location)

CONTRACTOR: _____ **CONTRACT #:** _____

BID PACKAGE #: 9390 **DESCRIPTION:** _____

REPORT DATE: _____

Equipment/System Designation Model # _____

Serial # _____ Near Column Lines _____ and _____

Location: _____ Level: _____

Operation Observed By: _____

Test/Inspection Observed By: _____

Date of Inspection:. _____ Time _____ ☐ AM ☐ PM

The above equipment is being turned over to the Owner for start of guarantee period, commencing (___/___/___). Maintenance and operation after this date are subject to the following conditions:

Incomplete Work List Attached: _____

Accepted: Owner's Name: _____
By: _____
(Signature)
Date: _____

Acknowledged: Architect's Name _____
By: _____
(Signature)
Date: _____

Acknowledged: Barton Malow Company
By: _____
(Signature)
Date: _____

Distribution:

OWNER TRAINING REGISTER

International Academy East - BP#9444

(Name of Project and Location)

DATE OF TRAINING: _____

CONTRACTOR: _____ **CONTRACT #:** _____

EQUIPMENT/SYSTEM DESCRIPTION: _____

Reference:

Specifications: _____ Section: _____ Page: _____

Manufacturer(s): _____

Location: _____

PARTICIPANTS

Barton Malow: _____

Architect: _____

Contractor/Manufacturer: _____

Owner: _____

TRAINING COMPLETED IN ACCORDANCE WITH CONTRACT REQUIREMENTS

Contractor: _____ Date: _____

Barton Malow: _____ Date: _____

Owner: _____ Date: _____

Attendees' Signatures:		

Distribution:

SECTION 01630
PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 WORK INCLUDED

A. Furnish and install Products specified, under options and conditions for substitutions stated in this Section.

1.03 BIDDER'S OPTIONS

A. For products that are specified only by reference standard, select Product meeting that is standard by any manufacturer.

B. For Products specified by naming several Products or manufacturers, select any one of products and manufacturers named which complies with Specifications.

C. For Products specified by naming several Products or manufacturers and stating "or equivalent", or "or equal", or "or Architect approved equivalent", or similar wording, submit a request as for substitutions, for any Product or manufacturer which is not specifically named for review and approval by the Architect.

D. For Products specified by naming only one Product and manufacturer, there is no option and no substitution will be allowed.

PART 2 - SUBSTITUTION PROCESS

2.01 SUBSTITUTIONS

A. Base Bid shall be in accordance with the Contract Documents.

B. 1. Substitutions for products may be made during the bidding period by submitting completed Substitution Request Form and substantiating product data/literature a minimum of ten (10) Days prior to Bid date to Barton Malow Company who will then forward to the Architect.

2. Architect will consider requests from the Bidder for substitution of products in place of those specified as set forth in this section.

3. Those submitted the specified calendar days prior to Bid Date will be included in an addendum if acceptable.

4. After the end of the bidding period, requests will be considered only in case of Product unavailability or other conditions beyond the control of Contractor.

5. Bid Proposals shall not be based on assumed acceptance of any item which has not been approved by addendum.

C. Bidders are required to submit a separate Substitution Request Form for each proposed substitution. Each substitution request should be accompanied by the following supporting documentation:

1. A full explanation of the proposed substitution.

2. Complete data substantiating compliance of the proposed substitution with the requirements stated in the Contract Documents.

   a. Product identification, including the manufacturer's name and address.
   b. Manufacturer's literature identifying:
      1) Product description and technical information.
      2) Reference standards.
      3) Performance and test data.
      4) Installation instructions, operating procedures and other like information.
   c. Samples, as applicable.
   d. Names and addresses of similar projects on which product has been used, and date of each installation.

3. Itemized comparison of the proposed substitution with the product specified, listing all significant variations.

4. Data relating to changes in delivery or construction schedule.

5. A list of all effects of the proposed substitution on separate contracts.

6. Accurate cost data comparing the proposed substitution with the product specified.
   a. Amount of any net change to Contract Sum.

7. Designation of required license fees or royalties.

8. Designation of availability of maintenance services and sources of replacement materials.

D. Substitutions will not be considered for acceptance when:

1. They are indicated or implied on shop drawings or product data submittals without a formal request from Bidder.

2. Acceptance will require substantial revision of Contract Documents.

3. In judgment of Architect, do not include adequate information necessary for a complete evaluation.

4. If requested after Contract Award directly by a subcontractor or supplier, except for special or unusual circumstances reviewed by the **Contractor** with Barton Malow Company.

E. Substitute products shall not be ordered or installed without written acceptance of Architect.

F. Architect will determine acceptability of proposed substitution.

2.02 BIDDER'S REPRESENTATION

A. In making formal request for substitution the Bidder represents that:

1. It has investigated the proposed product and has determined it is equivalent to or superior in all respects to the product specified.

2. It will provide same warranties or bonds for the proposed substitution as required for the product specified.

3. It will coordinate installation of the accepted substitution into the Work, and will make such changes as may be required for the Work to be complete in all respects.

4. It waives all claims for additional costs caused by or arising from the substitution which may subsequently become apparent.

5. Cost data is complete and includes related costs under its Agreement, but not:
   a. Costs under separate contracts.
   b. Architect's costs for redesign or revision of Contract Documents.

6. Cost data need not be submitted, if request is for inclusion in an addendum. Requests after the Agreement is awarded shall contain a complete cost comparison.

B. Any modifications necessary as a result of the use of an approved substitute shall be paid by the **Contractor** proposing the substitution.

C. Any additional engineering costs required to be performed by the Architect to approve, implement or coordinate the substitution above reasonable review services, shall be paid by the **Contractor** proposing the substitution.

D. Under no circumstances will the Architect be required to prove that a product proposed for substitution is or is not equal to the quality of the product specified.

2.03 ARCHITECT'S DUTIES

A. Review requests for substitutions with reasonable promptness.

B. Coordinate review/approval of "Architect Approved" substitutions with the Owner prior to notifying the Barton Malow Company.

C. Issue a written instruction of decision to accept the substitution.

D. Substitution requests that are not approved will be returned to the party submitting the request with an explanation for the rejection.

2.04 SUBSTITUTION REQUEST FORM

A. The form is attached to this Section.

B. SUBSTITUTIONS WILL BE CONSIDERED ONLY WHEN THE ATTACHED FORM IS COMPLETED AND INCLUDED WITH THE SUBMITTAL WITH ALL BACKUP DATA.

SUBSTITUTION REQUEST FORM

TO: **BARTON MALOW COMPANY/KINGSCOTT ASSOCIATES**
1301 Boyd
Troy, MI 48083
PH – 248-823-4631 FAX – 248-823-4672

We hereby submit for your consideration the following product instead of the specified item for the above Project:

DRAWING NO.: _____ **DRAWING NAME:** _____

SPEC. SECT.	SPEC. NAME	PARAGRAPH	SPECIFIED ITEM
_____	_____	_____	_____

Proposed Substitution:

Attached complete information on changes to Drawings and/or Specifications which proposed substitution will require for its proper installation.

Submit with request all necessary samples and substantiating data to prove equal quality and performance to that which is specified. Clearly mark manufacturer's literature to indicate equality in performance.

CERTIFICATION OF EQUAL PERFORMANCE AND ASSUMPTION OF LIABILITY FOR EQUAL PERFORMANCE

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item.

Submitted by:

_____ _____
Signature Title

_____
Firm

_____
Address

_____ _____
Telephone Date

Signature shall be by person having authority to legally bind his/her firm to the above terms. Failure to provide legally binding signature will result in retraction of approval.

For use by Architect:	**For Use by Owner:**
____ Accepted ____ Accepted as Noted	____ Accepted ____ Accepted as Noted
____ Not Accepted ____ Received Too Late	____ Not Accepted ____ Received Too Late
____ Insufficient Data Received	____ Insufficient Data Received
By: _____	By: _____
Date: _____	Date: _____
Fill in Blanks Below: (Attach additional sheets as required)	

A. Does the Substitution affect dimensions shown on Drawings?
Yes _____ No _____ If yes, clearly indicate changes: _____
_____

B. Will the undersigned pay for changes to the building design, including engineering and detailing costs caused by the requested substitution?
Yes _____ No _____ If no, fully explain: _____
_____

C. What affect does substitution have on other contracts or other trades?
_____

D. What affect does substitution have on the delivery and construction schedule? _____
_____

E. Manufacturer's warranties of the proposed and specified items are: _____ Same_____ Different
If Different, explain on an Attachment

F. Reason for Request: _____
_____

G. Itemized comparison of specified item(s) with the proposed substitution; list significant variations:
_____

H. Accurate cost data comparing proposed substitution with product specified:
_____

I. This substitution will amount to a credit or an extra cost to the Owner of:
_____dollars
($_____)

END OF SECTION 01630

SECTION 01700
CONTRACT CLOSE-OUT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

B. Comply with requirements stated in Sections 00500, 00700, 00800 and in Specifications for administrative procedures in closing out the Work. Where this Section conflicts with another Section or the technical Specifications, the provision granting greater rights or remedies to the Owner Barton Malow Company, or imposing the greater duty, standard, responsibility or obligation on Contractor shall govern.

1.02 DEFINITIONS

A. Close-out is the process of organizing the general project requirements near the end of contract time to evidence the completion of the Work. The time of close-out directly relates to "Substantial Completion." It can either be a single time period for the entire Work, or a series of time periods for individual parts of the Work, which have been certified as Substantially Complete at different dates. Unless otherwise defined in the Contract Documents

Substantial Completion of the Work is the stage in the progress of construction when the **Work** is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

Substantial Completion of the Project is the stage when Project construction is sufficiently complete so the Owner can occupy or utilize the project for its intended use.

Final Completion of the Project is the stage when Certification of Substantial Completion has been issued by the Architect according to the terms and conditions of the Contract Documents and "approval of the Project Certificate for Payment has been received from the Architect (or Owner) and Barton Malow Company has received the proceeds of the Final Payment from the Owner in order to release final payment to the Contractor".

1.03 PROJECT COMPLETION

A. Contract requirements shall be met when construction activities have successfully produced, in this order, these three Project completion milestones:

1. Substantial Completion
2. Final Completion
3. Final Payment

PART 2 - CLOSE-OUT PROCESS

2.01 CONTRACT CLOSE OUT DOCUMENTATION

A. Before processing the completion of all contractual responsibilities of a **Contractor**, and to expedite final payment to a **Contractor**, a detailed review of all contractual requirements will be performed along with compiling a list of deficiencies. Refer to Sections 00500, 00700 and 00800 for detailed requirements. Effective and timely contract close-out is the objective, but it also requires efficient and timely action of the

Contractor to provide the necessary punchlist completion Work, documents, materials, close-out documentation, and all other requirements set forth in the Contract Documents.

2.02 CLOSE-OUT PROCEDURE

A. The following procedure and forms will be used to progress through the contract close-out stage in a productive and timely manner.

Step 1 PREPARATION FOR CONTRACT CLOSE-OUT

During the course of the Project, the **Contractor** will thoroughly review the Contract Documents as it relates to the requirements and obligations and gather and submit to Barton Malow Company the proper submittals, shop drawings, material certifications, waivers, certificates of insurance, bonds, and other contractual requirements impacting contract close-out.

Step 2 INITIATING THE FINAL CLOSE-OUT PROCESS

When nearing 75% completion of the Work, the **Contractor** will review the status of the Close-Out process with Barton Malow Company. The **Contractor**'s contractual responsibilities will be reviewed and outstanding close-out and other submittals identified.

Step 3 OBTAINING THE CERTIFICATE OF SUBSTANTIAL COMPLETION

As the **Contractor** is nearing the completion of the Work and after concurrence with Barton Malow Company, it shall submit a written request for Substantial Completion, all required documentation as outlined, and a listing of all minor deficiencies yet to be completed.

The following documents are the minimum required at the time of request for Substantial Completion. **Contractor** shall also submit all additional documentation as required in the Contract Documents:

a. AIA G704 Certificate of Substantial Completion

b. As-built records (see Section 01720)

c. Operation and Maintenance Manuals (see Section 01730)
Typically, all O&M manuals will be submitted to the Owner six months prior to acceptance of equipment systems or building occupancy

c. Keys, Maintenance Stock, and Spare Parts - quantities as required in the specifications

d. Test and Start-up/Owner Operational Instruction Sessions (see Section 01750)

e. Submission of Permits and Approvals (i.e., Fire Marshal, Department of Public Health Approvals, etc.)

f. Guarantee and Warranties (see Section 01740)

h. Punchlist (list of work to be completed or corrected)

Once Barton Malow Company has received all required documents they will be forwarded to the Architect and Owner. Barton Malow Company will review the **Contractor**'s request for Substantial Completion; all above documentation, and list of deficiencies, add appropriate comments, and forward to the Architect and/or Owner for review. In conjunction with the **Contractor**, Barton Malow Company will establish a schedule for the completion of all listed

items, which in no event shall exceed any time periods established in the Contract Documents for Final Completion.

When the Architect and/or Owner determine(s) that the Work is substantially complete, the Certificate of Substantial Completion shall be issued to the **Contractor**.

Step 4 CONTRACTOR COMPLETES PUNCHLIST WORK

Each **Contractor** shall submit a letter certifying all punchlist items are completed, in a manner acceptable to the Owner, Barton Malow Company and the Architect.

Step 5 FINAL INSPECTION NOTICE

Each **Contractor** is to forward **(written notice and accompanying documentation)** to Barton Malow Company that Work is ready for final inspection and acceptance. Barton Malow Company will forward written notice to the Architect if Barton Malow Company is in agreement that Work is complete. The Architect will perform a final inspection and sign off on the punchlist form if Work is in fact completed. If punchlist work is not found complete, the **Contractor** shall take action to remedy any insufficiencies and then shall re-submit the written notice and accompanying documentation that Work is ready for **final** inspection and acceptance. If Barton Malow Company and/or Architect are required to perform **"more than 2"** site visits to determine Substantial or Final Completion of **Contractor**'s Work, the costs for such additional inspections shall be charged to **Contractor**.

The following documents are the minimum required to complete final payment. **Contractor** shall also submit all additional documentation as required in the Contract Documents:

a. Final Payment Request (on G702 & G703)

b. Guarantees/Warranties (including subs and suppliers)

c. Final Sworn Statements (including subs and suppliers)

d. Acknowledgment of Payment and Partial Unconditional Release

e. Final Release Subcontractor/Materialman

f. Certified Payroll Report (projects governed by prevailing wage laws)

g. Verification of Rate Classification and Payment (Federal projects)

h. Consent of Surety Company to Final Payment (AIA G707)

i. Consent of Surety to Reduction or Partial Release of Retainage (AIA G707A)

j. Certificate of Substantial Completion (on G704)

k. Completion and acceptance of all punchlist Work

l. LEED Required documentation

Items b, c, d and e must always be submitted with the final request for payment.

Step 6 REVIEW OF FINAL PAYMENT REQUEST

Barton Malow Company and the Architect will review the **Contractor**'s final payment request and Close-Out file. **Barton Malow Company reserves the right to withhold 200% of the estimated cost for each punchlist item not completed until complete.** If all administrative documents are attached or have been submitted (i.e. guarantee, warranty, waiver of lien, etc.), all Work is complete, and all other responsibilities are met, the Project Team will forward the Contractor's Application for Final Payment to the Owner and payment shall be processed according to the Owner's regular procedures.

2.03 FINAL COMPLETION

A. To attain final completion, the **Contractor** shall complete activities pertaining to Substantial Completion, and complete Work on punch list items. Only then shall it issue written request to Barton Malow Company to conduct a site visit to determine Final Completion.

B. When **Contractor** considers the Work is finally complete, it shall submit written certification that:

1. Contract Documents have been reviewed.

2. Work has been inspected for compliance with Contract Documents.

3. Work has been completed in accordance with Contract Documents.

4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.

5. Work is completed and ready for final observation.

C. Barton Malow Company and/or Architect will make an observation to verify the status of completion with reasonable promptness after receipt of such certification.

D. Should Barton Malow Company and/or Architect consider that the Work is incomplete or defective:

1. Barton Malow Company will promptly notify the **Contractor** in writing, listing the incomplete or defective Work.

2. **Contractor** shall take immediate steps to remedy the stated deficiencies, and send a second written certification to the Barton Malow Company that the Work is complete.

3. Barton Malow Company and/or Architect will re-inspect the Work.

E. When Barton Malow Company and/or Architect determines that the Work is acceptable under the Contract Documents, it shall request the **Contractor** to make close-out submittals.

2.04 **CONTRACTOR**'S CLOSE-OUT SUBMITTALS

A. Evidence of compliance with requirements of governing authorities (state, local or federal):

1. Certificates of Inspection:
   a. Mechanical
   b. Electrical
   c. Others as required

B. Project Record Documents: Refer to requirements of Section 01720.

C. Operating and Maintenance Data, Instructions to Owner's Personnel: Refer to requirements of Section 01730.

D. Warranties and Bonds: Refer to requirements of Individual Sections and Individual Technical Specifications and Section 01740.

E. Spare Parts and Maintenance Materials: Refer to requirements of Individual Technical Specifications.

F. Evidence of Payment and Release of Liens: Refer to requirements of General and Supplementary Conditions and Section 01290.

G. LEED Required Documentation

END OF SECTION 01700

SECTION 01720
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 SUMMARY

A. Each **Contractor** shall be responsible to maintain at the job site one copy of:

1. Record Contract Drawings
2. Record Project Manual
3. Addenda
4. Reviewed/Approved Shop Drawings
5. Change Orders
6. Other modifications to Contract
7. Field test records
8. Affidavits

B. Store documents apart from documents used for construction.

C. Maintain documents in clean, dry, legible condition.

D. Do not use project record documents for construction purposes.

E. Make documents available for inspection by the Owner, Barton Malow Company and the Architect.

F. Failure to maintain documents up-to-date will be cause for withholding payments to **Contractor.**

G. At the outset of the project, obtain from the Architect through the Barton Malow Company, at no charge to the **Contractor**, one complete set of Contract Documents including:

1. Technical Specifications with all addenda.
2. One complete set of prints of all Drawings.

1.03 RECORDING

A. Label each document "Project Record".

B. Keep record documents current.

C. Do not permanently conceal any work until required information has been recorded.

D. Contract Drawings:

1. **Contractor** may at his option enter required information on a "working set" and then at completion of Project transfer the information to final submitted "Project Record" set.

2. **Contractor** shall legibly mark to record actual construction:

a. Depths of various elements of foundation in relation to survey data.

b. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.

c. Location and depths of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.

d. Field changes of dimension and detail.

e. Changes made by PCO – Notice to Proceed

f. Details not on original Contract Drawings.

E. Technical Specifications and Addenda:

1. **Contractor** shall legibly mark up each section to record:

a. Manufacturer, trade name, catalog number and Supplier of each product and item of equipment actually installed.

b. Changes made by PCO - Notice to Proceed.

c. Other items not originally specified.

F. Conversion of Schematic Layouts:

1. Arrangement of conduits, circuits, piping, ducts and similar items are in most cases shown schematically on the Drawings.

2. **Contractor** shall legibly mark to record actual construction:

a. Dimensions accurate to within 1" of the center of items shown schematically.

b. Identify each item, for example, "cast iron drain", "galvanized water", etc.

c. Identify location of each item, for example, "under slab", "in ceiling plenum", "exposed", etc.

3. The Owner, Architect or Barton Malow Company may waive requirements of schematic layout conversion, when in their opinion, it serves no beneficial purpose. Do not, however, rely on waivers being issued except as specifically issued by the Barton Malow Company in written form.

1.04 SUBMITTAL

A. At completion of Project deliver, one (1) original and Two (2) copy sets of Record Documents, in a format acceptable to the Owner and the Architect, using the Final Document Submittal Form (in Section 01600 Forms), to Barton Malow Company prior to request for final payment.

B. Accompany submittal with transmittal letter, in duplicate, containing:

1. Date
2. Project title and number
3. Contractor's name and address
4. Title and number of each record document
5. Certification that each document as submitted is complete and accurate
6. Signature of Contractor, or his authorized representative

END OF SECTION 01720

SECTION 01730
OPERATIONS AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 SCOPE

A. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under Contract.

1. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of the Technical Specifications.

B. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems in accordance with the requirements in Section 01750 Systems Demonstration, Operational Instruction and Start-up.

1.03 QUALITY ASSURANCE

A. Preparation of data shall be done by personnel:

1. Trained and experienced in maintenance and operation of described products.
2. Familiar with requirements of this Section.
3. Skilled as technical writer to the extent required to communicate essential data.
4. Skilled as draftsman competent to prepare required drawings.

1.04 FORM OF SUBMITTALS

A. Prepare data in the form of an instructional manual for use by Owner's personnel.

B. Format:

1. Size: 8-1/2" x 11"
2. Paper: white, for typed pages.
3. Text: Manufacturer's printed data, or neatly typewritten.
4. Drawings:
   a. Provide reinforced punched binder tab, bind in with text.
   b. Fold larger drawings to size of text pages.
5. Provide fly-leaf for each separate product, or each piece of operating equipment.
   a. Provide typed description of product, and major component parts of equipment.
   b. Provide indexed tabs.
6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS." list:
   a. Title of Project.
   b. Identity of separate structures as applicable.
   c. Identity of general subject matter covered in the manual.

C. Binders:

1. Commercial quality three-ring binders with durable and cleanable plastic covers.

2. Maximum ring size: 3"
3. When multiple binders are used, correlate the data into related consistent groupings.

1.05 CONTENT OF MANUAL

A. Neatly typewritten table of contents for each volume, arranged in systematic order.

1. Contractors, name of responsible principal, address and telephone number.
2. A list of each product required to be included, indexed to content of the volume.
3. List with each product, name, address and telephone number of:
   a. Subcontractor or installer.
   b. Maintenance contractor, as appropriate.
   c. Identify area of responsibility of each.
   d. Local source of supply for parts and replacement.
4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.

B. Product Data:

1. Include only those sheets which are pertinent to the specific product.
2. Annotate each sheet to:
   a. Clearly identify specific product or part installed.
   b. Clearly identify data applicable to installation.
   c. Delete references to inapplicable information.

C. Drawings:

1. Supplement product data with drawings as necessary to clearly illustrate:
   a. Relations of component parts or equipment and systems.
   b. Control and flow diagrams.
2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
3. Contractor may use Project Record Documents as maintenance drawings - coordinate with Barton Malow Company.

D. Written text, as required to supplement product data for the particular installation:

1. Organize in consistent format under separate headings for different procedures.
2. Provide logical sequence of instructions for each procedure.

E. Copy of each warranty, bond and service contract issued.

1. Provide information sheet for Owner's personnel, give:
   a. Proper procedures in event of failure.
   b. Instances which might affect validity of warranties or bonds.

1.06 MANUAL REVIEW AND PREPARATION SCHEDULE

A. Submit two copies of preliminary draft of proposed formats and outlines of contents to Barton Malow Company prior to start of preparation.

1. Architect will review draft and return one copy with comments.

B. Submit two (2) copies of completed data in final form to the Barton Malow Company at least six (6) months before the end of the project, for Owner review.

1. Copy will be returned after final inspection or acceptance, with comments.

C. Submit copies of completed operation and maintenance manuals at least two (2) weeks before execution and have at hand for use in demonstrations and instructions.

D. Submit specified number of copies of approved data in final form to the Barton Malow Company ten (10) days after final inspection or acceptance.

PART 2 - PRODUCTS

2.01 MANUAL FOR MATERIALS AND FINISHES

A. Submit two (2) copies of complete manual in final form.

B. Content, for architectural products, applied materials and finishes:

1. Manufacturer's data, giving full information on products.
   a. Catalog number, size, and composition.
   b. Color and texture designations.
   c. Information required for reordering special-manufactured products.
2. Instructions for care, maintenance and preventative maintenance.
   a. Manufacturer's recommendation for types of cleaning agents and methods.
   b. Cautions against cleaning agents and methods which are detrimental to product.
   c. Recommended schedule for cleaning and maintenance.

C. Content, for moisture-protection and weather-exposed products:

1. Manufacturer's data, giving full information on products.
   a. Applicable standards.
   b. Chemical composition.
   c. Details of installation.
2. Instructions for inspection, maintenance and repair.

D. Additional requirements for maintenance data: Reference sections of Technical Specifications.

2.02 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit two (2) copies of complete manual in final form.

B. Content, for each unit of equipment and system, as appropriate:

1. Description of unit and component parts.
   a. Function, normal operating characteristics, and limiting conditions.
   b. Performance curves, engineering data and tests.
   c. Complete nomenclature and commercial number of replaceable parts.
2. Operating procedures:
   a. Start-up, break-in, routine and normal operating instructions.
   b. Regulation, control, stopping, shutdown and emergency instructions.
   c. Summer and winter operating instructions.
   d. Special operating instructions.
3. Maintenance and Preventative Maintenance Procedures:
   a. Routine operations.
   b. Guide to "trouble-shooting".
   c. Disassembly, repair and re-assemble.

   d. Alignment, adjusting and checking.
4. Servicing and lubrication schedule.
   a. List of lubricants required.
5. Manufacturer's printed operating and maintenance instructions.
6. Description of sequence of operation by control manufacturer.
7. Original manufacturer's parts, list, illustrations, assembly drawings and diagrams required for maintenance.
   a. Predicted life of parts subject to wear.
   b. Items recommended to be stocked as spare parts.
8. As-installed control diagrams by controls manufacturer.
9. Each Contractor's coordination drawings.
   a. As-installed color coded piping diagrams.
10. Charts of valve tag numbers, with location and function of each valve.
11. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
12. Other data as required under pertinent sections of specifications.

C. Content, for each electric and electronic system, as appropriate:

1. Description of system and component parts.
   a. Function, normal operating characteristics and limiting conditions.
   b. Performance curves, engineering data and tests.
   c. Complete nomenclature and commercial number of replaceable parts.
2. Circuit directories of panel boards.
   a. Electrical service.
   b. Controls.
   c. Communications.
3. As-installed color coded wiring diagrams.
4. Operating procedures:
   a. Routine and normal operating instructions.
   b. Sequences required.
   c. Special operating instructions.
5. Maintenance and preventative maintenance procedures:
   a. Routine operations.
   b. Guide to "trouble-shooting".
   c. Disassembly, repair and re-assemble.
   d. Adjustment and checking.
6. Manufacturer's printed operating and maintenance instructions.
7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
8. Other data as required under pertinent sections of specifications.

D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.

E. Additional requirements for operating and maintenance data: Reference sections of Technical Specifications.

END OF SECTION 01730

SECTION 01740
WARRANTIES AND GUARANTEES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention as directed to Bidding and Contract Requirements, and to Division 1, General requirements, which are hereby made part of this section.

1.02 SUMMARY

A. This section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers' standard warranties on products and special warranties:

1. Refer to General Conditions for terms of the Contractor's period and obligations for Correction of the Work.

B. Related Sections: The following sections also contain requirements that relate to this section:

1. Division 1 Section "Contract Close-out" specifies contract close-out procedures.

2. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

3. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.03 DEFINITIONS

A. **Standard Product Warranties** are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by manufacturer to Owner.

B. **Special Warranties** are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.04 WARRANTY REQUIREMENTS

A. Deliver all written warranties and guarantees required by the Contract Documents with the Owner and Barton Malow Company named as beneficiaries. All warranties shall include labor and materials, shall be signed by the manufacturer or subcontractor as the case may be, and countersigned by the Contractor. All written warranties shall be addressed to the Owner and delivered to Barton Malow Company upon completion of the Project, before or with the submission of Request for Final Payment.

B. In addition to all other warranties set forth in the Contract Documents or imposed by applicable law, Contractor warrants to Owner and Barton Malow Company that the Work will be free from defects and performed in strict conformity with the requirements of the Contract Documents. This warranty survives the termination of the Agreement and shall only be extinguished by limitation periods imposed by applicable law and shall not be limited by any other provisions contained in the Agreement, including any provisions or time periods related to Contractor's obligation to correct defective Work.

C. Contractor, upon signing the Agreement, shall obtain and forward to Barton Malow Company any and all Standard Product Warranties for products, materials and systems covered under its Agreement. The Manufacturer's warranties do NOT relieve the Contractor from its warranty obligations under the Contract Documents.

D. Special Warranties shall become effective on a date established by the Project Team. This date generally shall be the date of Final Completion of the Project or Substantial Completion of the Project or portions thereof as agreed upon by the Project Team. In the case of acceptance of a portion of the Work or Project, separate warranties shall be issued for those specific portions of the Project that were accepted, and shall be dated the date the specific portion was accepted. As additional Work is accepted, separate warranties for those specific portions of the Work shall be issued and properly dated. Issuance of warranties for a portion of the Work shall in no way become the basis for Application for Final Payment.

E. If for any reason, the Bidder cannot warrant any part of the Work using products, materials, or construction methods that have been specified or shown, it shall notify Barton Malow Company in writing at least ten (10) days before the bid submission date, giving reasons together with the names of products and data on substitutions it can guarantee. Should the Bidder fail to so notify Barton Malow Company within this time period, it will be bound to all warranties and guarantees as set forth in the Contract Documents.

F. Related Damages and Losses: In correcting Work that has been rejected as defective or otherwise failing to conform to the Contract Documents, whether before or after Substantial Completion, Contractor shall bear all related costs, including, but not necessarily limited to, the cost to correct the Work, the cost to correct all other Work that has been damaged by the defective or non-conforming Work, or that is damaged in the process of correcting the defective or nonconforming Work, and the cost of all additional testing and inspections and compensation for the Architect and/or Barton Malow Company's services and expenses made necessary thereby.

G. Reinstatement of Warranty: When Work covered by a warranty with a specific time period has failed and has been corrected by Contractor, the warranty shall be reinstated for a time period equal to the original warranty.

H. Express warranties are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available to the Owner or Barton Malow Company under the law. Express warranty periods shall not be interpreted as limitations on the time in which Owner or Barton Malow Company may enforce Contractor's duties and obligation or their rights and remedies under the Agreement and applicable law.

1. Rejection of Warranties: The Owner and Barton Malow Company reserve the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

I. Where the Contract Documents require a Special Warranty, or similar commitment on the Work or part of the Work, the Owner and Barton Malow Company reserve the right to refuse to accept the Work, until the Contractor presents evidence that the entities required to countersign such commitments are willing to do so.

1.05 SUBMITTALS

A. Submit one (1) original and one (1) copy of written warranties to the Barton Malow Company within fourteen (14) days of Substantial Completion using the form found in section 01600-Forms and organizing the warranty documents into an orderly sequence based on the table of contents of the Project Manual. If the project Team's Certificate of Substantial Completion designates a commencement date

for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of Barton Malow Company.

B. When the Contract Documents require Contractor, or Contractor and a Subordinate Party to execute a Special Warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Barton Malow Company for approval prior to final execution.

C. Forms for warranties are included in Section 01600-Forms. Prepare a written document utilizing the appropriate form, ready for execution by Contractor and its Subordinate Party(ies). Submit a draft to Barton Malow Company for approval prior to final execution.

1. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting Special Warranties.

END OF SECTION 01740

SECTION 01750
SYSTEMS DEMONSTRATION, TRAINING AND START-UP

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 SCOPE

A. Procedures for demonstration of equipment operation and instruction of Owner's personnel. This will be coordinated through Barton Malow Company.

1.03 QUALITY ASSURANCE

A. When specified in individual Sections, require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstrations and instructions have been completed.

B. Barton Malow Company will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

1.04 SUBMITTALS

A. Submit preliminary schedule to Barton Malow Company for Architect's and Owner's approval, listing times and dates for demonstration of each item of equipment and each system, at least two (2) weeks prior to proposed dates.

B. Submit one (1) report within one week after completion of demonstrations, that demonstrations and instructions have been satisfactorily completed. Give time and date of each demonstration, and hours devoted to demonstration, with a list of persons present.

PART 2 - EXECUTION

2.01 PREPARATION

A. Provide substantiating information that verifies equipment has been inspected and put into operation; testing, adjusting, and balancing has been performed; and equipment and systems are fully operational.

B. Submit copies of completed operation and maintenance manuals (see Section 01730) at least two (2) weeks before execution and have at hand for use in demonstrations and instructions.

C. Barton Malow Company will develop a schedule for the system demonstration, Operational Instruction, start-up and turn over of all systems and equipment.

2.02 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of equipment and systems to the Owner's, Barton Malow Company's and Architect's personnel two (2) weeks prior to date of final inspection. For equipment requiring seasonal operation, perform instructions for other seasons within six months. Contractor shall document the testing, equipment start-up and Operational Instruction sessions as required using the following forms in Section 01600 Forms:

1. Equipment/System Acceptance - This form will be completed for each piece of equipment or system for each contract that requires operational testing and/or Operational Instruction before acceptance. This will document the date of testing, the equipment tested, names of personnel which witnessed the testing and acceptance.

2. Owner Operational Instruction - This form will be completed for each contract that requires Operational Instruction to be provided to the Owner's personnel. This will document the date of Operational Instruction, type of Operational Instruction, names of the personnel trained and acceptance of the Operational Instruction.

B. The amount of time required for instruction on each item of equipment and system is that specified in individual sections or as mutually agreed upon between Contractor and Barton Malow Company.

C. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at designated location.

D. Use operation and maintenance manuals as basis of instruction and review the contents of the manuals with personnel in full detail to explain all aspects of operations and maintenance.

E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

END OF SECTION 01750

SPECIFICATIONS

FOR

INTERNATIONAL ACADEMY EAST
TROY SCHOOL DISTRICT
TROY, MICHIGAN

BID PACKAGE 9444

ISSUED FOR BIDS: MAY 11, 2007

A/E #2643-22

OWNER
TROY SCHOOL DISTRICT
4400 LIVERNOIS ROAD
TROY, MICHIGAN 48098
(248) 823-4000

ARCHITECTS/ENGINEERS
KINGSCOTT ASSOCIATES, INC
229 EAST MICHIGAN AVENUE, SUITE 335
KALAMAZOO, MICHIGAN 49007
(269) 381-4880

STRUCTURAL ENGINEER
JDH ENGINEERING
3000 IVANREST, S.W., SUITE B
GRANDVILLE, MICHIGAN 49418
(616) 531-6020

LANDSCAPE ARCHITECTS
O'BOYLE, COWELL, BLALOCK
521 SOUTH RIVERVIEW DRIVE
KALAMAZOO, MICHIGAN 49004
(269) 381-3357

FOOD SERVICE
THE BAKER GROUP
2220 EAST PARIS AVENUE S.E.
GRAND RAPIDS, MI 49546
(616) 942-4011

CONSTRUCTION MANAGER
BARTON MALOW COMPANY
26500 AMERICAN DRIVE
SOUTHFIELD, MICHIGAN 49034
(248) 436-5000

TABLE OF CONTENTS

DIVISION 1 - GENERAL REQUIREMENTS
01230 ALTERNATES
01731 CUTTING AND PATCHING
01732 SELECTIVE DEMOLITION

DIVISION 2 - SITE CONSTRUCTION
02230 SITE CLEARING
02300 EARTHWORK
02751 CEMENT CONCRETE PAVEMENT
02764 PAVEMENT JOINT SEALANTS
02920 LAWNS AND GRASSES
02930 EXTERIOR PLANTS

DIVISION 3 - CONCRETE
03300 CAST-IN-PLACE CONCRETE
03542 HYDRAULIC-CEMENT-BASED UNDERLAYMENT

DIVISION 4 - MASONRY
04810 UNIT MASONRY ASSEMBLIES
04860 STONE MASONRY

DIVISION 5 - METALS
05500 METAL FABRICATIONS
05521 PIPE AND TUBE RAILINGS

DIVISION 6 - WOOD AND PLASTICS
06105 MISCELLANEOUS CARPENTRY

DIVISION 7 - THERMAL AND MOISTURE PROTECTION
07552 MODIFIED BITUMINOUS MEMBRANE ROOFING
07710 MANUFACTURED ROOF SPECIALTIES
07720 ROOF ACCESSORIES
07841 THROUGH-PENETRATION FIRESTOP SYSTEMS
07842 FIRE-RESISTIVE JOINT SYSTEMS
07920 JOINT SEALANTS

DIVISION 8 - DOORS AND WINDOWS
08111 STANDARD STEEL DOORS AND FRAMES
08211 FLUSH WOOD DOORS
08311 ACCESS DOORS AND FRAMES
08411 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
08520 ALUMINUM WINDOWS

08710 DOOR HARDWARE
08800 GLAZING

DIVISION 9 - FINISHES
09111 NON-LOAD-BEARING STEEL FRAMING
09250 GYPSUM BOARD
09310 CERAMIC TILE
09511 ACOUSTICAL PANEL CEILINGS
09651 RESILIENT FLOOR TILE
09653 RESILIENT WALL BASE AND ACCESSORIES
09681 CARPET TILE
09911 EXTERIOR PAINTING
09912 INTERIOR PAINTING

DIVISION 10 - SPECIALTIES
10101 VISUAL DISPLAY SURFACES
10155 TOILET COMPARTMENTS
10200 LOUVERS AND VENTS
10350 FLAGPOLES
10505 METAL LOCKERS
10520 FIRE-PROTECTION SPECIALTIES
10801 TOILET AND BATH ACCESSORIES

DIVISION 11 – EQUIPMENT
11400 FOOD SERVICE EQUIPMENT
11610 LABORATORY FUME HOODS

DIVISION 12 – FURNISHINGS
12355 INSTITUTIONAL CASEWORK
12360 LABORATORY CASEWORK

DIVISION 13 - SPECIAL CONSTRUCTION
13845 LIGHTING CONTROLS
13851 FIRE ALARM

DIVISION 14 - CONVEYING SYSTEMS
14420 WHEELCHAIR LIFTS

DIVISION 15 - MECHANICAL
15050 BASIC MECHANICAL MATERIALS AND METHODS
15055 MOTORS
15060 HANGERS AND SUPPORTS
15074 VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT
15075 MECHANICAL IDENTIFICATION
15080 MECHANICAL INSULATION
15110 VALVES
15127 METERS AND GAGES FOR HVAC PIPING
15140 DOMESTIC WATER PIPING
15145 DOMESTIC WATER PIPING SPECIALTIES
15150 SANITARY WASTE AND VENT PIPING

15155 SANITARY WASTE PIPING SPECIALTIES
15160 STORM DRAINAGE PIPING
15165 STORM DRAINAGE PIPING SPECIALTIES
15181 HYDRONIC PIPING
15183 REFRIGERANT PIPING
15185 HYDRONIC PUMPS
15189 HVAC WATER TREATMENT
15195 FACILITY NATURAL GAS PIPING
15221 CHEMICAL WASTE PIPING
15410 PLUMBING FIXTURES
15412 EMERGENCY PLUMBING FIXTURES
15513 CONDENSING BOILERS
15550 BREECHINGS, CHIMNEYS, AND STACKS
15671 CONDENSING UNITS
15725 MODULAR INDOOR AIR-HANDLING UNITS
15732 PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS
15768 UNIT VENTILATORS
15785 AIR-TO-AIR ENERGY RECOVERY EQUIPMENT
15815 METAL DUCTS
15820 DUCT ACCESSORIES
15838 POWER VENTILATORS
15840 AIR TERMINAL UNITS
15855 DIFFUSERS, REGISTERS, AND GRILLES
15900 HVAC INSTRUMENTATION AND CONTROLS
15950 TESTING, ADJUSTING, AND BALANCING

DIVISION 16 - ELECTRICAL
16050 BASIC ELECTRICAL MATERIALS AND METHODS
16060 GROUNDING AND BONDING
16075 ELECTRICAL IDENTIFICATION
16080 ELECTRICAL TESTING
16120 CONDUCTORS AND CABLES
16130 RACEWAYS AND BOXES
16140 WIRING DEVICES
16145 LIGHTING CONTROL DEVICES
16289 TRANSIENT VOLTAGE SUPPRESSION
16410 ENCLOSED SWITCHES AND CIRCUIT BREAKERS
16420 ENCLOSED CONTROLLERS
16442 PANELBOARDS
16491 FUSES
16511 INTERIOR LIGHTING
16521 EXTERIOR LIGHTING

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 01230
ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Add Alternate No. 1: Exterior widow replacement

END OF SECTION 01230

SECTION 01731
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:

1. Division 1 Section "Selective Demolition" for demolition of selected portions of the building.
2. Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
3. Division 7 Section "Through-Penetration Firestop Systems" for patching fire-rated construction.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:

1. Primary operational systems and equipment.
2. Air or smoke barriers.

3. Fire-suppression systems.
4. Mechanical systems piping and ducts.Control systems.
5. Communication systems.
6. Electrical wiring systems.
7. Operating systems of special construction in Division 13 Sections.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Exterior curtain-wall construction.
4. Equipment supports.
5. Piping, ductwork, vessels, and equipment.
6. Noise- and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.5 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01731

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 01732
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Sections include the following:

1. Division 1 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
2. Division 1 Section "Construction Waste Management" for disposal of demolished materials.
3. Division 1 Section "Cutting and Patching" for cutting and patching procedures.
4. Division 2 Section "Site Clearing" for site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 SUBMITTALS

A. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

B. Predemolition Photographs or Videotapes: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Comply with Division 1 Section "Photographic Documentation." Submit before Work begins.

C. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1. Comply with submittal requirements in Division 1 Section "Construction Waste Management."

1.5 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Standards: Comply with ANSI A10.6 and NFPA 241.

E. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.

2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.7 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or preconstruction videotapes.

G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

    a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 1 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 1 Section "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Cut concrete to a depth of at least 3/4 inch at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.

1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

E. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.8 SELECTIVE DEMOLITION SCHEDULE

A. Existing Items to Be Removed and Reinstalled:

1. One unit ventilator, see mechanical plans.
2. One RTU cooling unit, see mechanical plans
3. Kitchen hand sink, see food service and plumbing plans
4. Media Center projection screen

B. Existing Items to Be Removed, Salvaged, and turned over to the owner:

1. Door hardware
2. Security cameras and security motion detectors.
3. Unit ventilators not re-used.
4. RTU's not re-used.

END OF SECTION 01732

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 02230
SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Protecting existing trees, shrubs, groundcovers, plants, and grass to remain.
2. Removing existing trees, shrubs, groundcovers, plants, and grass.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Temporary erosion and sedimentation control measures.

B. Related Sections include the following:

1. Division 1 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and temporary erosion and sedimentation control procedures.
2. Division 1 Section "Execution Requirements" for verifying utility locations and for recording field measurements.
3. Division 2 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.
4. Division 2 Section "Lawns and Grasses" for finish grading including preparing and placing planting soil mixes and testing of topsoil material.

1.3 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Record drawings, according to Division 1 Section "Project Record Documents," identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

E. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE PROTECTION

A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.

1. Minimum requirement for tree protection shall be a barrier constructed of sound lumber or steel or aluminum posts.

a. Posts shall be securely driven or dug into the ground, placed no closer than 15' from the tree trunk **or the drip line of the tree crown, whichever is greater, or as indicated.**
b. Fence shall be removed when construction is complete.

2. Do not store construction materials, debris, or excavated material within fenced area.
3. Do not permit vehicles, equipment, or foot traffic within fenced area.
4. Maintain fenced area free of weeds and trash.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

1. Cover exposed roots with burlap and water regularly.
2. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
3. Coat cut faces of roots more than 1-1/2 inches (38 mm) in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
4. Backfill with soil as soon as possible.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

1. Employ an arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
2. Replace trees that cannot be repaired and restored to full-growth status, as determined by Architect.

3.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
3. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches (450 mm) below exposed subgrade.
4. Use only hand methods for grubbing within tree protection zone.
5. Chip removed tree branches and stockpile in areas approved by Architect.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Do not stockpile topsoil within tree protection zones.
2. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly **saw-cut** length of existing pavement to remain before removing existing pavement. **Saw-cut** faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

3.7 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

1. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION 02230

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 02300
EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for walks, pavements, lawns and grasses, and exterior plants.
2. Subbase course for concrete walks and pavements.
3. Subsurface drainage backfill for walls and trenches.
4. Excavating and backfilling for utility trenches.
5. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.

B. Related Sections include the following:

1. Division 1 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities.
2. Division 2 Section "Site Clearing" for temporary erosion and sedimentation control measures, site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
3. Division 3 Section "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
4. Divisions 2, 15, and 16 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Course placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D 1557 for each on-site and borrow soil material proposed for fill and backfill.

1.5 QUALITY ASSURANCE

A. The Owner has supplied a survey of the project area that describes physical characteristics of the site. The information and data shown or indicated in the construction documents with respect to existing underground facilities at or contiguous to the site is based on information and

date furnished by the owners of such underground facilities or by others. Unless otherwise provided in the Contract Documents:

1. Owner and Architect shall not be responsible for the accuracy or completeness of any such information or data.
2. Contractor shall have full responsibility for reviewing and checking all such information and data; for locating all underground facilities shown or indicated in the Contract Documents; for coordination of the Work with the owners of such underground facilities during construction; for the safety, protection and repairing of any damage thereto resulting from the Work, the cost of which will be considered as having been included in the Contract Price.

B. Erosion Control: Erosion shall be controlled as described on Drawings and required by Oakland County, the State of Michigan or other authorities having jurisdiction. Erosion control devices referenced on the plans are based on the *Standard Erosion Control Handbook* published by MDOT.

C. Preexcavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.
3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM, or a combination of these groups; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Material complying with the requirements of MDOT Class II sand

E. Base Course: Material complying with the requirements of MDOT 21AA.

F. Engineered Fill: Material complying with the requirements of MDOT Class II sand.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.

J. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 157 lbf (700 N); ASTM D 4632.
3. Sewn Seam Strength: 142 lbf (630 N); ASTM D 4632.
4. Tear Strength: 56 lbf (250 N); ASTM D 4533.
5. Puncture Strength: 56 lbf (250 N); ASTM D 4833.
6. Apparent Opening Size: No. 40 (0.425-mm) sieve, maximum; ASTM D 4751.
7. Permittivity: 0.5 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.

4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 2 Section "Site Clearing."

C. Protect and maintain erosion and sedimentation controls, which are specified in Division 2 Section "Site Clearing," during earthwork operations.

D. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering systemto keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.

1. Clearance: 12 inches (300 mm) each side of pipe or conduit.

C. Trench Bottoms: Excavate trenches 4 inches (100 mm) deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.

1. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.8 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof-roll with a fully loaded, tandem-axle truck.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions forchanges in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Architect.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 3 Section "Cast-in-Place Concrete."

D. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the utility pipe or conduit.

E. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

F. Backfill voids with satisfactory soil while installing and removing shoring and bracing.

G. Place and compact final backfill of satisfactory soil to final subgrade elevation.

H. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.13 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. Under lawn or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 85 percent.

D. Excavated footing trenches shall be compacted to 95% just prior to concrete placement.

3.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Walks: Plus or minus 1 inch (25 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.17 SUBBASE AND BASE COURSES

A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course under pavements and walks as follows:

1. Shape subbase and base course to required crown elevations and cross-slope grades.
2. Place subbase and base course 6 inches (150 mm) or less in compacted thickness in a single layer.

3. Place subbase and base course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
4. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.18 DRAINAGE COURSE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Place drainage course 6 inches (150 mm) or less in compacted thickness in a single layer.
2. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
3. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.19 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab, but in no case fewer than 3 tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet (30 m) or less of wall length, but no fewer than 2 tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet (46 m) or less of trench length, but no fewer than 2 tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.20 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 02300

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 02751
CEMENT CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:

1. Curbs and gutters.
2. Walkways.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for subgrade preparation, grading, and subbase course.
2. Division 2 Section "Pavement Joint Sealants" for joint sealants of joints in concrete pavement and at isolation joints of concrete pavement with adjacent construction.
3. Division 3 Section "Cast-in-Place Concrete " for general building applications of concrete.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

A. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

B. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.

D. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves with a radius 100 feet (30.5 m) or less.

B. Concrete Footing Forms: Except where detailed and where conditions provide firm, solid sidewall excavation, forms will not be required. Where loose soil conditions are present, "Sonotube" forms or acceptable substitutes may be used. Form top as detailed on Drawings.

C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.

C. Plain Steel Wire: ASTM A 82, as drawn.

D. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Cut bars true to length with ends square and free of burrs.

E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.

B. Portland Cement: ASTM C 150, Type I.

C. Aggregate: **Limestone** of hard, durable, uncoated particles. Gradation and physical requirements to conform to MDOT 6AA.

1. Do not use fine or coarse aggregates containing substances that cause spalling.

D. Water: ASTM C 94/C 94M, clean and not detrimental to concrete.

2.4 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement to be compatible with other admixtures.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.

F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.5 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

B. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.

2.6 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Epoxy Adhesive: ASTM C 881, two component material suitable for dry or damp surfaces. Provide material type, grade, and class to suit requirements. Subject to compliance with requirements. Submit certification of compliance.

C. Detectable Warnings: Provide Armor-Tile, Cast In Place Truncated Dome Detectable Warning System as manufactured by Engineered Plastics, Inc., 300 International Drive, Suite 100, Williamsville, NY 14221, (800) 682-2525 or approved substitute. Color to be selected from manufacturer's standard list. Install per manufacturer's written recommendations and as detailed on the Drawings.

2.7 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

2. Do not use Owner's field quality-control testing agency as the independent testing agency.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 4000 psi (27.6 MPa).
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
3. Slump Limit: 3 inches (75 mm), plus or minus 1 inch (25 mm).

C. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.

D. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows within a tolerance of plus or minus 1.5 percent:

1. Air Content: 6 percent plus or minus 1.5 percent for 1-inch (25-mm) nominal maximum aggregate size.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.

1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

2.9 DETECTABLE WARNINGS

A. Provide Armor-Tile, Cast In Place Truncated Dome Detectable Warning System as manufactured by Engineered Plastics, Inc., 300 International Drive, Suite 100, Williamsville, NY 14221, (800) 682-2525 or approved substitute.

1. Color to be selected from manufacturer's standard list
2. Install per manufacturer's written recommendations and as indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap of adjacent mats.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
3. Provide tie bars at sides of pavement strips where indicated.
4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet (15.25 m), unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with a radiused jointer tool. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
2. Inserts: From contraction joints by inserting premolded plastic, hardboard, or fiberboard strips into fresh concrete until top surface of strip is flush with paving surface. Radius each joint edge with a jointer tool. Carefully remove strips or cans of two-piece assemblies after concrete has hardened. Clean groove of loose debris.

F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

1. Radius: ¼ inch (6 mm).

3.6 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

H. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.

I. Screed pavement surfaces with a straightedge and strike off.

J. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

K. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

L. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

M. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

N. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true

planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by curing compound as follows:
1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.9 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch (6 mm).
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm).
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing shall be performed according to the following requirements:

1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m.), plus one set for each additional 50 cu. yd. (38 cu. m.). One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reverse for later testing if required.
7. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
9. Strength level of concrete will be considered satisfactorily if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi (3.4 MPa).

C. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

E. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

E. Remove all hard water stains (white chalky build-up) from the top of the sealer surface, with commercial grade lime.

END OF SECTION 02751

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 02764
PAVEMENT JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Expansion and contraction joints within cement concrete pavement.
2. Joints between cement concrete and asphalt pavement.

B. Related Sections include the following:

1. Division 2 Section "Cement Concrete Pavement" for constructing joints in concrete pavement.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
2. When joint substrates are wet or covered with frost.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 COLD-APPLIED JOINT SEALANTS

A. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag silicone sealant complying with ASTM D 5893 for Type NS.

B. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.

C. Available Products: Subject to compliance with requirements, cold-applied joint sealants that may be incorporated into the Work include, but are not limited to, the following:

1. Type NS Silicone Sealant for Concrete:

a. Roadsaver Silicone-SL; Crafco Inc.
b. 888; Dow Corning

2. Type SL Silicone Sealant for Concrete and Asphalt:

a. 890-SL; Dow Corning

2.3 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

D. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

2.4 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of backer materials.
2. Do not stretch, twist, puncture, or tear backer materials.
3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses provided for each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealants from surfaces adjacent to joint.
2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions, unless otherwise indicated.

G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 02764

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 02920
LAWNS AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Seeding.
2. Lawn renovation.

B. Related Sections include the following:

1. Division 2 Section "Site Clearing" for topsoil stripping and stockpiling.
2. Division 2 Section "Earthwork" for excavation, filling and backfilling, and rough grading.

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety,

and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

C. Material Test Reports: For existing surface soil and imported topsoil.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawnestablishment.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of topsoil.

1. Report suitability of topsoil for lawn growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.7 SCHEDULING

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: May 15th to June 30th
2. Fall Planting: September 1st to October 31st

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.8 LAWN MAINTENANCE

A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

1. Seeded Lawns: 60 days from date of Substantial Completion.

    a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.

B. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.

1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent displacement.

C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches (100 mm).

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water lawn at a minimum rate of 1 inch (25 mm) per week.

D. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 40 percent of grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
1. Mow grass 1-1/2 to 2 inches (38 to 50 mm) high.

E. Lawn Postfertilization: Apply fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) to lawn area.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: State-certified seed of grass species, as indicated in Seed Mixture Schedule at the end of this section.

2.2 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth.

1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

    a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.

2.3 PLANTING ACCESSORIES

A. Selective Herbicides: EPA registered and approved, of type recommended by manufacturer for application.

2.4 FERTILIZER

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.

2.5 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic; free of plant-growth or germination inhibitors; with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

C. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

2.6 EROSION-CONTROL MATERIALS

A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding overspray.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 LAWN PREPARATION

A. Limit lawn subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches (150 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Spread planting soil mix to a depth of 6 inches (150 mm) but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.

D. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

E. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

3.4 DRILL SEEDING/ HYDROMULCHING LAWNS

A. Lawn seed mixes shall be mechanically seeded with a "Brillion" or equivalent seeding machine. Do not broadcast or drop seed. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged.
2. Sow seed at the rate of 8 lb per 1000 sq. ft. (3.8 kg per 100 sq. m).

B. Hydromulch within 24 hours after completing seeding operations.

C. Mix specified fertilizer and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

D. Apply slurry uniformly to all seeded areas in a one-step process. Apply mulch at a minimum rate of 1500-lb/acre (15.3-kg/92.9 sq. m) dry weight.

3.5 LAWN RENOVATION

A. Renovate existing lawn damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish lawn where settlement or washouts occur or where minor regrading is required.

B. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury in soil.

C. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.

D. Mow, dethatch, core aerate, and rake existing lawn.

E. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

F. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

G. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches (150 mm).

H. Apply seed and hydromulch as required for new lawns.

I. Water newly planted areas and keep moist until new lawn is established.

3.6 SATISFACTORY LAWNS

A. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm).

B. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.7 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.

C. Remove erosion-control measures after grass establishment period.

3.8 SEED MIXTURE SCHEDULE

A. GENERAL SEED MIX

Species	Mix	Purity	Germination
Annual Rye	10%	98%	95%
*Perennial Rye	30%	98%	95%
Creeping Red Fescue	20%	98%	95%
**Turf Type Fescue	40%	98%	95%

*Note: Provide a minimum of two varieties of Perennial Rye from the following list. Affinity, APM, Buccaneer, Nighthawk, Partner, Saturn, Seville.

**Note: Provide a minimum of two varieties of Turf Type Tall Fescue from the following list: Jubilee, Veranda, Morgan, Stagecoach.

END OF SECTION 02920

SECTION 02930
EXTERIOR PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Trees.
2. Shrubs.
3. Ground cover.
4. Perennials.
5. Edgings.

B. Related Sections include the following:

1. Division 2 Section "Site Clearing" for protection of existing trees and planting, topsoil stripping and stockpiling, and site clearing.
2. Division 2 Section "Earthwork" for excavation, filling, and rough grading and for subsurface aggregate drainage and drainage backfill materials.

1.3 DEFINITIONS

A. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum-laced as recommended by ANSI Z60.1.

B. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for kind, type, and size of exterior plant required.

C. Finish Grade: Elevation of finished surface of planting soil.

D. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

E. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

F. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

1.4 SUBMITTALS

A. Nursery Source: For all nursery stock indicated on Plans.

1. Submit list of growers for each plant species to be installed within 30 days following award of contract. Include substitution requests base on plant unavailability at that time. Substitution requests after this period will not be accepted.

B. Topsoil Analysis: Analysis of topsoil stockpiled for re-spreading prior to spreading or use in planting mix.

C. Material Test Reports: For existing surface soil and imported topsoil.

D. Planting Schedule: Indicating anticipated planting dates for exterior plants.

E. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of exterior plants during a calendar year. Submit before expiration of required maintenance periods.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of exterior plants.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when exterior planting is in progress.

B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of topsoil.

1. Report suitability of topsoil for plant growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil.

D. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."

E. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches (150 mm) above ground for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

F. Observation: Architect may observe trees and shrubs either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size, and quality. Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Architect of sources of planting materials seven days in advance of delivery to site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver exterior plants freshly dug.

B. Do not prune trees and shrubs before delivery, except as approved by Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.

C. Handle planting stock by root ball.

D. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants trees in shade, protect from weather and mechanical damage, and keep roots moist.

1. Heel-in bare-root stock. Soak roots in water for two hours if dried out.
2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. Do not remove container-grown stock from containers before time of planting.
4. Water root systems of exterior plants stored on-site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.7 COORDINATION

A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

B. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns, unless otherwise acceptable to Architect.

1. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.

1.8 WARRANTY

A. Special Warranty: Warrant the following exterior plants, for the warranty period indicated, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, or incidents that are beyond Contractor's control.

1. Warranty Period: One year from date of Substantial Completion.
2. Remove dead exterior plants immediately. Replace immediately unless required to plant in the succeeding planting season.
3. Replace exterior plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
4. A limit of one replacement of each exterior plant will be required, except for losses or replacements due to failure to comply with requirements.

1.9 MAINTENANCE

A. Trees and Shrubs: Maintain for the following maintenance period by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease. Restore or replace damaged tree wrappings.

1. Maintenance Period: Six months from date of Substantial Completion.

B. Ground Cover and Plants: Maintain for the following maintenance period by watering, weeding, fertilizing, and other operations as required to establish healthy, viable plantings:

1. Maintenance Period: Three months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TREE AND SHRUB MATERIAL

A. General: Furnish nursery-grown trees and shrubs complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

B. Grade: Provide trees and shrubs of sizes and grades complying with ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Label each tree and shrub with securely attached, waterproof tag bearing legible designation of botanical and common name.

D. If formal arrangements or consecutive order of trees or shrubs is shown, select stock for uniform height and spread, and number label to assure symmetry in planting.

2.2 SHADE AND FLOWERING TREES

A. Shade Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, complying with ANSI Z60.1 for type of trees required.

1. Provide balled and burlapped trees.
2. Branching Height: One-half of tree height.

B. Small Upright Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form as follows:

1. Stem Form: Single stem.
2. Provide balled and burlapped trees.

C. Multistem Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form as follows:

1. Stem Form: Clump.
2. Provide balled and burlapped trees.

2.3 DECIDUOUS SHRUBS

A. Form and Size: Deciduous shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of shrub.

1. Provide balled and burlapped or container grown shrubs.

2.4 CONIFEROUS EVERGREENS

A. Form and Size: Normal-quality, well-balanced, coniferous evergreens, of type, height, spread, and shape required, complying with ANSI Z60.1.

B. Form and Size: Specimen-quality, exceptionally heavy, tightly knit, symmetrically shaped coniferous evergreens and the following grade:

1. Heavy Grade: " XX."
2. Provide balled and burlapped trees.

2.5 BROADLEAF EVERGREENS

A. Form and Size: Normal-quality, well-balanced, broadleaf evergreens, of type, height, spread, and shape required, complying with ANSI Z60.1.

1. Provide balled and burlapped trees.

2.6 GROUND COVER PLANTS

A. Ground Cover: Provide ground cover of species indicated, established and well rooted in pots or similar containers, and complying with ANSI Z60.1.

2.7 PLANTS

A. Perennials: Provide healthy, field-grown plants from a commercial nursery, of species and variety shown or listed.

2.8 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 6 percent organic material content; free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth.

1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

    a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.

2.9 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:

1. Class: Class T, with a minimum 99 percent passing through No. 8 (2.36-mm) sieve and a minimum 75 percent passing through No. 60 (0.25-mm) sieve.
2. Provide lime in form of dolomitic limestone.

B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 (3.35-mm) sieve and a maximum 10 percent passing through No. 40 (0.425-mm) sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Aluminum Sulfate: Commercial grade, unadulterated.

E. Perlite: Horticultural perlite, soil amendment grade.

F. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.

G. Sand: Clean, washed, natural or manufactured, free of toxic materials.

2.10 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 Insert range percent of dry weight.

B. Peat: Finely divided or granular texture, with a pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having a water-absorbing capacity of 1100 to 2000 percent.

C. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.11 FERTILIZER

A. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.12 PLANTING SOIL MIX

A. Planting Soil Mix: Mix topsoil with the following soil amendments and fertilizers in the following quantities:

1. Compost: To achieve 6% organic matter.
2. Ratio of Loose Peat to Topsoil by Volume: Three (3) parts by volume of topsoil to one (1) part of granulated peat unless otherwise required.
3. Lime: As specified to meet the pH range of 5.5 to 7.
4. Weight of Slow-Release Fertilizer: Ten (10) pounds per 1,000 Sq. Ft. (92.9 Sq. M.).

2.13 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood.

2.14 LANDSCAPE EDGINGS

A. Steel Edging: Standard commercial-steel edging, rolled edge, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.

1. Edging Size: 3/16 inch (4.8 mm) wide by 4 inches (100 mm) deep.
2. Stakes: Tapered steel, a minimum of 15 inches (380 mm) long.
3. Accessories: Standard tapered ends, corners, and splicers.
4. Finish: Standard paint.
5. Paint Color: Black.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Steel Edging:

a. Border Concepts, Inc.
b. Collier Metal Specialties, Inc.
c. Russell, J. D. Company (The).
d. Ryerson Tull, Inc.
e. Sure-loc Aluminum Edging Corporation.

2.15 MISCELLANEOUS PRODUCTS

A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

B. Trunk-Wrap Tape: Two layers of crinkled paper cemented together with bituminous material, 4-inch- (100-mm-) wide minimum, with stretch factor of 33 percent.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, and lawns and existing exterior plants from damage caused by planting operations.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple exterior plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before planting. Make minor adjustments as required.

D. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

3.3 PLANTING BED ESTABLISHMENT

A. Loosen subgrade of planting beds to a minimum depth of 4 inches (100 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Thoroughly blend planting soil before spreading.

a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.

2. Spread planting soil mix to a depth of 4 inches (100 mm) but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

B. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

C. Restore planting beds if eroded or otherwise disturbed after finish grading and before planting.

3.4 TREE AND SHRUB EXCAVATION

A. Pits and Trenches: Excavate as detailed on Drawings.

B. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

C. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.

D. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE AND SHRUB PLANTING

A. Set balled and burlapped stock plumb and in center of pit or trench with top of root ball 1 inch (25 mm) above adjacent finish grades.

1. Place stock on setting layer of compacted planting soil.
2. Remove burlap and wire baskets from tops of root balls and partially from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.

B. Set container-grown stock plumb and in center of pit or trench with top of root ball 1 inch (25 mm) above adjacent finish grades.

1. Carefully remove root ball from container without damaging root ball or plant.
2. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.

C. Organic Mulching: Apply 3-inch (75-mm) average thickness of organic mulch extending 12 inches (300 mm) beyond edge of planting pit or trench. Do not place mulch within 3 inches (75 mm) of trunks or stems.

D. Wrap trees of 2-inch (50-mm) caliper and larger with trunk-wrap tape. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling. Inspect tree trunks for injury, improper pruning, and insect infestation; take corrective measures required before wrapping.

3.6 TREE AND SHRUB PRUNING

A. Prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character. Shrub sizes indicated are sizes after pruning.

3.7 GROUND COVER AND PLANT PLANTING

A. Set out and space ground cover and plants as indicated.

B. Dig holes large enough to allow spreading of roots, and backfill with planting soil.

C. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

D. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

E. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.8 PLANTING BED MULCHING

A. Mulch backfilled surfaces of planting beds and other areas indicated.

1. Organic Mulch: Apply 3-inch (75-mm) average thickness of organic mulch, and finish level with adjacent finish grades. Do not place mulch against plant stems.

3.9 EDGING INSTALLATION

A. Steel Edging: Install steel edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately 30 inches (760 mm) apart, driven below top elevation of edging.

3.10 CLEANUP AND PROTECTION

A. During exterior planting, keep adjacent pavings and construction clean and work area in an orderly condition.

B. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged exterior planting.

3.11 DISPOSAL

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 02930

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Slabs-on-grade.

B. Related Sections include the following:

1. Division 2 Section "Cement Concrete Pavement" for concrete pavement and walks.
2. Division 3 Section "Cast-in-Place Architectural Concrete" for general building applications of specially finished formed concrete.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 318, "Specification for Structural Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control and concrete protection.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

a. High-density overlay, Class 1 or better.
b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
c. Structural 1, B-B or better; mill oiled and edge sealed.
d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.

B. Epoxy-Coated Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, ASTM A 775/A 775M epoxy coated.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I, Supplement with the following:

a. Fly Ash: ASTM C 618, as noted on structural drawings.

B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 FIBER REINFORCEMENT

A. Fibrous Reinforcement: Steel Fibers to be low carbon, cold drawn steel wire conforming to ASTM A820 Type 1. Steel fibers to be corrugated, minimum 2 inches in length. Dosage of steel fibers is to be minimum 30 lbs/yds, or as recommended by manufacturer.

2.7 VAPOR RETARDERS

A. Plastic Vapor Retarder: ASTM E 1745, Class B. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.8 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

C. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.9 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.10 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3500 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.50.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: Not applicable.

B. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Minimum Cementitious Materials Content: 470 lb/cu. yd.
3. Maximum water/cement ratio to be 0.45.
4. Steel fibers at 30 lb/yd3.
5. Slump Limit: 3 inches, plus or minus 1 inch.
6. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for exterior concrete.
7. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

2.12 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class C, 1/2 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Do not chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
2. Space vertical joints in walls at 20'-0" o.c.. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of

weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to be covered, or sand-bed terrazzo.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring or carpet, paint, or another thin-film-finish coating system.
2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:

    a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
    b. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
    c. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.
    d. Specified overall values of flatness, F(F) 45; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and of levelness, F(L) 24.

3. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot- long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/8 inch

D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.11 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

    a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound

manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

2. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least **[one]** [**six**] month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
5. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

4. Air Content: ASTM C 231, pressure method, for normal-weight concrete;one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
6. Compression Test Specimens: ASTM C 31/C 31M.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure one set of two standard cylinder specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.

C. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

END OF SECTION 03300

SECTION 03542
HYDRAULIC-CEMENT-BASED UNDERLAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes hydraulic-cement-based underlayment for use below interior floor coverings.

B. Related Sections include the following:

1. Division 9 Sections for patching and leveling compounds applied with floor coverings.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Manufacturer Certificates: Signed by manufacturers of both underlayment and floor covering system certifying that products are compatible.

C. Qualification Data: For Installer.

D. Minutes of preinstallation conference.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

B. Product Compatibility: Manufacturers of both underlayment and floor covering system certify in writing that products are compatible.

C. Mockups: Apply hydraulic-cement-based underlayment mockups to demonstrate surface finish, bonding, texture, tolerances, and standard of workmanship.

1. Apply mockups approximately 100 sq. ft. in area in location indicated or, if not indicated, as directed by Architect.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature and humidity, ventilation, and other conditions affecting underlayment performance.

1. Place hydraulic-cement-based underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

1.7 COORDINATION

A. Coordinate application of underlayment with requirements of floor covering products, including adhesives, specified in Division 9 Sections, to ensure compatibility of products.

PART 2 - PRODUCTS

2.1 HYDRAULIC-CEMENT-BASED UNDERLAYMENTS

A. Underlayment: Hydraulic-cement-based, polymer-modified, self-leveling product that can be applied in minimum uniform thicknesses of 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Ardex; K-15 Self-Leveling Underlayment Concrete.
b. Bonsal, W. R. Company; Self-Leveling Underlayment.
c. ChemRex; MBT Mastertop 110 Plus Underlayment, Sonneborn Sonocrete Sonoflow, Thoro Underlayment, Self-Leveling.
d. Conspec, a Dayton Superior Company; Conflow.
e. Dayton Superior Corporation; LeveLayer I.
f. Dependable Chemical Co., Inc.; Skimflow ES.
g. L&M Construction Chemicals, Inc.; Levelex.
h. MAPEI Corporation; Ultraplan 1.
i. Maxxon Corporation; Level-Right.

j. US Mix Products Company; US SPEC Self - Leveling Underlayment.

2. Cement Binder: ASTM C 150, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
3. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer formulated for use with underlayment when applied to substrate and conditions indicated.

B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch; or coarse sand as recommended by underlayment manufacturer.

1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.

C. Water: Potable and at a temperature of not more than 70 deg F.

D. Reinforcement: For underlayment applied to wood substrates, provide galvanized metal lath or other corrosion-resistant reinforcement recommended in writing by underlayment manufacturer.

E. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

F. Corrosion-Resistant Coating: Recommended in writing by underlayment manufacturer for metal substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance.

1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare and clean substrate according to manufacturer's written instructions.

1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
2. Fill substrate voids to prevent underlayment from leaking.

B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.

1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 APPLICATION

A. General: Mix and apply underlayment components according to manufacturer's written instructions.

1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
2. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.
3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply underlayment to produce uniform, level surface.

1. Apply a final layer without aggregate to produce surface.
2. Feather edges to match adjacent floor elevations.

D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.

E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

F. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 03542

SECTION 04810
UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units (CMUs).
2. Face brick.
3. Structural-clay facing tile.
4. Mortar and grout.
5. Reinforcing steel.
6. Masonry joint reinforcement.
7. Ties and anchors.
8. Embedded flashing.
9. Miscellaneous masonry accessories.
10. Cavity-wall insulation.

B. Related Sections include the following:

1. Division 4 Section "Stone Masonry" for stone wall caps.
2. Division 7 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
3. Division 7 Section "Through-Penetration Firestop Systems" for firestopping at openings in masonry walls.
4. Division 7 Section "Fire-Resistive Joint Systems" for fire-resistive joint systems at heads of masonry walls.
5. Division 7 Section "Joint Sealants" for sealing control and expansion joints in unit masonry.

C. Products furnished, but not installed, under this Section include the following:

1. Anchor sections of adjustable masonry anchors for connecting to structural frame, installed under Division 5 Section "Structural Steel."

D. Products installed, but not furnished, under this Section include the following:

1. Steel lintels and shelf angles for unit masonry, furnished under Division 5 Section "Metal Fabrications."
2. Manufactured reglets in masonry joints for metal flashing, furnished under Division 7 Section "Sheet Metal Flashing and Trim."

1.3 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths (f'_m) at 28 days.

B. Determine net-area compressive strength (f'_m) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For the following:

1. Colored mortar.

C. Samples for Verification: For each type and color of the following:

1. Face brick, in the form of straps of five or more bricks.
2. Glazed structural-clay facing tile.
3. Special brick shapes.
4. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
5. Weep holes/vents.
6. Accessories embedded in masonry.

D. Qualification Data: For testing agency.

E. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:

1. Masonry units.

a. Include material test reports substantiating compliance with requirements.
b. For bricks, include size-variation data verifying that actual range of sizes falls within specified tolerances.

c. For exposed brick, include material test report for efflorescence according to ASTM C 67.
d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

F. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specification.
2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

G. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

H. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

C. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical wall area as shown on Drawings.
2. Build mockups for typical exterior wall in sizes approximately 48 inches long by 72 inches high by full thickness, including face and backup wythes and accessories.

a. Include a sealant-filled joint at least 16 inches long in exterior wall mockup.

3. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
4. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
5. Protect accepted mockups from the elements with weather-resistant membrane.
6. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

    a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
    b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not uses units where such defects, including dimensions that vary from specified

dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.3 CONCRETE MASONRY UNITS (CMUs)

A. Shapes: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide bullnose units for outside corners, unless otherwise indicated.

B. Concrete Masonry Units: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
2. Weight Classification: Medium weight or Normal weight.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.4 BRICK

A. General: Provide shapes indicated and as follows:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Face Brick: ASTM C 216, Grade SW Type FBS.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3000 psi.
2. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
3. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
4. Provide face brick matching color range, texture, and size of existing adjacent brickwork. Field verification and brick selection must be checked for each section of the building due to variations in exiting brick.
5. Color and Texture: As selected by Architect.
6. For bid purposes provide the following brick:

a. Beldon Brick: "Pago Blend" velour or pre-approved equal to match existing Baker Middle School.

2.5 STRUCTURAL-CLAY FACING TILE

A. General:

1. Provide solid, multicored, or hollow units, with shape and direction of cores optional, unless otherwise indicated.
2. Provide special shapes where required for corners, jambs, coved bases, sills, and other special conditions indicated, including applications that cannot be produced by sawing standard units.

    a. Provide bullnose units for outside corners, unless otherwise indicated.
    b. Provide coved internal corners.

B. Glazed Structural-Clay Facing Tile: ASTM C 126, Grade S (Select).

1. Sizes: Match existing base course or base and wall till where required.
2. Provide Type I (single-faced units) where only one finished face is exposed when units are installed.
3. Provide special units glazed on ends and tops, as well as faces for corners, jambs, sills, pilasters, columns, and other applications indicated, where glazed units are exposed on other surfaces and faces.
4. Colors and Patterns: Match existing colors. Color shall be field verified and approved by the Architect.

2.6 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.

D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

1. Products:

    a. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments.
    b. Davis Colors; True Tone Mortar Colors.
    c. Solomon Grind-Chem Services, Inc.; SGS Mortar Colors.

E. Colored Cement Product: Packaged blend made from portland cement and lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
2. Pigments shall not exceed 10 percent of portland cement by weight.
3. Available Products:

a. Colored Portland Cement-Lime Mix:

1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
3) Lafarge North America Inc.; Eaglebond.
4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.

F. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

G. Aggregate for Grout: ASTM C 404.

H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Products:

a. Addiment Incorporated; Mortar Kick.
b. Euclid Chemical Company (The); Accelguard 80.
c. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset.
d. Sonneborn, Div. of ChemRex; Trimix-NCA.

I. Water: Potable.

2.7 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951.

1. Interior Walls: Hot-dip galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.
3. Wire Size for Side Rods: W1.7 or 0.148-inch diameter.
4. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.

5. Wire Size for Veneer Ties: W2.8 or 0.188-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet , with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

D. Masonry Joint Reinforcement for Multiwythe Masonry:

1. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate ties that extend into facing wythe. Ties have two hooks that engage eyes or slots in reinforcement and resist movement perpendicular to wall. Ties extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.

2.8 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.

1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units or hollow units laid with cells horizontal.
2. Where wythes are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
3. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel wire.

D. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire.
2. Tie Section for Steel Frame: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.188-inch- diameter, hot-dip galvanized steel wire.

E. Partition Top anchors: 0.097-inch- thick metal plate with 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

F. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins, unless otherwise indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

G. Adjustable Masonry-Veneer Anchors

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:

a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.

2. Contractor's Option: Unless otherwise indicated, provide any of the following types of anchors:
3. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.

a. Anchor Section: Zinc-alloy barrel section with flanged head with eye and corrosion-resistant, self-drilling screw. Eye designed to receive wire tie and to serve as head for drilling fastener into framing. Barrel length to suit sheathing thickness, allowing screw to seat directly against framing with flanged head covering hole in sheathing.
b. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.188-inch-diameter, hot-dip galvanized steel wire.
c. Available Products:

1) Heckmann Building Products Inc.; Pos-I-Tie.

2.9 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.

B. Anchor Bolts: Headed steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

C. Postinstalled Anchors: Provide chemical or torque-controlled expansion anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

2.10 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with Division 7 Section "Sheet Metal Flashing and Trim" and as follows:

1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.

    a. Products:

        1) Cheney Flashing Company.
        2) Keystone Flashing Company, Inc.; Keystone 3-Way Interlocking Thruwall Flashing.

3. Fabricate through-wall metal flashing embedded in masonry under stone coping and caps from copper, with ribs at 3-inch (75-mm) intervals along length of flashing to provide an integral mortar bond.

    a. Available Products:

        1) Cheney Flashing Company; Cheney Flashing (Dovetail) or Cheney 3-Way Flashing (Sawtooth)].
        2) Keystone Flashing Company, Inc.; Keystone 3-Way Interlocking Thruwall Flashing.

4. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
5. Metal Flashing Terminations: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 3/8 inch to form a stop for retaining sealant backer rod.
6. Metal Expansion-Joint Strips: Fabricate from stainless steel to shapes indicated.

B. Flexible Flashing: For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:

1. Copper-Laminated Flashing: 7-oz./sq. ft. copper sheet bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.

    a. Products:

        1) Advanced Building Products Inc.; Copper Fabric Flashing.
        2) AFCO Products Inc.; Copper Fabric.
        3) Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
        4) Phoenix Building Products; Type FCC-Fabric Covered Copper.
        5) Polytite Manufacturing Corp.; Copper Fabric Flashing.
        6) Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
        7) York Manufacturing, Inc.; York Copper Fabric Flashing.

2. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637, 0.040 inch thick.

a. Products:

1) Carlisle Coatings & Waterproofing; Pre-Kleened EPDM Thru-Wall Flashing.
2) Firestone Building Products; FlashGuard.
3) Heckmann Building Products Inc.; No. 81 EPDM Thru-Wall Flashing.

C. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."

1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
2. Elastomeric Sealant: ASTM C 920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

C. Weep/Vent Products: Use the following, unless otherwise indicated:

1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.

a. Products:

1) Advanced Building Products Inc.; Mortar Maze weep vent.
2) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
3) Heckmann Building Products Inc.; No. 85 Cell Vent.
4) Hohmann & Barnard, Inc.; Quadro-Vent.
5) Wire-Bond; Cell Vent.

D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Provide one of the following configurations:

a. Strips, full-depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings.

2. Products:

a. Morta Net USA, LTD.; Mortar Net.

2.12 CAVITY-WALL INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, closed-cell product extruded with an integral skin.

B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

2.13 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers:

a. Diedrich Technologies, Inc.
b. EaCo Chem, Inc.
c. ProSoCo, Inc.

2.14 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Limit cementitious materials in mortar to portland cement and lime.
3. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement and lime.
4. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For masonry below grade or in contact with earth, use Type M.
2. For reinforced masonry, use Type S.
3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.

4. For interior non-load-bearing partitions, Type N.

D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments shall not exceed 10 percent of portland cement by weight.
2. Mix to match Architect's sample.

E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Mix to match Architect's sample.

F. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

G. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.

2.15 SOURCE QUALITY CONTROL

A. Owner will engage a qualified independent testing agency to perform source quality-control testing indicated below:

1. Payment for these services will be made by Owner.
2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

B. Clay Masonry Unit Test: For each type of unit furnished, per ASTM C 67.

C. Concrete Masonry Unit Test: For each type of unit furnished, per ASTM C 140.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

H. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

G. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

H. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c., unless otherwise indicated.
3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 7 Section "Fire-Resistive Joint Systems."

3.4 MORTAR BEDDING AND JOINTING

A. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

C. Lay structural-clay tile as follows:

1. Lay vertical-cell units with full head joints, unless otherwise indicated. Provide bed joints with full mortar coverage on face shells and webs.
2. Lay horizontal-cell units with full bed joints, unless otherwise indicated. Keep drainage channels, if any, free of mortar. Form head joints with sufficient mortar so excess will be squeezed out as units are placed in position. Butter both sides of units to be placed, or butter one side of unit already in place and one side of unit to be placed.
3. Maintain joint thicknesses indicated except for minor variations required to maintain bond alignment. If not indicated, lay walls with 3/8-inch thick joints.
4. Provide epoxy-mortar pointed joints for base units, rake out setting mortar to a uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.

3.5 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.

    a. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type ties to allow for differential movement regardless of whether bed joints align.

2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.

    a. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement to allow for differential movement regardless of whether bed joints align.

3. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

C. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.6 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

    a. Reinforcement above is in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1/2 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally.

3.8 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Embed tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
2. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
3. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally with not less than 1 anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

3.9 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry as follows:

1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.

C. Form expansion joints in brick made from clay or shale as follows:

1. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants."

D. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants," but not less than 3/8 inch.

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.10 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and where openings of more than 12 inches for brick size units and 24 inches for block size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.11 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.

2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and 1-1/2 inches into the inner wythe. Form 1/4-inch hook in edge of flashing embedded in inner wythe.
3. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
4. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
5. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.

B. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

C. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products to form weep holes.
2. Space weep holes 24 inches o.c., unless otherwise indicated.

D. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.

3.12 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:

1. Payment for these services will be made by Owner.
2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

B. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

C. Clay Masonry Unit Test: For each type of unit provided, per ASTM C 67.

D. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.

E. Mortar Test (Property Specification): For each mix provided, per ASTM C 780. Test mortar for mortar air content and compressive strength.

F. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

G. Prism Test: For each type of construction provided, per ASTM C 1314 at 7 days and at 28 days.

3.14 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Excess Masonry Waste: Remove masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04810

SECTION 04860
STONE MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the following applications of stone masonry:

1. Wall caps.

B. Related Sections:

1. Division 4 Section "Unit Masonry Assemblies" for cavity-wall insulation, concealed flashing, horizontal joint reinforcement, veneer anchors and mortar.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For stone varieties proposed for use on Project, include test data indicating compliance with physical properties specified or required by referenced ASTM standards.

B. Samples for Verification:

1. For each stone type indicated. Include at least two samples in each set for each type of stone, exhibiting extremes of the full range of color and other visual characteristics expected in completed Work. Samples will establish the standard by which stone provided will be judged.

C. Qualification Data: For qualified Installer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs experienced stonemasons and stone fitters.

B. Source Limitations for Stone: Obtainstone,from one quarrywith resources to provide materials of consistent quality in appearance and physical properties.

C. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

A. Protection of Stone Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed stone masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining the face of stone masonry.

1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on the ground and over the wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at end of each day to prevent rain from splashing mortar and dirt on completed stone masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace stone masonry damaged by frost or freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1.7 COORDINATION

A. Advise installers of other work about specific requirements for placement of reinforcement, veneer anchors, flashing, and similar items to be built into stone masonry.

PART 2 - PRODUCTS

2.1 LIMESTONE

A. Limestone: Comply with ASTM C 568.

1. Classification: II Medium-Density.
2. Description: Oolitic limestone.

B. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.2 STONE TRIM ANCHORS

A. Stone Trim Anchors: Units fabricated with tabs or dowels designed to engage kerfs or holes in stone trim units and holes for fasteners or postinstalled anchor bolts for fastening to substrates or framing as indicated.

B. Materials: Fabricate anchors from stainless steel, ASTM A 240/A 240M, Type 304. Fabricate dowels from stainless steel, ASTM A 276, Type 304.

C. Fasteners for Stone Trim Anchors: Annealed stainless-steel bolts, nuts, and washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.

D. Postinstalled Anchor Bolts for Fastening Stone Trim Anchors: Chemical anchors made from stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

2.3 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by cleaner manufacturer and stone producer.

2.4 FABRICATION

A. Fabricate stone to comply with sizes, shapes, and tolerances recommended by applicable stone association or, if none, by stone source, for faces, edges, beds, and backs.

1. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."

B. Cut stone to produce pieces of thickness, size, and shape indicated, including details on Drawings. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated.

C. Cut and drill sinkages and holes in stone for anchors and supports.

D. Carefully inspect stone at quarry or fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units before shipment.

1. Clean sawed backs of stone to remove rust stains and iron particles.

E. Thickness of Stone: Provide thickness indicated, but not less than the following:

1. Thickness: 4 inches plus or minus 1/8 inch. Thickness does not include projection of pitched faces.

F. Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples and mockups.

1. Finish: Smooth.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces indicated to receive stone masonry, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine substrate to verify that dovetail slots, inserts, reinforcement, veneer anchors, flashing, and other items installed in substrates and required for or extending into stone masonry are correctly installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.3 SETTING OF STONE MASONRY, GENERAL

A. Perform necessary field cutting and trimming as stone is set.

1. Use power saws to cut stone that is fabricated with saw-cut surfaces. Cut lines straight and true, with edges eased slightly to prevent snipping.

B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.

C. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.

D. Set stone to comply with requirements indicated on Drawings. Install supports, fasteners, and other attachments indicated or necessary to secure stone masonry in place. Set stone accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

E. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment if any. Lay stone with joints not less than 3/8 inch at narrowest points or more than 1/2 inch at widest points.

F. Provide sealant joints of widths and at locations indicated.

1. Keep sealant joints free of mortar and other rigid materials.
2. Sealing joints is specified in Division 7 Section "Joint Sealants."

G. Install embedded flashing obstructions to downward flow of water in wall, and where indicated.

1. Under caps and sills.
2. At ends of head and sill flashing turn up not less than 2 inches to form end dams.
3. Cut flexible flashing flush with face of wall after masonry wall construction is completed.

3.4 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/8 inch in 20 feet or 1/2 inch in 40 feet or more.

B. Measure variation from level, plumb, and position shown in plan as variation of the average plane of the face of each stone from level, plumb, or dimensioned plane.

C. Variation in Mortar-Joint Thickness: Do not vary from joint size range indicated.

D. Variation in Plane between Adjacent Stones: Do not exceed one-half of tolerance specified for thickness of stone.

3.5 INSTALLATION OF ANCHORED STONE MASONRY

A. Anchor stone trim with stone trim anchors where indicated. Install anchors by fastening to substrate and inserting tabs and dowels into kerfs and holes in stone units. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with mortar.

B. Set stone in full bed of mortar with full head joints unless otherwise indicated. Build anchors into mortar joints as stone is set.

C. Rake out joints for pointing with mortar to depth of not less than 1/2 inch before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides.

3.6 POINTING

A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch deep until a uniform depth is formed.

B. Point stone joints by placing and compacting pointing mortar in layers not more than 3/8 inch deep. Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.

C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:

1. Joint Profile: Concave.

3.7 ADJUSTING AND CLEANING

A. Remove and replace stone masonry of the following description:

1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
2. Defective joints.
3. Stone masonry not matching approved samples and mockups.
4. Stone masonry not complying with other requirements indicated.

B. Replace in a manner that results in stone masonry matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean stone masonry as work progresses. Remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean stone masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
3. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
4. Clean stone masonry by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised II, using job-mixed detergent solution.

5. Clean stone masonry with proprietary acidic cleaner applied according to manufacturer's written instructions.
6. Clean limestone masonry to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.8 EXCESS MATERIALS AND WASTE

A. Excess Stone: Stack excess stone where directed by Owner for Owner's use.

B. Disposal as Fill Material: Dispose of clean masonry waste, including mortar and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in greatest dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 2 Section "Earthwork."
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other waste, and legally dispose of off Owner's property.

END OF SECTION 04860

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 05500
METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Loose bearing and leveling plates.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.
2. Division 4 Section "Unit Masonry Assemblies" for installing loose lintels, anchor bolts, and other items indicated to be built into unit masonry.
3. Division 5 Section "Structural Steel."

1.3 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A 500, cold-formed steel tubing.

C. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.

C. Anchor Bolts: ASTM F 1554, Grade 36.

1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

D. Eyebolts: ASTM A 489.

E. Machine Screws: ASME B18.6.3.

F. Lag Bolts: ASME B18.2.1.

G. Wood Screws: Flat head, ASME B18.6.1.

H. Plain Washers: Round, ASME B18.22.1.

I. Lock Washers: Helical, spring type, ASME B18.21.1.

J. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material for Anchors in Exterior Locations: Alloy Group 1 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that comply with Division 9 painting Sections.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.

1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.

G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Furnish inserts if units are installed after concrete is placed.

C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Galvanize miscellaneous framing and supports where indicated.

E. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches, unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

2.8 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize shelf angles located in exterior walls.

D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.9 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Prime plates with zinc-rich primer.

2.10 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.11 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

3.3 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05500

SECTION 05521
PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel pipe railings.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

3. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
b. Uniform load of 25 lbf/sq. ft. applied horizontally.
c. Infill load and other loads need not be assumed to act concurrently.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.3 SUBMITTALS

A. Product Data: For grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples: For each exposed finish required.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating railings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

PART 2 - PRODUCTS

2.1 METALS

A. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

B. Steel and Iron:

1. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
2. Castings: Either gray or malleable iron, unless otherwise indicated.

a. Gray Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.
b. Malleable Iron: ASTM A 47/A 47M.

2.2 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Shop Primers: Provide primers that comply with Division 9 painting Sections.

C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
3. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
4. Products: Subject to compliance with requirements, provide one of the following:

   a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
   b. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
   c. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
   d. Tnemec Company, Inc.; Tneme-Zinc 90-97.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

2.3 FABRICATION

A. General: Fabricate railings to comply with design, dimensions, and details indicated, but not less than that required to support structural loads.

B. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

C. Form changes in direction by bending.

D. Form curves by bending in jigs to produce uniform curvature; maintain cross section of member throughout bend without cracking or otherwise deforming exposed surfaces.

E. Close exposed ends of railing members with prefabricated end fittings.

F. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.

2.4 STEEL AND IRON FINISHES

A. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For nongalvanized steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.

C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed railings:
   1. Interior Railings (SSPC Zone 1A): SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."

D. Apply shop primer to prepared surfaces of railings, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

   1. Do not apply primer to galvanized surfaces.
   2. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation.

   1. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
   2. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

C. Anchor posts in concrete by inserting into formed or core-drilled holes and grouting annular space.

D. Anchor railing ends to concrete and masonry with round flanges connected to railing ends and anchored to wall construction with anchors and bolts.

E. Attach handrails to wall with wall brackets.

   1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt

F. Adjusting and Cleaning:

   1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting.
   2. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05521

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 06105
MISCELLANEOUS CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Rooftop equipment bases and support curbs.
2. Wood blocking, cants, and nailers.
3. Wood furring and grounds.

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NHLA: National Hardwood Lumber Association.
3. NLGA: National Lumber Grades Authority.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.4 SUBMITTALS

A. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.

1.5 QUALITY ASSURANCE

A. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria":

1. Dimension lumber framing.
2. Miscellaneous lumber.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

B. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C2.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).

1. Use treatment that does not promote corrosion of metal fasteners.
2. Use Exterior type for exterior locations and where indicated.
3. Use Interior Type A, unless otherwise indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings, and the following:

1. Concealed blocking.
2. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.
7. Utility shelving.

B. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber with 19 percent maximum moisture content of any species.

C. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber with 19 percent maximum moisture content and any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB, or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
6. Western woods; WCLIB or WWPA.

7. Northern species; NLGA.
8. Eastern softwoods; NeLMA.

D. For blocking not used for attachment of other construction Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, 3/4-inch nominal thickness.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
2. All fasteners used in contact with non-arsenic treated lumber must be double dipped galvanized or stainless steel in compliance with lumber manufacturer's requirements and all applicable codes. Other corrosive resistant finishes may be used if approved by lumber manufacturer and submitted and approved by the architect.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Lag Bolts: ASME B18.2.1.

G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.

D. Do not splice structural members between supports, unless otherwise indicated.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

F. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

G. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

H. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

I. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

END OF SECTION 06105

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 07552
MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Modified bituminous membrane roofing over prepared substrate.
2. Roof Insulation.
3. Roof substrate board.

B. Related Sections include the following:

1. Division 6 Section "Miscellaneous Carpentry" for wood blocking and nails.
2. Division 7 "Flashing and Sheet Metal" for metal roof penetration flashings, flashings, and counter-flashings..

1.3 REFERENCES

A. American Society of Civil Engineers (ASCE):

1. ASCE 7-98, Minimum Design Loads for Buildings and Other Structures.

B. American Society for Testing and Materials (ASTM):

1. ASTM D41-94, Specification for Asphalt Primer Used in Roofing, Dampproofing and Waterproofing.
2. ASTM D312-00, Specification for Asphalt Used in Roofing.
3. ASTM D451-91, Test Method for Sieve Analysis of Granular Mineral Surfacing for Asphalt Roofing Products.
4. ASTM D1079-01, Terminology Relating to Roofing, Waterproofing and Bituminous Materials.
5. ASTM D1863-93, Specification for Mineral Aggregate Used as a Protective Coating for Roofing.
6. ASTM D2178-97a, Specification for Asphalt Glass Felt Used as a Protective Coating for Roofing.
7. ASTM D2822-91, Specification for Asphalt Roof Cement.

8. ASTM D2824-02, Specification for Aluminum-Pigmented Asphalt Roof Coating.
9. ASTM D5147-01a, Test Method for Sampling and Testing Modified Bituminous Sheet Materials.
10. ASTM D6162-0a, Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.
11. ASTM D6163-00, Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.
12. ASTM E108-00, Test Methods for Fire Test of Roof Coverings.

C. Factory Mutual Research (FM):

1. Roof Assembly Classifications.

D. National Roofing Contractors Association (NRCA):

1. Roofing and Waterproofing Manual.

E. Underwriters Laboratories, Inc. (UL):

1. Fire Hazard Classifications.

F. Warnock Hersey (WH):

1. Fire Hazard Classifications.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide and install a long-term, quality roof system that meets or exceeds all current NRCA guidelines as stated in the most recent edition of the NRCA Roofing and Waterproofing Manual.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

1.5 SUBMITTALS

A. Any material submitted as equal to the specified material must be accompanied by a copy of the manufacturer's standard specification section. That specification section shall be signed and sealed by a professional engineer licensed in the state in which the installation is to take place. Substitution requests containing specifications without licensed engineer certification shall be rejected for non-conformance.

B. Submit under provisions of Section 01300.

C. Product Data: Provide manufacturer's technical product data for each type of roofing product specified. Include data substantiating that materials comply with specified requirements.

D. Samples: Submit two (2) 12" X 12"samples of each membrane product specified.

E. Manufacturer's Installation Instructions: Submit installation instructions and recommendations indicating special precautions required for installing the membrane.

F. Manufacturer's Certificate: Certify that roof system furnished is approved by Factory Mutual, Underwriters Laboratories, Warnock Hersey or approved third party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.

G. Manufacturer's Certificate: Certify that the roof system is adhered properly to meet or exceed the requirements of FM 1-90.

H. Manufacturer's Certificate: Certify that the roof system furnished is approved by Factory Mutual Approval Standard 4470.

I. Manufacturer's Certificate: Certify that materials are manufactured in the United States and conform to requirements specified herein, are chemically and physically compatible with each other, and are suitable for inclusion within the total roof system specified herein.

J. Manufacturer's Certificate: Submit a certified copy of the roofing manufacturer's ISO 9001 compliance certificate.

K. Test Reports: Submit test reports, prepared by an independent testing agency, for all modified bituminous sheet roofing, indicating compliance with ASTM D5147.

L. Submit a copy of an unexecuted manufacturer's warranty for review.

M. Submit a sample of roofing aggregate for review.

N. Design Loads: Submit copy of manufacturer's minimum design load calculations according to ASCE 7-98, Method 2 for Components and Cladding, sealed by a registered professional engineer employed by the system manufacturer as a full-time staff engineer. In no case shall the design loads be taken to be less than those detailed in article 1.14 of this specification.

1.6 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum 12 years documented experience and has ISO 9001 certification.

B. Installer: Company specializing in modified bituminous roofing installation with a minimum 5 years experience and authorized by roofing system manufacturer as qualified to install manufacturer's roofing materials.

C. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of roofing work and at any time roofing work is in progress. Maintain proper

supervision of workmen. Maintain a copy of the specifications in the possession of the Supervisor/Foremen and on the roof at all times.

D. Immediately correct roof leakage during construction. If the Contractor does not respond within twenty four (24) hours, the Owner has the right to hire a qualified contractor and backcharge the original contractor.

E. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

F. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to roofing system including, but not limited to, the following:

1. Convene a pre-roofing conference approximately two (2) weeks before scheduled commencement of modified bituminous roofing system installation and associated work.
2. Require attendance of installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of rooftop units and other work in and around roofing which must precede or follow roofing work (including mechanical work if any), Architect, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of the Work, including (where applicable) Owner's insurers, testing agencies and governing authorities.
3. Review foreseeable methods and procedures related to roofing work.
4. Tour representative areas of roofing substrates (decks), inspect and discuss condition of substrate, roof drains, curbs, penetrations and other preparatory work performed by others.
5. Review structural loading limitations of deck and inspect deck for loss of flatness and for required attachment.
6. Review roofing system requirements (drawings, specifications and other contract documents).
7. Review required submittals both completed and yet to be completed.
8. Review and finalize construction schedule related to roofing work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
9. Review required inspection, testing, certifying and material usage accounting procedures.
10. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not mandatory requirement).
11. Record discussion of conference including decisions and agreements (or disagreements) reached and furnishes copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.
12. Review notification procedures for weather or non-working days.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.

B. Store and handle roofing sheets in a dry, well-ventilated, weather-tight place to ensure no possibility of significant moisture exposure. Store rolls of felt and other sheet materials on pallets or other raised surface. Stand all roll materials on end. Cover roll goods with a canvas tarpaulin or other breathable material (not polyethylene).

C. Do not leave unused materials on the roof overnight or when roofing work is not in progress unless protected from weather and other moisture sources.

D. It is the responsibility of the contractor to secure all material and equipment on the job site. If any material or equipment is stored on the roof, the contractor must make sure that the integrity of the deck is not compromised at any time. Damage to the deck caused by the contractor will be the sole responsibility of the contractor and will be repaired or replaced at his expense.

1.9 MANUFACTURER'S INSPECTIONS

A. When the project is in progress, the roofing system manufacturer will provide the following:

1. Keep the Architect informed as to the progress and quality of the work as observed.
2. Provide daily job site inspections.
3. Report to the Architect in writing any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.
4. Confirm after completion that manufacturer has observed no applications procedures in conflict with the specifications other than those that may have been previously reported and corrected.

1.10 PROJECT CONDITIONS

A. Proceed with roofing work only when existing and forecasted weather conditions will permit unit of work to be installed in accordance with manufacturer's recommendations and warranty requirements.

B. Do not apply roofing insulation or membrane to damp deck surface.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

1.11 SEQUENCING AND SCHEDULING

A. Sequence installation of modified bituminous sheet roofing with related units of work specified in other sections to ensure that roof assemblies including roof accessories,

flashing, trim and joint sealers are protected against damage from effects of weather, corrosion and adjacent construction activity.

B. Fully complete all modified bituminous membrane roofing field assembly work each day. **Phased construction will not be accepted.**

1.12 WARRANTY

A. Upon completion of installation, and acceptance by the Owner and Architect, the manufacturer will supply to the Owner a twenty-five (25) year warranty which is inclusive, not prorated and carry no dollar limitations. The warranty will cover roof assembly, flashing details including metal flashing and adjoining standing seam metal roof system supplied by the roof system manufacturer.

B. Installer will submit a minimum of a five (5) year warranty to the membrane manufacturer with a copy directly to Owner.

C. Membrane manufacturer will provide an annual inspection for the life of the warranty.

1.13 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Any material submitted as an equal to the specified material must include a list of three (3) projects where the proposed material has been used in a similar roofing system as that which is specified and is located within a one hundred mile radius from the location of the project. In addition, the three projects must be at least three (3) years old and be available for inspection by the Architect, Owner or Owner's Representative.

B. Any deficiencies in performance, warranty terms or improper submittal procedure will constitute grounds for immediate rejection of substitution.

1.14 DESIGN AND PERFORMANCE CRITERIA

A. Uniform Wind Uplift Load Capacity

1. Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria. Attachment shall be installed exactly as given in article 3.3 G.
   a. Design Code: ASCE 7-02, Method 2 for Components and Cladding.
   b. Category III Building with an Importance Factor of 1.15
   c. Wind Speed: 90 mph
   d. Ultimate Pullout Value: 450 pounds per each fastener
   e. Exposure Category: B
   f. Design Roof Height: feet: 12' 8" feet
   g. Minimum Building Width: 200 feet.
   h. Roof Pitch: 1/4-1/2 inch per foot.
   I. Topographic Factor: 1.00

B. Snow Load: 25 psf.

C. Live Load: 20 psf, or not to exceed original building design.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. When a particular trade name or performance standard is specified it shall be indicative of a standard required.

B. Provide roof system products as manufactured by The Garland Company. Submit substitutions under provisions of Section 01600.

C. Any item or materials submitted as a substitution to the manufacturer specified must comply in all respects as to the quality and performance of the brand name specified. The Architect/Owner shall be the sole judge as to whether or not an item submitted as a substitute is truly equal. Should the Contractor choose to submit a substitute product, he shall assume all monetary or other risk involved, should the Architect/Owner find the substitution unacceptable.

2.2 DESCRIPTION

A. Modified bituminous roofing work including but not limited to:

1. Minimum two (2) plies of approved ASTM D2178, Type IV glass fiber roofing felt bonded to the prepared substrate with hot bitumen. Ply sheets must be supplied by roof system manufacturer to qualify for 25 year NDL warranty.
2. Hot Bitumen: ASTM D312, Type III steep asphalt having the following characteristics:

a.	Softening Point	185°F - 205°F
b.	Flash Point	500°F
c.	Penetration @ 77°F	15-35 units
d.	Ductility @ 77°F	2.5 cm

3. Base Backer Flashing Ply: One (1) ply of 40 mil SBS base flashing ply covered by an additional layer of mineral-surfaced modified bitumen membrane and set in bitumen.

4. Top Flashing Ply Modified Membrane: STRESSPLY PLUS FR Mineral; 145 mil SBS (Styrene-Butadiene-Styrene) rubber modified membrane incorporating post polyester composite scrim. Membrane is surfaced with reflective mineral granules.

5. Field Cap Sheet Modified Membrane: STRESSPLY PLUS -Environmentally Friendly; 105 mil SBS (Styrene-Butylene-Styrene) rubber modified roofing membrane incorporating recycled rubber and reinforced with a fiberglass and polyester composite scrim.

6. Surfacing: Flood coat of hot bitumen and ASTM D1863 roofing aggregate consisting of new dry roofing slag,

7. Hot Surfacing Bitumen: ASTM D312, Type III steep asphalt having the following characteristics:

a.	Softening Point	185°F - 205°F
b.	Flash Point	500°F
c.	Penetration @ 77°F	15-35 units
d.	Ductility @ 77°F	2.5 cm

2.3 BITUMINOUS MATERIALS

A. Asphalt Primer: V.O.C. compliant, ASTM D41.

B. Asphalt Roofing Mastic: V.O.C. compliant, ASTM D2822, Type II.

C. Interply Adhesive: ASTM D312, Type III.

D. Aluminum Pigmented Trowel-Grade Roof Mastic: Reflectivity > 60%

2.4 SHEET MATERIALS

A. Felt Plies:

1. Fiberglass Felts: ASTM D2178, Type IV

B. Base Flashing Backer Ply:

1. 40 mil SBS modified membrane with woven fiberglass scrim reinforcement with the following minimum performance requirements according to ASTM D5147:

Properties (Finished Membrane):		
Tensile Strength (ASTM D5147) 2 in/min. @73.4 ± 3.6°F	MD 205 lbf/in	CMD 205 lbf/in
Tear Strength (ASTM D5147) 2 in/min. @ 73.4 ± 3.6°F	MD 295 lbf	CMD 280 lbf
Elongation at Maximum Tensile (ASTM D5147)		

2 in/min. @ 73.4 ± 3.6°F	MD 4.5%	CMD 5.0%

C. Modified Flashing Ply:

1. STRESSPLY PLUS FR MINERAL; ASTM D-6162, Type III Grade G

Tensile Strength (ASTM D-5147)		
2 in/min. @ 73.4 ± 3.6°F	MD 310 lbf/in	CMD 310 lbf/in
Tear Strength (ASTM D-5147)		
2 in/min. @ 73.4 ± 3.6°F	MD 500 lbf	CMD 510 lbf
Elongation at Maximum Tensile (ASTM D-5147)		
2 in/min. @ 73.4 ± 3.6°F	MD 3.5%	CMD 3.5%
Low Temperature Flexibility (ASTM D-5147):	Passes -30°F	

D. Field Roofing Cap Sheet Ply:

1. STRESSPLY PLUS; ASTM D6162, Type III Grade S

Tensile Strength (ASTM D5147)		
2 in/min. @ 73.4 ± 3.6°F	MD 310 lbf/in	CMD 310 lbf/in
Tear Strength (ASTM D5147)		
2 in/min. @ 73.4 ± 3.6°F	MD 500 lbf	CMD 500 lbf
Elongation at Maximum Tensile (ASTM D5147)		
2 in/min. @ 73.4 ± 3.6°F	MD 3.5%	CMD 3.5%
Low Temperature Flexibility (ASTM D5147):	Passes -30°F	

2.5 SURFACINGS

A. Roofing Aggregate (cover field roofing): To conform to ASTM D-1863

1. New Clean Dry Roofing Slag,

B. Non-Fibered Aluminum Paint (paint asphalt spills on flashing): GarlaBrite; non-fibered aluminum paint having the following characteristics:

Flash Point	103°F min.
Weight/Gallon	7.9 lbs./gal.

C. Aluminum Trowel-Grade Mastic (Seal vertical laps in conjunction with Garmesh reinforcing membrane in a 3-course application): Silver Flash aluminum roof mastic has the following characteristics:

Flash Ponit	>103°F min.
Weight/Gallon	8.3 lbs. /gal.
Reflectivity	>60%

2.6 RELATED MATERIALS

A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces.

1. Manufacturers:

   a. Celotex Corporation.
   b. Firestone Building Products Company.
   c. GAF Materials Corporation.
   d. Johns Manville International, Inc.

2. Polyisocyanurate Insulation: shall be Polyisocyanurate foam insulation complying with physical properties of Federal Specification HH-I-1972/GEN. Insulation shall have a minimum 'R' Value of 5.8 per inch and compressive strength of minimum 16 psi per ASTM D-1621. The insulation shall be compatible to the roofing material manufacturer, with appropriate facing on surface.
3. Provide preformed wood fiberboard or perlite saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated. Tapered Edge Strips and Cants: ASTM C 208-94, asphalt coated fiberboard, tapered edge strips tapered from 1-5/8 inch to 1/8 inch, size: 12" x 48". Cants 3 ½" x 3 ½"
4. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/2 inch per 12 inches, unless otherwise indicated.
5. Provide ½" asphalt coated fiberboard substrate over foam insulation.

C. All fasteners, nails and caps shall be per roofing manufacturer's installation specifications for specified insulation and corresponding to roofing deck materials are to be fastened to, and shall meet current FM Standard 4470 for corrosion resistance.

D. Wood Blocking - Shall be Standard Grade, No. 2 or better, Douglas fir or other approved species, surfaced four sides. Lumber shall not be treated lumber per current N.R.C.A. guidelines

E. Metal Discs: Flat discs or caps of zinc-coated sheet metal not lighter than twenty eight (28) gauge and not less than one (1) inch in diameter. Form discs to prevent dishing. Bell or cup shaped caps are not acceptable.

F. Walkway Pads: 1" X 3' X 4' walkway pads placed at the base of all roof top doors and around all hatches and HVAC equipment as specified on the roof drawings.

G. Urethane Sealant: One part, non-sag sealant as recommended and furnished by the membrane manufacturer for moving joints.

1.	Tensile Strength (ASTM D412)	250 psi
2.	Elongation (ASM D412)	950%
3.	Hardness, Shore A (ASTM C920)	35
4.	Adhesion-in-Peel (ASTM C920)	30 pli

H. Butyl Tape: 100% solids, asbestos free and compressive tape designed to seal as recommended and furnished by the membrane manufacturer.

I. Pitch Pocket Sealer: Two part, 100% solids, self leveling, polyurethane sealant for filling pitch pans as recommended and furnished by the membrane manufacturer.

1.	Durometer (ASTM D2240)	40-50 Shore
2.	Elongation (ASTM D 412)	250%
3.	Tensile Strength (ASTM D 412)	200 @ 100 mil

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that deck surfaces and project conditions are ready to receive work of this section.

B. Verify that deck is supported and secured to structural members.

C. Verify that deck is clean and smooth, free of depressions, projections or ripples, and is properly sloped to drains.

D. Verify that adjacent roof members do not vary more than 1/4 inch in height.

E. Verify that deck surfaces are dry and free of snow or ice. Verify that metal deck flutes are clean and dry.

F. Verify that openings, curbs, pipes, conduit, sleeves, ducts, and other items which penetrate the roof are set solidly, and that wood cant strips, wood nailing strips and reglets are set in place.

3.2 PREPARATION – METAL DECK

A. Install preformed sound absorbing insulation strips in acoustic deck flutes in accordance with manufacturer's instructions.

3.3 GENERAL INSTALLATION

A. Cooperate with manufacturer, inspection and test agencies engaged or required to perform services in connection with installing the roof system.

B. Insurance/Code Compliance: Where required by code, install and test the roofing system to comply with governing regulation and specified insurance requirements.

C. Protect other work from spillage of roofing materials and prevent materials from entering or clogging drains and conductors. Replace or restore other work damaged by installation of the modified bituminous roofing system.

D. Coordinate installation of roofing system components so that insulation and roofing plies are not exposed to precipitation or left exposed overnight. Provide cut-offs at end of each day's work to cover exposed ply sheets and insulation with two (2) plies of #15 organic roofing felt set in full mopping of bitumen and with joints and edges sealed with roofing cement. Remove cut-offs immediately before resuming work.

E. Asphalt Bitumen Heating: Heat and apply bitumen in accordance with the Equiviscous Temperature (EVT) Method as recommended by National Roofing Contractors Association (NRCA). Do not raise temperature above minimum normal fluid-holding temperature necessary to attain EVT (plus 5°F at point of application) more than one (1) hour prior to time of application. Determine flash point, finished blowing temperature, EVT, and fire-safe handling temperature of bitumen either from information by manufacturer or by suitable test. Do not exceed recommended temperature limits during bitumen heating. Do not heat to a temperature higher than twenty five degrees (25°) below flash point. Discard bitumen that has been held at temperature exceeding Finishing Blowing Temperature (FBT) for more than three (3) hours. Keep kettle lid closed except when adding bitumen.

F. Bitumen Mopping Rate:

1. Interply Mopping: Apply bitumen at the rate of approximately twenty five (25) lb. of bitumen per roof square.
2. Modified Membrane Mopping: Apply bitumen at the rate of approximately thirty (30) lb. of bitumen per roof square.
3. Flood Coat: Apply bitumen at the rate of approximately sixty (60) to seventy (70) lb. of bitumen per square (plus or minus twenty five (25) percent on a total job average basis).

G. Substrate Joint Penetrations: Prevent bitumen from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction. Install bleeder strip around perimeter and all penetrations openings where bitumen could flow into the building.

H. Apply roofing materials as specified by manufacturer's instructions.

1. Keep roofing materials dry before and during application.
2. Do not permit phased construction.

3. Complete application of roofing plies, modified sheet and flashing in a continuous operation.
4. Begin and apply only as much roofing in one day as can be completed that same day.

I. Cut-Offs (Waterstops): At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets and insulation. Provide temporary covering of two (2) plies of #15 organic roofing felt set in full mopping of bitumen with joints and edges sealed.

3.4 INSULATION INSTALLATION

A. Insulation: Install base layer of 3.2" Polyisocyanurate insulation mechanically fastened to the steel deck according to the fastening patterns following FM I-90. Install second layer consisting of 1/2 inch High-Density Fiberboard set with off-set joints in hot steep asphalt. The total of all two insulation layers must have a minimum "R" value of 21.0.

B. Fastener pattern required:

11 fasteners per 48" X 96" insulation board in Zone 1

17 fasteners per 48" X 96" insulation board in Zone 2

20 fasteners per 48" X 96" insulation board in Zone 3

C. Zone 2 and Zone 3 required widths

39' X 25' addition requires an edge zone width of 3 feet 0 inches.

46' X 38' addition requires an edge zone width of 3 feet 8 inches.

3.5 FELT PLY INSTALLATION

A. Fiberglass Plies: Install two (2) fiberglass ply sheets in twenty five (25) lbs. per square of bitumen shingled uniformly to achieve two plies over the entire prepared substrate. Shingle in direction of slope of roof to shed water on each area of roof.

B. Lap ply sheet ends eight (8) inches. Stagger end laps twelve (12) inches minimum.

C. Lightly broom in fiberglass plies to assure complete adhesion.

D. Extend plies two (2) inches beyond top edges of cants at wall and roof projections and equipment bases.

E. Install base flashing ply to all perimeter and projection details.

3.7 MODIFIED MEMBRANE APPLICATION

A. Solidly bond the modified membrane to the base layers with specified asphalt at the rate of twenty five (25) to thirty (30) lbs. per 100 square feet.

B. The modified membrane roll must push a puddle of asphalt in front of it with asphalt slightly visible at all side laps. Exercise care during application to eliminate air entrapment under the membrane.

C. Apply pressure to all seams to ensure that the laps are solidly bonded to substrate.

D. Install subsequent rolls of modified membrane across the roof as above with a minimum of four (4) inch side laps and eight (8) inch end laps. Stagger the end laps. Apply the modified membrane in the same direction as the previous layers but stagger the laps so they do not coincide with the laps of the base layers.

E. Apply asphalt no more than five (5) feet ahead of each roll being embedded.

F. Extend membrane two (2) inches beyond top edge of all cants in full mopping of the specified asphalt as shown on the drawings.

3.8 FLASHING MEMBRANE INSTALLATION

A. Seal all curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membranes.

B. Prepare all walls, penetrations, expansion joints and where shown on the drawings to be flashed with asphalt primer at the rate of one hundred (100) square feet per gallon. Allow primer to dry tack free.

C. Use the modified membrane as the flashing membrane. Adhere to the underlying base flashing ply with specified asphalt unless otherwise noted in these specifications. Nail off at a minimum of eight (8) inches o.c. from the finished roof at all vertical surfaces.

D. Solidly adhere the entire sheet of flashing membrane to the substrate.

E. Seal all of flashing membrane end laps and miters (corners) with a three-course application of trowel grade aluminum mastic and fiberglass mesh.

F. Raised Metal Edge Detail No. MBH-11:

1. Inspect the nailer to assure proper attachment and configuration.

2. Run one ply over the edge. Assure coverage of all wood nailers. Fasten plies with ring shank nails at eight (8) inches o.c.
3. Install continuous cleat and fasten at six (6) inches o.c.
4. Install new metal edge hooked to continuous cleat and set in bed of roof cement. Fasten flange to wood nailer every three (3) inches o.c. staggered.
5. Prime metal edge at a rate of one hundred (100) square feet per gallon and allow to dry.
6. Strip in flange with base flashing ply covering entire flange in bitumen with six (6) inches on to the field of roof. Assure ply laps do not coincide with metal laps.
7. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine (9) inches on to the field of the roof.

G. Raised Metal Edge Cap Detail No. MBH-12:

1. Inspect the nailer to assure proper attachment and configuration.
2. Run one ply over the edge. Assure coverage of all wood nailers. Fasten plies with ring shank nails at eight (8) inches o.c.
3. Install continuous cleat and fasten at six (6) inches o.c.
4. Strip in cant dam with base flashing ply covering entire vertical area in bitumen with six (6) inches on to the field of the roof. Assure ply laps do not coincide with metal laps.
5. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine (9) inches on to the field of the roof.
6. Install new metal edge hooked to continuous cleat and set in bed of roof cement.
7. Attach metal edge with approved fasteners and neoprene washers at eight (8) o.c.

I. Coping Cap Detail No. MBH-20:

1. Minimum flashing height is eight (8) inches. Maximum flashing height is twenty four (24) inches. Prime vertical wall at a rate of one hundred (100) square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of two (2) inches.
3. Install base flashing ply covering entire wall and wrapped over top of wall and down face with six (6) inches on to field of the roof and set in hot asphalt. Nail membrane at eight (8) inches o.c.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine (9) inches on to the field of the roof. Apply a three-course application of aluminum mastic and mesh at all end laps and miters (corners).
5. Install coping cap per manufacturer's recommendations.

J. Reglet Mounted Counterflashing Detail No. MBH-23:

1. Minimum flashing height is eight (8) inches. Maximum flashing height is twenty four (24) inches. Prime vertical wall at a rate of one hundred (100) square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of two (2) inches.
3. Install base flashing ply covering wall set in bitumen with six (6) inches on to field of the roof.

4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine (9) inches on to the field of the roof. Apply a three-course application of aluminum mastic and mesh at all end laps and miters (corners).
5. Apply butyl tape to wall behind flashing. Secure termination bar through flashing, butyl tape and into wall.
6. Cut reglet in masonry one joint above flashing.
7. Secure reglet counterflashing with expansion fasteners and caulk reglet opening.

K. Base Flashing For Non-Supported Deck Detail No. MBH-25:

1. Inspect the nailer to assure proper attachment and configuration. The wood cant strip should be mechanically attached to the vertical and horizontal wood nailers.
2. Install compressible insulation in neoprene cradle between wall and vertical wood nailer.
3. Prime vertical wall at a rate of one hundred (100) square feet per gallon and allow to dry.
4. Install base flashing ply covering entire wall and wrapped to top of wood nailer with six (6) inches on to field of the roof. Nail membrane at eight (8) inches o.c.
5. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine (9) inches on to the field of the roof. Apply a three-course application of aluminum mastic and mesh at all end laps and miters (corners).
6. Attach counterflashing through wall flashing at a spacing of twenty four (24) inches o.c.

L. Expansion Joint Detail No. MBH-30A:

1. Minimum curb height is eight (8) inches. Chamfer top of curb. Prime vertical curb at a rate of one hundred (100) square feet per gallon and allow to dry.
2. Mechanically attach wood cant to expansion joint nailers. Run all field plies over cant a minimum of two (2) inches.
3. Install compressible insulation in neoprene cradle.
4. Install base flashing ply covering curb set in bitumen with six (6) inches on to field of the roof.
5. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine (9) inches on to the field of the roof. Attach top of membrane to top of curb and nail at eight (8) inches o.c. Apply a three-course application of aluminum mastic and mesh at all end laps and miters (corners).
6. Install pre-manufactured expansion joint cover. Fasten sides at twelve (12) inches o.c. with fasteners and neoprene washers. Furnish all joint cover laps with butyl tape between metal covers.

M. Area Divider Detail No. MBH-31:

1. Minimum curb height is eight (8) inches. Prime vertical curb at a rate of one hundred (100) square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of two (2) inches.
3. Install base flashing ply covering curb set in bitumen with six (6) inches on to field of the roof.

4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine (9) inches on to the field of the roof. Attach top of membrane to top of curb and nail at eight (8) inches o.c. Apply a three-course application of aluminum mastic and mesh at all end laps and miters (corners).
5. Install pre-manufactured metal cover. Fasten sides at twenty four (24) inches o.c. with fasteners and neoprene washers. Furnish all joint cover laps with butyl tape between metal covers.

N. Equipment Support Detail No. MBH-32:

1. Minimum curb height is eight (8) inches. Prime vertical at a rate of one hundred (100) square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of two (2) inches.
3. Install base flashing ply covering curb set in bitumen with six (6) inches on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine (9) inches on to the field of the roof. Attach top of membrane to top of curb and nail at eight (8) inches o.c. Apply a three-course application of aluminum mastic and mesh at all end laps and miters (corners).
5. Install pre-manufactured cover. Fasten sides at twenty four (24) inches o.c. with fasteners and neoprene washers. Furnish all joint cover laps with butyl tape between metal covers.
6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.

O. Curb Detail/Air Handling Station Detail No. MBH-33:

1. Minimum curb height is eight (8) inches. Prime vertical at a rate of one hundred (100) square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of two (2) inches.
3. Install base flashing ply covering curb set in bitumen with six (6) inches on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine (9) inches on to the field of the roof. Apply a three-course application of aluminum mastic and mesh at all end laps and miters (corners).
5. Install pre-manufactured counterflashing with fasteners and neoprene washers or per manufacturer's recommendations.
6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.

P. Pre-manufactured Curb For Equipment Support Detail No. MBH-35:

1. Minimum curb height is eight (8) inches. Prime vertical at a rate of one hundred (100) square feet per gallon and allow to dry.
2. Run all field plies over cant of the pre-manufactured equipment support a minimum of two (2) inches.
3. Install base flashing ply covering pre-manufactured curb with six (6) inches on to field of the roof.

4. Install a second ply of modified flashing ply installed over the base flashing ply, nine (9) inches on to field of the roof. Attach top of membrane to top of wood curb and nail at eight (8) inches o.c. Apply a three-course application of aluminum mastic and mesh at all end laps and miters (corners).
5. Install pre-manufactured cover. Fasten sides at twenty four (24) inches o.c. with fasteners and neoprene washers. Furnish all joint cover laps with butyl tape between metal covers.
6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.

Q. Exhaust Fan Detail No. MBH-36:

1. Minimum curb height is eight (8) inches. Prime vertical at a rate of one hundred (100) square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all plies over cant a minimum of two (2) inches.
3. Install base flashing ply covering curb with six (6) inches on to field of the roof.
4. Install a second ply of modified flashing ply installed over the base flashing ply, nine (9) inches on to field of the roof. Attach top of membrane to top of wood curb and nail at eight (8) inches o.c. Apply a three-course application of aluminum mastic and mesh at all end laps and miters (corners).
5. Install metal exhaust fan over the wood nailers and flashing to act as counterflashing. Fasten per manufacturer's recommendation.

R. Passive Vent/Air Intake Detail No. MBH-37:

1. Minimum curb height is eight (8) inches. Prime vertical at a rate of one hundred (100) square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all plies over cant a minimum of two (2) inches.
3. Install base flashing ply covering curb with six (6) inches on to the field of the roof.
4. Install a second ply of modified flashing ply installed over the base flashing ply, nine (9) inches on to field of the roof. Attach top of membrane to top of wood curb and nail at eight (8) inches o.c. Apply a three-course application of aluminum mastic and mesh at all end laps and miters (corners).
5. Install passive vent/air intake over the wood nailers and flashing to act as counterflashing. Fasten per manufacturer's recommendations.

S. Roof Drain Detail No. MBH-40:

1. Plug drain to prevent debris from entering plumbing.
2. Taper insulation to drain minimum of twenty four (24) inches from center of drain.
3. Run roof system plies over drain. Cut out plies inside drain bowl.
4. Set lead/copper flashing (thirty (30) inch square minimum) in ¼ inch bed of mastic. Run lead/copper into drain a minimum of two (2) inches. Prime lead/copper at a rate of one hundred (100) square feet per gallon and allow to dry.
5. Install base flashing ply (forty (40) inch square minimum) in bitumen.

6. Install top ply flashing of mineral-surfaced modified membrane (forty eight (48) inch square minimum) in bitumen.
7. Install clamping ring and assure that all plies are under the clamping ring.
8. Remove drain plug and install strainer.
9. Install a copper gravel stop at outer edge perimeter of drain sump stripped in mastic and membrane.

T. Plumbing Stack Detail No. MBH-50:

1. Minimum stack height is twelve (12) inches.
2. Run roof system over the entire surface of the roof. Install 2-ply modified flashing target. Seal the base of the stack with elastomeric sealant.
3. Prime flange of new sleeve. Install properly sized sleeves set in ¼ inch bed of roof cement.
4. Install base flashing ply in bitumen.
5. Install membrane in bitumen.
6. Caulk the intersection of the membrane with elastomeric sealant.
7. Turn sleeve a minimum of one (1) inch down inside of stack.

U. Heat Stack Detail No. MBH-51:

1. Minimum stack height is twelve (12) inches.
2. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.
3. Prime flange of new sleeve. Install properly sized sleeves set in ¼ inch bed of roof cement.
4. Install base flashing ply in bitumen.
5. Install modified membrane in bitumen.
6. Caulk the intersection of the membrane with elastomeric sealant.
7. Install new collar over cape. Weld collar or install stainless steel draw brand.

V. Pitch Pocket Detail No. MBH-52:

1. Run all plies up to the penetration.
2. Place the pitch pocket over the penetration and prime all flanges.
3. Strip in flange of pitch pocket with one (1) ply of base flashing ply. Extend six (6) inches onto field of roof.
4. Install second layer of modified membrane extending nine (9) inches onto field of the roof.
5. Fill pitch pocket half full with non-shrink grout. Let this cure and top off with pourable sealant.
6. Caulk joint between roof system and pitch pocket with roof cement.

W. Pitch Pocket Umbrella Detail No. MBH-53:

1. Run all plies up to the penetration.
2. Place the pitch pocket over the penetration and prime all flanges.
3. Strip in flange of pitch pocket with one (1) ply of base flashing ply. Extend six (6) inches onto field of roof.

4. Install second layer of modified membrane extending nine (9) inches onto field of the roof.
5. Fill pitch pocket half full with non-shrink grout. Let this cure and top off with pourable sealant.
6. Caulk joint between roof system and pitch pocket with roof cement.
7. Place a watershedding type metal bonnet over the top of the pitch pocket and clamp the top with a drawband collar. Caulk the upper edge of the band with an elastomeric sealant.

3.9 APPLICATION OF SURFACING

A. Aggregate Surfacing:

1. Apply surfacing materials to the finished field roofing five hundred (500) lbs. per square of new dry roofing slag. Uniformly embed aggregate in a flood coat of bitumen at a rate of sixty (60) to seventy (70) lbs. per square coverage after felt flashings, tests, repairs, and corrective actions have been completed and approved.

B. Aluminum Coating:

1. Allow all cold applied mastics and coating to properly dry and cure before installing the aluminum coating. Exception: Install 3-course mesh and Silver Flash Aluminum mastic to all end laps and miters (corners).
2. Paint all spilled or stained asphalt on exposed flashing with manufacturer's non-fibrated aluminum paint installed at a rate of one-half gallon per square per coat. This shall be a two-coat application with the finished stroke in one direction.

3.10 FIELD QUALITY CONTROL

A. Require daily attendance of roofing materials manufacturers' representatives at site during installation of the roofing system.

3.11 CLEANING

A. Remove bitumen adhesive drippings from all walls, windows, floors, ladders and finished surfaces.

B. In areas where finished surfaces are soiled by asphalt or any other sources of soiling caused by work of this section, consult manufacturer of surfaces for cleaning instructions and conform to their instructions.

C. Repair or replace defaced or disfigured finishes caused by work of this section.

3.12 FINAL INSPECTION

A. At completion of roofing installation and associated work, meet with the Roofing Contractor, Architect, Owner, and roofing system manufacturer's representative.

B. Walk roof surface areas of the building, inspect perimeter building edges as well as flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each party in attendance.

C. The roofing system manufacturer reserves the right to request a thermographic scan of the roof during final inspection to determine if any damp or wet materials have been installed. The thermographic scan shall be provided by the Roofing Contractor.

D. If core cuts verify the presence of damp or wet materials, the Roofing Contractor shall be required to replace the damaged areas at his own expense.

E. Repair or replace deteriorated or defective work found at time above inspection as required to a produce an installation which is free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

F. Notify the Roofing Contractor, Architect and Owner upon completion of corrections.

G. Following the final inspection, provide written notice of acceptance of the installation from the roofing system manufacturer.

END OF SECTION 07552

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 07710
MANUFACTURED ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following manufactured roof specialties:

1. Copings.
2. Counterflashings and reglets.

B. Related Sections include the following:

1. Division 4 Section "Unit Masonry Assemblies" for installing reglets.
2. Division 6 Section "Miscellaneous Carpentry" for wood nailers, curbs, and blocking.
3. Division 7 Section "Roof Expansion Assemblies" for manufactured roof expansion-joint cover assemblies.
4. Division 7 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
5. Division 7 Section "Joint Sealants" for field-applied sealants.

1.3 PERFORMANCE REQUIREMENTS

A. General: Manufacture and install manufactured roof specialties to resist thermally induced movement and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. FMG Listing: Manufacture and install copings and roof edge flashings that are listed in FMG's "Approval Guide" and approved for Windstorm Classification, Class 1-90. Identify materials with FMG markings.

C. Thermal Movements: Provide manufactured roof specialties that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Water Infiltration: Provide manufactured roof specialties that do not allow water infiltration to building interior.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show layouts of manufactured roof specialties, including plans and elevations. Identify factory- vs. field-assembled work. Include the following:

1. Details for fastening, joining, supporting, and anchoring manufactured roof specialties including fasteners, clips, cleats, and attachments to adjoining work.
2. Details for expansion and contraction.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, verifying compliance of copings and roof edge flashings with performance requirements.

D. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.6 COORDINATION

A. Coordinate installation of manufactured roof specialties with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

1.7 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace manufactured roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXPOSED METALS

A. Prepainted, Zinc-Coated Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation, structural quality, and prepainted by the coil-coating process to comply with ASTM A 755 / A 755M.

1. Surface: Smooth, flat finish.
2. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.

a. Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with physical properties and coating performance requirements of AAMA 2604.

2.2 CONCEALED METALS

A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for use and structural performance indicated, mill finished.

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

C. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.

C. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

D. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

F. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.4 COPINGS

A. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding 12 feet, concealed anchorage, concealed splice plates with same finish as coping caps, mitered corner units, and end cap units.

1. Coping Caps: Snap-on, fabricated from the following exposed metal:

   a. Prepainted, Zinc-Coated Steel: 24 gauge minimum.

2. Coping Cap Color:

   a. Smith @ Office Addition – Match existing clear anodized aluminum color.
   b. Smith @ Computer Lab Addition – Match existing Dark Brown.

3. Corners: Mechanically clinched and sealed watertight.
4. Special Fabrications: One-way and two-way sloped coping cap where shown.
5. Snap-on Coping Anchor Plates: Concealed, galvanized steel sheet, 12 inches wide, 0.028 inch thick, with integral cleats.
6. Face Leg Cleats: Concealed, continuous galvanized steel sheet.

2.5 COUNTERFLASHINGS AND REGLETS

A. Counterflashings: Manufactured units in lengths not exceeding 12 feet designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal in thickness indicated:

1. Aluminum: 0.032 inch thick.
2. Prepainted, Zinc-Coated Steel: 0.28" thick.

B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashings indicated with factory-mitered and -welded corners and junctions, from the following exposed metal in thickness indicated:

1. Stainless Steel: 0.0187 inches thick.
2. Type: For masonry application, with offset top flange for embedment in masonry mortar joint.

2.6 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.

1. Examine walls, roof edges, and parapets for suitable conditions for manufactured roof specialties.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install manufactured roof specialties according to manufacturer's written instructions. Anchor manufactured roof specialties securely in place and capable of resisting forces specified in performance requirements. Use fasteners, separators, sealants, and other miscellaneous items as required to complete manufactured roof specialty systems.

1. Install manufactured roof specialties with provisions for thermal and structural movement.
2. Torch cutting of manufactured roof specialties is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum manufactured roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.

C. Install manufactured roof specialties level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil-canning, buckling, or tool marks.

D. Install manufactured roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.

E. Expansion Provisions: Provide for thermal expansion of exposed manufactured roof specialties. Space movement joints at a maximum of 12 feet with no unplanned joints within 18 inches of corners or intersections.

F. Fasteners: Use fasteners of type and size recommended by manufacturer but of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

G. Seal joints with sealant as required by manufacturer of roofing specialties.

3.3 COPING INSTALLATION

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings to resist uplift and outward forces according to performance requirements.

1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at manufacturer's recommended spacing.
2. Interlock face leg drip edge into continuous cleat anchored to substrate at manufacturer's recommended spacing. Anchor back leg of coping with screw fasteners and elastomeric washers at manufacturer's recommended spacing.

3.4 COUNTERFLASHING AND REGLET INSTALLATION

A. Counterflashings: Coordinate installation of counterflashings with installation of base flashings. Insert counterflashings in reglets or receivers and fit tightly to base flashings. Extend counterflashings 4 inches over base flashings. Lap counterflashing joints a minimum of 4 inches and bed with sealant.

B. Reglets: Installation of reglets is specified in Division 4 Section "Unit Masonry Assemblies."

3.5 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Remove temporary protective coverings and strippable films as manufactured roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

C. Replace manufactured roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07710

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 07720
ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Roof curbs.
2. Equipment supports.
3. Roof supports.
4. Preformed flashings.

B. Related Sections include the following:

1. Division 7 low-slope roofing Sections for roofing accessories.

1.3 SUBMITTALS

A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work.

C. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.

D. Samples: For each type of exposed factory-applied color finish required and for each type of roof accessory indicated, prepared on Samples of size to adequately show color.

E. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify required openings for each type of roof accessory by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

1. With Architect's approval, adjust location of roof accessories that would interrupt roof drainage routes or roof expansion joints.

1.8 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers listed in other Part 2 articles.

2.2 METAL MATERIALS

A. Prepainted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by hot-dip process and prepainted by coil-coating process to comply with ASTM A 755/A 755M.

1. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coated.
2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coated.
3. Exposed Finishes: High-Performance Organic Finish (2-Coat Fluoropolymer): Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.

a. Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with physical properties and coating performance requirements in AAMA 2605, except as modified below:

1) Humidity Resistance: 1000 hours.
2) Salt-Spray Resistance: 1000 hours.

B. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and finish. Coil-coat finish as follows:

1. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: Cleaned with inhibited chemicals; Chemical Finish: Conversion coating; Organic Coating: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturer's written instructions.

a. Color and Gloss: White, match Architect's sample.

C. Aluminum Extrusions and Tubes: ASTM B 221, alloy and temper recommended by manufacturer for type of use, mill finished.

D. Stainless-Steel Shapes or Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304 or Type 316, No. 2D finish.

E. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized to comply with ASTM A 123/A 123M, unless otherwise indicated.

F. Steel Tube: ASTM A 500, round tube, baked-enamel finished.

G. Galvanized Steel Tube: ASTM A 500, round tube, hot-dip galvanized to comply with ASTM A 123/A 123M.

H. Galvanized Steel Pipe: ASTM A 53/A 53M.

2.3 MISCELLANEOUS MATERIALS

A. Polyisocyanurate Board Insulation: ASTM C 1289, 1 inch thick.

B. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 inches thick.

C. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

D. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.

E. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.

F. Elastomeric Sealant: ASTM C 920, silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

G. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, and heavy bodied for hooked-type expansion joints with limited movement.

H. Roofing Cement: ASTM D 4586, nonasbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

2.4 ROOF CURBS

A. Roof Curbs: Provide metal roof curbs, internally reinforced and capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Fabricate with welded or sealed mechanical corner joints, with stepped integral metal cant raised the thickness of roof insulation and integral formed mounting flange at perimeter bottom. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1. Available Manufacturers:

    a. Colony Custom Curbs.
    b. Commodity Products Company, Inc.
    c. Conn-Fab Sales, Inc.

d. Curbs Plus Inc.
e. Custom Curb, Inc.
f. LM Curbs.
g. Loren Cook Company.
h. Metallic Products Corporation.
i. Pate Company (The).
j. Roof Products & Systems Corporation.
k. Roof Products, Inc.
l. Thaler Metal Industries Ltd.
m. ThyCurb; Div. of Thybar Corporation.
n. Uni-Curb, Inc.
o. Vent Products Company, Inc.

2. Material: Aluminum sheet, 0.090 inch thick.
3. Liner: Same material as curb, of manufacturer's standard thickness and finish.
4. Factory install wood nailers at tops of curbs.
5. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
6. Factory insulate curbs with 1-1/2-inch- thick, glass-fiber board insulation.
7. Curb height may be determined by adding thickness of roof insulation and minimum base flashing height recommended by roofing membrane manufacturer. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
8. Sloping Roofs: Where slope of roof deck exceeds 1:48, fabricate curb units with water diverter or cricket and with height tapered to match slope to level tops of units.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.
2. Verify dimensions of roof openings for roof accessories.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Install roof accessories to fit substrates and to result in watertight performance.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
3. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.

D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.

E. Roof Curb Installation:

1. Set roof curb so top surface of roof curb is level.

F. Seal joints with elastomeric sealant as required by manufacturer of roof accessories.

3.3 TOUCH UP

A. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Division 9 painting Sections.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.4 CLEANING

A. Clean exposed surfaces according to manufacturer's written instructions.

END OF SECTION 07720

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 07841
THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

B. Related Sections include the following:

1. Division 13 Sections specifying fire-suppression piping penetrations.
2. Division 15 Sections specifying duct and piping penetrations.
3. Division 16 Sections specifying cable and conduit penetrations.

1.3 PERFORMANCE REQUIREMENTS

A. General: For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

1. Fire-resistance-rated walls including fire walls, fire partitions, fire barriers and smoke barriers.

B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814:

1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:

a. Penetrations located outside wall cavities.
b. Penetrations located outside fire-resistance-rated shaft enclosures.

3. L-Rated Systems: Where through-penetration firestop systems are indicated in smoke barriers, provide through-penetration firestop systems with L-ratings of not more than 3.0 cfm/sq. ft at both ambient temperatures and 400 deg F.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.

C. Qualification Data: For Installer.

D. Product Certificates: For through-penetration firestop system products, signed by product manufacturer.

E. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the

necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Installation Responsibility: Assign installation of through-penetration firestop systems in Project to a single qualified installer.

C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

D. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers:

1. Grace, W. R. & Co. - Conn.
2. Hilti, Inc.
3. Johns Manville.
4. 3M; Fire Protection Products Division.
5. Tremco; Sealant/Weatherproofing Division.
6. USG Corporation.

2.2 FIRESTOPPING, GENERAL

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:

1. Permanent forming/damming/backing materials, including the following:

    a. Slag-/rock-wool-fiber insulation.
    b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    c. Fire-rated form board.
    d. Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.

4. Collars.
5. Steel sleeves.

2.3 FILL MATERIALS

A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by referencing the types of materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.

B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

H. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

I. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.

J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

K. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.

3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

2.4 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:

1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified, independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.

B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.6 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

END OF SECTION 07841

SECTION 07842
FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes fire-resistive joint systems for the following:

1. Head-of-wall joints.

B. Related Sections include the following:

1. Division 7 Section "Roof Expansion Assemblies" for fire-resistive roof expansion assemblies.
2. Division 7 Section "Through-Penetration Firestop Systems" for systems installed in openings in walls and floors with and without penetrating items.
3. Division 7 Section "Joint Sealants" for non-fire-resistive joint sealants.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed.

B. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equaling or exceeding the fire-resistance ratings of construction that they join, and with movement capabilities and L-ratings indicated as determined by UL 2079.

C. For fire-resistive systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed; also show relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to

authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.

C. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.

D. Qualification Data: For Installer.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."

B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.

C. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.

D. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistive joint systems acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, fire-resistive joint systems that may be incorporated into the Work include, but are not limited to, those systems indicated in the Fire-Resistive Joint System Schedule at the end of Part 3.

2.2 FIRE-RESISTIVE JOINT SYSTEMS

A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.

B. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates or damaging adjoining surfaces.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.

B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION 07842

SECTION 07920
JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes joint sealants for the applications indicated in the Joint-Sealant Schedule at the end of Part 3.

1. Exterior joints in the following vertical surfaces and horizontal nontraffic surfaces:

    a. Construction joints in cast-in-place concrete.
    b. Joints between plant pre-cast structural concrete planks and between planks and unit masonry.
    c. Control and expansion joints in unit masonry.
    d. Joints between metal panels.
    e. Joints between different materials listed above.
    f. Perimeter joints between materials listed above and frames of doors, windows and louvers.
    g. Other joints as indicated.

2. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:

    a. Control and expansion joints on exposed interior surfaces of exterior walls.
    b. Perimeter joints of exterior openings where indicated.
    c. Vertical joints on exposed surfaces of interior unit masonry, walls and partitions.
    d. Joints on underside of plant-precast structural concrete.
    e. Joints between plant pre-cast structural concrete planks and between planks and unit masonry.
    f. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
    g. Other joints as indicated.

3. Interior joints in the following horizontal traffic surfaces:

    a. Isolation joints in cast-in-place concrete slabs.
    b. Other joints as indicated.

B. Related Sections include the following:
   1. Division 2 Section "Pavement Joint Sealants" for sealing joints in pavements, walkways, and curbing.
   2. Division 4 Section "Unit Masonry Assemblies" for masonry control and expansion joint fillers and gaskets.
   3. Division 7 Section "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
   4. Division 8 Section "Glazing" for glazing sealants.
   5. Division 9 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
   6. Division 9 Section "Acoustical Panel Ceilings" and "Acoustical Tile Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

D. Qualification Data: For Installer.

E. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

   1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

G. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the commencement of the Work.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.

D. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:

1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Silicone 20 years and all other types 5 years from date of Substantial Completion.

C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:

1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Single-Component Neutral- and Basic-Curing Silicone Sealant **ES-1**:

1. Products:

    a. Dow Corning Corporation; 790.
    b. Tremco; Spectrem 1 (Basic).
    c. Pecora Corporation; 864.
    d. Pecora Corporation; 890.
    e. Polymeric Systems Inc.; PSI-641.
    f. Sonneborn, Division of ChemRex Inc.; Omniseal.
    g. Tremco; Spectrem 3.
    h. Dow Corning Corporation; 791.
    i. Dow Corning Corporation; 795
    j. Pecora Corporation; 865.
    k. Pecora Corporation; 895.
    l. Pecora Corporation; 898.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 100/50.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel and brick.

D. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant **ES-2**:

1. Available Products:

    a. Pecora Corporation; 898.
    b. Tremco; Tremsil 600 White.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, ceramic tile and other Use O substrates.

E. Multicomponent Nonsag Urethane Sealant **ES-3**:

1. Available Products:

    a. Pecora Corporation; Dynatrol II.
    b. Tremco; Dymeric 511.

c. Tremco; Vulkem 922.

2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 50.
4. Use[s] Related to Exposure: NT (nontraffic) and T (traffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick and ceramic tile.

F. Multicomponent Pourable Urethane Sealant **ES-4**:

1. Available Products:

a. Pecora Corporation; Urexpan NR-200.
b. Polymeric Systems, Inc.; PSI-270SL.
c. Tremco; THC-901.
d. Tremco; THC-900.
e. Tremco; Vulkem 245.
f. Pecora Corporation; Urexpan NR 300, Type H.
g. Pecora Corporation; Urexpan NR 300, Type M.

2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 25.
4. Use[s] Related to Exposure: T (traffic).
5. Uses Related to Joint Substrates: M, A and as applicable to joint substrates indicated, O.

a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel and brick.

2.4 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant for Exposed and Concealed Joints **AS-1**: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:

1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
2. Available Products:

a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

2.5 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and

approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.
    d. Precast concrete.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

    1. Do not leave gaps between ends of sealant backings.

2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application **JS-1**: Exterior vertical construction joints in cast-in-place concrete.

1. Joint Sealant: ES-3.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

B. Joint-Sealant Application **JS-2**: Exterior vertical control and expansion joints in unit masonry.

1. Joint Sealant: Single-component neutral- and basic-curing silicone sealant ES-1.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

C. Joint-Sealant Application **JS-3**: Exterior butt joints between metal panels.

1. Joint Sealant: Single-component neutral- and basic-curing silicone sealant ES-1.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

D. Joint-Sealant Application **JS-4**: Vertical control and expansion joints on exposed interior surfaces of exterior walls.

1. Joint Sealant: Multicomponent nonsag urethane sealant ES-3.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

E. Joint-Sealant Application **JS-5**: Interior perimeter joints of exterior openings.

1. Joint Sealant: Multicomponent nonsag urethane sealant ES-3.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

F. Joint-Sealant Application **JS-6**: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.

1. Joint Sealant: Single-component mildew-resistant neutral-curing silicone sealant ES-3.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

G. Joint-Sealant Application **JS-7**: Vertical joints on exposed surfaces of interior unit masonry and concrete, walls and partitions, and perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.

1. Joint Sealant: Multicomponent nonsag urethane sealant ES-3.
2. Joint-Sealant Color: White.

H. Joint-Sealant Application **JS-8**: Exterior perimeter joints between masonry and frames of doors, windows and louvers.

1. Joint Sealant: Single-component neutral- and basic-curing silicone sealant ES-1.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

I. Joint-Sealant Application **JS-9**: Interior control, expansion and isolation joints in horizontal concrete traffic surfaces.

1. Joint Sealant: Multicomponent pourable urethane sealant ES-4.
2. Joint Sealant Color: As selected by Architect from manufacturer's full range.

J. Joint-Sealant Application **JS-10**: Bottom of plant precast structural concrete planks.

1. Joint Sealant: Multicomponent non-sag urethane sealant ES-3.
2. Joint Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 07920

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 08111
STANDARD STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Standard hollow-metal steel doors.
2. Standard hollow-metal steel frames.

B. Related Sections include the following:

1. Division 4 Section "Unit Masonry Assemblies" for building anchors into and grouting standard steel frames in masonry construction.
2. Division 8 Section "Glazing" for glazed lites in standard steel doors and frames.
3. Division 8 Sections for door hardware for standard steel doors.
4. Division 9 painting Sections for field painting standard steel doors and frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance and temperature-rise ratings, and finishes for each type of steel door and frame specified.

B. Shop Drawings: In addition to requirements below, provide a schedule of standard steel doors and frames using same reference numbers for details and openings as those on Drawings:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details.
3. Frame details for each frame type, including dimensioned profiles.
4. Details and locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, accessories, joints, and connections.

7. Details of glazing frames and stops showing glazing.

C. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of standard steel door and frame.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.

C. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.

D. Fire-Rated Door Sidelight and Transom Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.

1. Test Pressure: Test according to NFPA 252 or UL 10C. After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches or less above the sill.
2. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 450 deg F maximum in 30 minutes of fire exposure.

E. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.

F. Smoke-Control Door Assemblies: Comply with NFPA 105.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber.

1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating standard steel frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate installation of anchorages for standard steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ceco Door Products; an ASSA ABLOY Group Company.
2. Pioneer Industries, Inc.
3. Republic Builders Products Company.
4. Steelcraft; an Ingersoll-Rand Company.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 zinc-iron-alloy (galvannealed) coating designation.

D. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Commercial Steel (CS), Class B coating; mill phosphatized.

E. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.

F. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.

G. Grout: Comply with ASTM C 476, with a slump of 4 inches for standard steel door frames built into concrete or masonry, as measured according to ASTM C 143/C 143M.

H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum

flame-spread and smoke-developed indexes of 25 and 50 respectively; passing ASTM E 136 for combustion characteristics.

I. Glazing: Comply with requirements in Division 8 Section "Glazing."

J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD STEEL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8.

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, mineral-board, or vertical steel-stiffener core that produces doors complying with ANSI A250.8.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

3. Vertical Edges for Single-Acting Doors: Square edge.
4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick end closures or channels of same material as face sheets.
5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Interior Doors: Face sheets fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior door requirements. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).

C. Hardware Reinforcement: Fabricate reinforcement plates from same material as door face sheets to comply with the following minimum sizes:

1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.

D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD STEEL FRAMES

A. General: Comply with ANSI A250.8 and with details indicated for type and profile.

B. Interior Frames: Fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior frame requirements.

1. Fabricate frames with mitered or coped and welded face corners and seamless face joints , unless otherwise indicated.
2. Fabricate knocked-down frames with mitered or coped corners, for field assembly where indicated.
3. Frames for Level 3 Steel Doors: 0.067-inch- thick steel sheet, unless otherwise indicated.
4. Frames for Wood Doors: 0.067-inch- thick steel sheet, unless otherwise indicated.
5. Frames for Borrowed Lights: 0.053-inch- thick steel sheet, unless otherwise indicated.

C. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with the following minimum sizes:

1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.

D. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.

E. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

F. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

G. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

H. Ceiling Struts: Minimum 3/8-inch-thick by 2-inch- wide steel.

2.5 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with standard steel frames, minimum 5/8 inch high, unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.6 FABRICATION

A. General: Fabricate standard steel doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Standard Steel Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.

C. Standard Steel Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints; fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners, unless otherwise indicated.
4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
5. Jamb Anchors: Provide number and spacing of anchors as follows:

a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Two anchors per jamb up to 60 inches in height.
2) Three anchors per jamb from 60 to 90 inches in height.
3) Four anchors per jamb from 90 to 120 inches in height.
4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof more than 120 inches in height.

b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Three anchors per jamb up to 60 inches in height.
2) Four anchors per jamb from 60 to 90 inches in height.
3) Five anchors per jamb from 90 to 96 inches in height.
4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof more than 96 inches in height.
5) Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.

6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Hardware Preparation: Factory prepare standard steel doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."

1. Reinforce doors and frames to receive nontemplated mortised and surface-mounted door hardware.
2. Comply with applicable requirements in ANSI A250.6 and ANSI/DHI A115 Series specifications for door and frame preparation for hardware. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of door or frame.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings such that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of doors and frames.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.7 STEEL FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish standard steel door and frames after assembly.

B. Metallic-Coated Steel Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

C. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

D. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of standard steel doors and frames.

1. Examine roughing-in for embedded and built-in anchors to verify actual locations of standard steel frame connections before frame installation.
2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory.

B. Prior to installation and with installation spreaders in place, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install standard steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Standard Steel Frames: Install standard steel frames for doors, sidelights, transoms, borrowed lights and other openings, of size and profile indicated. Comply with SDI 105.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-protection-rated openings, install frames according to NFPA 80.
    b. Install frames with removable glazing stops located on secure side of opening.
    c. Install door silencers in frames before grouting.
    d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    e. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    f. Apply bituminous coating to backs of frames that are filled with mortar, grout, and plaster containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with postinstalled expansion anchors.
3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar as specified in Division 4 Section "Unit Masonry Assemblies."
5. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
6. Installation Tolerances: Adjust standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Standard Steel Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

    a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
    c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
    d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with standard steel door and frame manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c., and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including standard steel doors or frames that are warped, bowed, or otherwise unacceptable.

B. Clean grout and other bonding material off standard steel doors and frames immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

D. Galvannealed Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08111

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 08211
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Solid-core doors with wood-veneer and plastic laminate faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Sections include the following:

1. Division 8 Section "Glazing" for glass view panels in flush wood doors.

1.3 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge constructionand trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire ratings for fire doors.

C. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the following:

1. Faces of Factory-Finished Doors: Show the full range of colors available for stained finishes.

D. Samples for Verification:

1. 6" plastic laminate samples

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Quality Standard: Comply with

1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1. Test Pressure: After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches or less above the sill.
2. Oversize, Fire-Rated Wood Doors: For door assemblies exceeding sizes of tested assemblies, provide oversize fire door label or certificate of inspection, from a testing and inspecting agency acceptable to authorities having jurisdiction, stating that doors comply with requirements of design, materials, and construction.
3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 450 deg F maximum in 30 minutes of fire exposure.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

2. Warranty shall be in effect during the following period of time from date of Substantial Completion:

   a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flush Wood Doors:

   a. Algoma Hardwoods Inc.
   b. Eagle Plywood & Door Manufacturing, Inc.
   c. Eggers Industries; Architectural Door Division.
   d. GRAHAM Manufacturing Corp.
   e. Mohawk Flush Doors, Inc.
   f. Oshkosh Architectural Door Co.
   g. Weyerhaeuser Company.

2.2 DOOR CONSTRUCTION, GENERAL

A. Adhesives: Do not use adhesives containing urea formaldehyde.

B. Doors for Transparent Finish:

1. Grade: Custom with Grade A faces.
2. Species and Cut: Select white maple plain sliced (flat sliced).
3. Match between Veneer Leaves: Book match.
4. Assembly of Veneer Leaves on Door Faces: Center-balance match.
5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
6. Stiles: Same species as faces.

2.3 SOLID-CORE DOORS

A. Particleboard Cores: Comply with the following requirements:

1. Particleboard: ANSI A208.1, Grade LD-2.

   a. Use particleboard made with binder containing no urea-formaldehyde resin.

2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.

3. Provide doors with either glued-block or structural composite lumber cores instead of particleboard cores at locations where exit devices are indicated.

B. Interior Veneer-Faced Doors:

1. Core: Particleboard.
2. Construction: Five or seven plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

C. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

D. Mineral-Core Doors:

1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as follows:

   a. 5-inch top-rail blocking.
   b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
   c. 4-1/2-by-10-inch lock blocks, in doors indicated to have exit devices.

3. Edge Construction: At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.

2.4 LOUVERS AND LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors:

1. Wood Species: Same species as door faces.
2. Profile: Manufacturer's standard shape.
3. At 20-minute, fire-rated, wood-core doors, provide wood beads and metal glazing clips approved for such use.

B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire protection rating indicated.

C. Metal Frames for Light Openings in Fire Rated Plastic Laminated Doors: Manufacturer's standard frame formed of 0.048 inch thick, cold rolled steel sheet; with baked-enamel or powder-coated finish; and approved for use in doors of fire protection rating indicated.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.

1. Light Openings: Trim openings with moldings of material and profile indicated.

2.6 FACTORY FINISHING

A. General: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated" for factory finishing.

B. Finish doors at factory.

C. Finish doors at factory that are indicated to receive transparent finish. Field finish doors indicated to receive opaque finish.

D. Finish doors at factory where indicated in schedules or on Drawings as factory finished.

E. Transparent Finish:

1. Grade: Custom.
2. Finish: AWI System TR-6 catalyzed polyurethane.
3. Staining: As selected by Architect from manufacturer's full range.
4. Effect: Filled.
5. Sheen: Satin.

F. Plastic Laminate Finishes:

1. Face: High pressure decorative laminate complying with NEMA LD 3, Grade HGS.
2. Color Pattern and Finish: Match existing adjacent smooth dark brown.
3. Exposed Edge Finish: All edges to be plastic laminate to match faces and applied before faces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08211

SECTION 08311
ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Access doors and frames for walls and ceilings.

B. Related Sections include the following:

1. Division 4 Section "Unit Masonry Assemblies" for anchoring and grouting access door frames set in masonry construction.
2. Division 7 Section "Roof Accessories" for roof hatches.
3. Division 9 Section "Acoustical Tile Ceilings" for suspended acoustical tile ceilings.
4. Division 15 Section "Duct Accessories" for heating and air-conditioning duct access doors.

1.3 SUBMITTALS

A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of access door(s) and frame(s) through one source from a single manufacturer.

B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for vertical access doors and frames.
2. ASTM E 119 or UL 263 for horizontal access doors and frames.

C. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

A. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS) with A60 zinc-iron-alloy (galvannealed) coating or G60 mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A 924/A 924M.

B. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation for Metallic-Coated Steel Sheet: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

    a. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

2. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.

C. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Acudor Products, Inc.
2. Babcock-Davis; A Cierra Products Co.
3. Jensen Industries.
4. J. L. Industries, Inc.
5. Larsen's Manufacturing Company.

6. Milcor Inc.

B. Flush Access Doors and Frames with Exposed Trim: Fabricated from metallic-coated steel sheet.

1. Locations: Existing wall and ceiling surfaces.
2. Door: Minimum 0.060-inch- thick sheet metal, set flush with exposed face flange of frame.
3. Frame: Minimum 0.060-inch- thick sheet metal with 1-1/4-inch- wide, surface-mounted trim.
4. Hinges: Continuous piano.
5. Latch: Slam latch operated by pinned hex head wrench with interior release.

C. Flush Access Doors and Trimless Frames: Fabricated from metallic-coated steel sheet.

1. Locations: New drywall, wall and ceiling surfaces.
2. Door: Minimum 0.060-inch- thick sheet metal, set flush with surrounding finish surfaces.
3. Frame: Minimum 0.060-inch- thick sheet metal with drywall bead flange.
4. Hinges: Continuous piano.
5. Latch: Slam latch operated by pinned hex head wrench with interior release.

D. Recessed Access Doors and Trimless Frames: Fabricated from metallic-coated steel sheet.

1. Locations: Ceiling surfaces with acoustical tile finish.
2. Door: Minimum 0.060-inch-thick sheet metal in the form of a pan recessed for acoustical tile infill.
3. Frame: Minimum 0.060-inch-thick sheet metal with drywall bead for gypsum board surfaces designed for insertion into acoustical tile ceiling.
4. Hinges: Concealed pivoting rod hinge.
5. Latch: Slam latch operated by pinned hex head wrench with interior release.

E. Fire-Rated, Insulated, Flush Access Doors and Frames with Exposed Trim: Fabricated from metallic-coated steel sheet.

1. Locations: Existing wall and ceiling, and new masonry walls surfaces.
2. Fire-Resistance Rating: Not less than that of adjacent construction.
3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch.
5. Frame: Minimum 0.060-inch-thick sheet metal with 1-inch-wide, surface-mounted trim.
6. Hinges: Continuous piano.
7. Automatic Closer: Spring type.
8. Latch: Self-latching device operated by flush key with interior release.

F. Fire-Rated, Insulated, Flush Access Doors and Trimless Frames: Fabricated from metallic-coated steel sheet.

1. Locations: New drywall ceiling surfaces.
2. Fire-Resistance Rating: Not less than 1 hour.
3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.

4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch.
5. Frame: Minimum 0.060-inch- thick sheet metal with drywall bead.
6. Hinges: Continuous piano.
7. Automatic Closer: Spring type.
8. Latch: Self-latching device operated by flush key with interior release.

G. Fire Rated, Uninsulated, Flush Access Doors and Frames with Exposed Trim: Fabricated from metallic-coated steel sheet.

1. Locations: Wall surfaces.
2. Fire-Resistance Rating: Not less than that of adjacent construction.
3. Door: Minimum 0.060-inch-thick sheet metal, flush construction.
4. Frame: Minimum 0.060-inch- thick sheet metal with 1-1/4-inch- wide, surface-mounted trim.
5. Hinges: Continuous piano.
6. Automatic Closer: Spring type.
7. Latch: Self-latching device operated by flush key with interior release.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

1. Exposed Flanges: As indicated
2. For trimless frames with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
3. Provide mounting holes in frames for attachment of units to metal or wood framing.
4. Provide mounting holes in frame for attachment of masonry anchors. Furnish adjustable metal masonry anchors.

D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.

1. For recessed doors with plaster infill, provide self-furring expanded metal lath attached to door panel.

E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08311

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 08411
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Exterior aluminum-framed storefronts.
    a. Glazing is retained mechanically with gaskets on four sides.
2. Exterior manual-swing aluminum doors.
3. Exterior manual-swing fiberglass reinforced polyester (FRP) flush doors.
4. Exterior aluminum doorframes.

B. Related Sections include the following:

1. Division 7 Section "Joint Sealants" for installation of joint sealants installed with aluminum-framed systems and for sealants to the extent not specified in this Section.
2. Division 8 Section "Door Hardware" for hardware to the extent not specified in this Section.
3. Division 8 Section "Glazing" for glazing requirements to the extent not specified in this Section.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:

1. Structural loads.
2. Thermal movements.
3. Dimensional tolerances of building frame and other adjacent construction.
4. Failure includes the following:
    a. Deflection exceeding specified limits.
    b. Thermal stresses transferred to building structure.
    c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.

d. Noise or vibration created by wind and thermal and structural movements.
e. Loosening or weakening of fasteners, attachments, and other components.
f. Sealant failure.
g. Failure of operating units to function properly.

B. Structural Loads:

1. Wind Loads: See structural drawings.

C. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.

D. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity but not less than 10 seconds.

E. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft.

G. Water Penetration Under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..

H. Sound Transmission: Provide aluminum-framed systems with fixed glazing and framing areas having minimum STC 32 according to ASTM E 413 and an OITC 26 according to ASTM E 1332, as determined by testing according to ASTM E 90.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.
2. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

E. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.

1. Engineering Responsibility: Preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.

B. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration caused by thermal movements.
c. Deterioration of metalsand other materials beyond normal weathering.
d. Water leakage through fixed glazing and framing areas.
e. Failure of operating components to function properly.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: For painted finishes 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include:

1. Kawneer, 350 heavy wall
2. Tubelite Inc., Monumental
3. United States Aluminum, Durafront
4. Capital Aluminum and Glass.
5. Cross, HD series

B. FRP (Fiberglass Reinforced Polyester): Where FRP doors are scheduled, provide products from one of the following manufacturer's:

1. Special-Lite, Inc.
2. Commercial Door
3. Capital Aluminum and Glass.
4. Kawneer

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.

4. Structural Profiles: ASTM B 308/B 308M.

B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

C. FRP Door Face Sheet:

1. Embossed fiberglass reinforced polyester (F.R.P.) 0.120" thick.
2. Core of flush doors to be froth-in-place urethane foam at 2.5 lb./cu. ft. density and to have zero ozone depletion potential and contains no CFC's or HCHC's.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads with a minimum wall thickness of 3/16".

1. Construction: Framing members are composite assemblies of two separate extruded-aluminum components permanently bonded by an elastomeric material of low thermal conductance.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Reinforce members as required to receive fastener threads.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

E. Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

F. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 8 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types, replaceable, molded or extruded, that maintain uniform pressure and watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric types.

2.5 DOORS

A. Doors: Manufacturer's standard glazed doors, for manual swing operation.

1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie rods.
2. Door Design: Wide stile; 5-inch nominal width.

    a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.

3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

    a. Provide nonremovable glazing stops on outside of door.

B. Doors: Manufacturer's standard flush fiberglass reinforced polyester (FRP) doors, for manual swing operation.

1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie rods. Face sheet shall be minimum .210" textured FRP.

2. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

C. Door Hardware: As specified in Division 8 Section "Door Hardware."

2.6 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 7 Section "Joint Sealants."

B. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.7 FABRICATION

A. Form aluminum shapes before finishing.

B. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from exterior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

C. Mechanically Glazed Framing Members: Fabricate for flush glazing (without projecting stops).

D. Storefront Framing: Fabricate components for assembly using shear-block system or screw-spline system.

E. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.

F. Doors: Reinforce doors as required for installing hardware.

1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

G. Hardware Installation: Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

2.9 FRP FINISHES

A. General: Manufacturer's standard color impregnated fiber reinforced polyester embossed surface.

1. Color: As selected by Architect from manufacturer's standard range of color.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight, unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 7 Section "Joint Sealants" and to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, without warp or rack.

F. Install glazing as specified in Division 8 Section "Glazing."

G. Entrances: Install to produce smooth operation and tight fit at contact points.

1. Exterior Entrances: Install to produce tight fit at weather stripping and weathertight closure.

2. Field-Installed Hardware: Install surface-mounted hardware according to hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install perimeter joint sealants as specified in Division 7 Section "Joint Sealants" and to produce weathertight installation.

I. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment:

a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

3. Diagonal Measurements: Limit difference between diagonal measurement to 1/8 inch.

3.3 ADJUSTING

A. Entrances: Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions.

1. For doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.

END OF SECTION 08411

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 08520
ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes fixed and operable aluminum-framed windows for exterior locations.

B. Related Sections include the following:

1. Division 8 Section "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units.

1.3 DEFINITIONS

A. Performance class designations according to AAMA/WDMA 101/I.S.2/NAFS:

1. AW: Architectural.

B. Performance grade number according to AAMA/WDMA 101/I.S.2/NAFS:

1. Design pressure number in pounds force per square foot used to determine the structural test pressure and water test pressure.

C. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.

D. Minimum Test Size: Smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of minimum test size indicated below:

1. Size indicated on Drawings.

B. Structural Performance: Provide aluminum windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Structural Test:

1. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.

a. Basic Wind Speed 90 MPH.
b. Importance Factor III.
c. Exposure Category C.

2. Deflection: Design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch, whichever is less, at design pressure based on testing performed according to AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Deflection Test or structural computations.

C. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:

1. Joinery details.
2. Expansion provisions.
3. Flashing and drainage details.
4. Weather-stripping details.
5. Glazing details.
6. Window cleaning provisions.

7. For installed products indicated to comply with design loads, include structural analysis data prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of aluminum windows and used to determine the following:

   a. Structural test pressures and design pressures from wind loads indicated.
   b. Deflection limitations of glass framing systems.

C. Qualification Data: For Installer, manufacturer, professional engineer and testing agency.

D. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency for each type, class, grade, and size of aluminum window. Test results based on use of downsized test units will not be accepted.

E. Maintenance Data: For operable window sash, operating hardware, weather stripping and finishes to include in maintenance manuals.

F. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

1. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of data for aluminum windows, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

C. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements." Do not modify size and dimensional requirements.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," for definitions and minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.

1. Provide AAMA-certified aluminum windows with an attached label.

F. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to aluminum windows.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.
b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
c. Faulty operation of movable sash and hardware.
d. Deterioration of metals, other materials, and metal finishes beyond normal weathering.
e. Failure of insulating glass.

2. Warranty Period:

a. Window: Ten years from date of Substantial Completion.
b. Glazing: 10 years from date of Substantial Completion.
c. Metal Finish: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Projected:

1. EFCO Corporation. 675, 3903
2. Kawneer; an Alcoa Company. 8325T
3. TRACO. 3100, 750
4. Winco Window Company. 1450H
5. Litex. 900T
6. Capital Aluminum and Glass. 325

C. Single Hung:

1. Kawneer; an Alcoa Company. 8400T
2. Litex 701 T
3. Peerless Products Inc. 9150
4. Wausau Window and Wall Systems. 3151

D. Double Hung:

1. Custom Window Company. 9250
2. EFCO Corporation. 675.

2.2 WINDOW

A. Window Types: Casement, Fixed, bottom-hinged inswinging, and projected awning.

B. AAMA/WDMA Performance Requirements: Provide aluminum windows of performance indicated that comply with AAMA/WDMA 101/I.S.2/NAFS.

1. Performance Class: IW-60 minimum.

C. Thermal Transmittance: Provide aluminum windows with a whole-window, U-factor maximum indicated at 15-mph exterior wind velocity and winter condition temperatures when tested according to AAMA 1503.

1. U-Factor: 0.60 Btu/sq. ft. x h x deg F or less.

D. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/WDMA 101/I.S.2/NAFS, Air Infiltration Test.

1. Maximum Rate: 0.01 cfm/sq. ft. of area at an inward test pressure of 1.57 lbf/sq. ft..

E. Water Resistance: No water leakage as defined in AAMA/WDMA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/WDMA 101/I.S.2/NAFS, Water Resistance Test.

1. Test Pressure: 20 percent of positive design pressure, but not more than 15 lbf/sq. ft..

F. Life-Cycle Testing: Test according to AAMA 910 and comply with AAMA/WDMA 101/I.S.2/NAFS.

G. Operating Force and Auxiliary (Durability) Tests: Comply with AAMA/WDMA 101/I.S.2/NAFS for operating window types indicated.

2.3 GLAZING

A. Glass and Glazing Materials: Refer to Division 8 Section "Glazing" for glass units and glazing requirements applicable to glazed aluminum window units.

2.4 HARDWARE

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows, and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals. Where exposed, provide solid bronze or nonmagnetic stainless steel.

B. Counterbalancing Mechanism: Comply with AAMA 902.

1. Sash Balance: Concealed, spring loaded, block and tackle type or ultralift spring type capable of lifting 70 percent of sash weight, of size and capacity to hold sash stationary at any open position.

C. Sill Cap/Track: Extruded-aluminum track with finish to match windows of thickness, dimensions, and profile indicated; designed to comply with performance requirements indicated and to drain to the exterior.

D. Locks and Latches: Designed to allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.

E. Double or Single Hung Windows: Provide the following operating hardware:

1. Sash Balances: Four concealed, spring loaded, block and tackle type or two ultralift spring type capable of lifting 70 percent of sash weight, of size and capacity to hold sash stationary at any open position.
2. Handle: Continuous, integral, sash lift bar and pull down on bottom rail of forward placed operating sash.
3. Sash Lock: Cam-action sweep lock and keeper on meeting rail; one per sash, and spring loaded, snap type lock on bottom rail of lower sash.
4. Pole Socket: Provide a pole socket or groove on inside face of top rail of upper and/or lower sash on windows with meeting rails more than 72 inches above floor.
5. Limit Device: Sash stop limit device; for each operable sash located at jamb; two per sash.
6. Removable Lift-Out Sash: Design windows and provide with hardware to permit removal of sash from inside of ceiling.

F. Projected Windows: Provide the following operating hardware:

1. Operator: Underscreen pivot shot type.

2. Hinge: Concealed four or six bar friction hinge with adjustable slide friction shoe; two per ventilator.
3. Lock: Cam-action, sweep lock handle with strike; two per ventilator.

G. Projected Awning Windows: Provide the following operating hardware:

1. Operator: Lever operated located on jam at sill.
2. Hinge: Concealed four or six bar friction hinge located on each jamb near top rail; two per ventilator.
3. Lock: Combination lever handle and cam action lock with concealed pawl and keeper; one minimum per ventilator.
4. Limit Device: Concealed friction adjustor, adjustable stay bar limit device; located on jamb of each ventilator.

2.5 INSECT SCREENS

A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Fabricate insect screens to fully integrate with window frame. Locate screens on outside of window and provide for each operable exterior sash or ventilator.

1. Aluminum Tubular Frame Screens: Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows," Architectural C-24 class.
2. Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows," for minimum standards of appearance, fabrication, attachment of screen fabric, hardware, and accessories unless more stringent requirements are indicated.

B. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch- diameter, coated aluminum wire.

1. Wire-Fabric Finish:

a. Charcoal Grey.

C. Wickets: Provide sliding or hinged wickets, framed and trimmed for a tight fit and for durability during handling.

2.6 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.

C. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.

D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

E. Provide water-shed members above side-hinged ventilators and similar lines of natural water penetration.

F. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 8 Section "Glazing" and with AAMA/WDMA 101/I.S.2/NAFS.

G. Glazing Stops: Provide snap-on glazing stops coordinated with Division 8 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.

1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
2. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and ventilators, screens, hardware,and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

C. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain window operating system. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION 08520

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 08710
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Commercial door hardware for the following:

a. Swinging doors.

B. Related Sections include the following:

1. Division 8 Section "Standard Steel Doors and Frames" for astragals provided as part of fire-rated labeled assemblies and for door silencers provided as part of hollow-metal frames.
2. Division 8 Section "Flush Wood Doors" for astragals and integral intumescent seals provided as part of fire-rated labeled assemblies.
3. Division 8 Section "Aluminum-Framed Entrances, Storefronts and Curtain Walls" for door hardware, listed in section 08710 including cylinders.

C. Products and Services furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.

1.3 SUBMITTALS

A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples for Verification: For exposed door hardware of each type, in specified finish, full size. Tag with full description for coordination with the door hardware sets. Submit Samples before, or concurrent with, submission of the final door hardware sets, if requested by the architect.

1. Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.

C. Qualification Certification: For Architectural Hardware Consultant.

D. Warranty: Special warranty specified in this Section.

E. Other Action Submittals:

1. Door Hardware Sets: Prepared by or under the supervision of Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

   a. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.
   b. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
   c. Content: Include the following information:

      1) Identification number, location, hand, fire rating, and material of each door and frame.
      2) Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device.
      3) Complete designations of every item required for each door or opening including name and manufacturer.
      4) Fastenings and other pertinent information.
      5) Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
      6) Explanation of abbreviations, symbols, and codes contained in schedule.
      7) Mounting locations for door hardware.
      8) Door and frame sizes and materials.

   d. Submittal Sequence: Submit the door hardware sets at earliest possible date, particularly where approval of the door hardware sets must precede fabrication of other work that is critical in Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the door hardware sets.

1.4 QUALITY ASSURANCE

A. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

B. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1. Test Pressure: Test at atmospheric pressure.

D. Keying: All Corbin/Russwin lock cylinders shall be provided in the proper keyway, by the hardware supplier. Keying of the cylinders will be by the hardware supplier.

E. Preinstallation Conference: Conduct a mandatory conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures relating to the installation of locksets, exit devices, door closers, overhead type stops and wall or floor type stops and holders Product manufacturers representatives shall illustrate and instruct the proper installation methods, along with the correct type of fasteners for use when installing their products.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.

1.6 COORDINATION

A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Existing Openings: Where new hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide for proper operation.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Structural failures including excessive deflection, cracking, or breakage.
   b. Faulty operation of operators and door hardware.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: One year from date of Substantial Completion, except as follows:
   a. Locksets: One year from date of Substantial Completion.
   b. Exit Devices: Two years from date of Substantial Completion.

c. Manual Closers: Ten years from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets listed in door and frame schedule and door hardware sets indicated in Part 3 "Door Hardware Sets" Article.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products listed in hardware sets or those listed as acceptable.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in the "Door Hardware Sets."
2. References to BHMA Standards: Provide named products complying with these standards and requirements for description, quality, and function.

C. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, those manufacturers specified or named as acceptable.

2.2 HINGES, GENERAL

A. Quantity: Provide the following, unless otherwise indicated:

1. Two Hinges: For doors with heights up to 60 inches (1524 mm).
2. Three Hinges: For doors with heights 61 to 90 inches (1549 to 2286 mm).
3. Four Hinges: For doors with heights 91 to 120 inches (2311 to 3048 mm).
4. For doors with heights more than 120 inches (3048 mm), provide 4 hinges, plus 1 hinge for every 30 inches (750 mm) of door height greater than 120 inches (3048 mm).

B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

C. Hinge Weight: Unless otherwise indicated, provide the following:

1. Exterior Doors: Heavy-duty continuous aluminum gear hinges.
2. Doors with Closers: Antifriction-bearing hinges.
3. Interior Doors: Antifriction-bearings. Standard or heavy weight hinges as listed in the hardware sets.

D. Hinge Base Metal: Unless otherwise indicated, provide the following:

1. Exterior Hinges: Aluminum gear hinges anodized after machining.
2. Interior Hinges: - Brass, with stainless-steel pin body and brass protruding heads, Steel, with steel pin, or Stainless steel, with stainless steel pin as listed in hardware sets.
3. Hinges for Fire-Rated Assemblies: Steel, with steel pin, or Stainless steel, with stainless-steel pin.

E. Hinge Options: Where indicated in door hardware sets or on Drawings:
1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for outswinging exterior doors.
2. Corners: Square.

F. Fasteners: Comply with the following:

1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
2. Wood Screws: For wood doors and frames.
3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
4. Screws: Phillips flat-head; Finish screw heads to match surface of hinges.

2.3 HINGES

A. Butts and Hinges: BHMA A156.1. Listed under Category A in BHMA's "Certified Product Directory."

B. Template Hinge Dimensions: BHMA A156.7.

C. Available Manufacturers:
1. Bommer Industries, Inc. (BOM).
2. Hager Companies (HAG).
3. Ives, an Ingersol-Rand company. (IVE)
4. McKinney Products Company; an ASSA ABLOY Group company (MCK).
5. Select products. (SEL).

2.4 LOCKS AND LATCHES, GENERAL

A. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans

with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." ANSI A117.1. FED-STD-795, "Uniform Federal Accessibility Standards." 2003 Michigan Building Code.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22 N).

B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf (67 N) to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

C. Lock Trim:

1. Levers: Wrought.
2. Roses: Wrought.
3. Lockset Designs: Corbin/Russwin LWA.

D. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
1. Mortise Locks: Minimum 3/4-inch (19-mm) latch bolt throw.
2. Deadbolts: Minimum 1-inch (25-mm) bolt throw.

E. Backset: 2-3/4 inches (70 mm), unless otherwise indicated.

F. Strikes: Manufacturer's standard strike with strike box for each latch bolt or lock bolt, with lip extended to protect frame, finished to match door hardware set, and as follows:
1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.

2.5 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the following:

1. Mortise Locks: BHMA A156.13.

B. Mortise Locks: Stamped steel case with steel or brass parts; BHMA A156.13, Grade 1; Series 1000. Listed under Category F in BHMA's "Certified Product Directory."

1. Acceptable Manufacturer:
   a. Corbin Russwin; an ASSA Abloy group company (C-R). "No-Substitution"

2.6 EXIT DEVICES

A. Exit Devices: BHMA A156.3, Grade 1, Listed under Category G in BHMA's "Certified Product Directory."

B. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural &

Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." ANSI A117.1. FED-STD-795, "Uniform Federal Accessibility Standards." 2003 Michigan Building Code.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22 N).

C. Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 15 lbf (67 N) to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

E. Removable Mullions: BHMA A156.3.

F. Acceptable Manufacturer:

1. Precision Hardware, Inc. (PRE). Apex Series "No-Substitution"

2.7 KEYING

1. Keying System: The contractor shall be responsible for providing correct 6 pin keyway cylinders to match existing building system, and keying new cylinders. The contractor shall meet with Mondo Belardi of Troy schools to obtain master and grand master keys for keying work, and assure that correct keyway cylinders are provided for new doors in additions or for new door openings in the existing buildings.

2.8 OPERATING TRIM

A. Standard: BHMA A156.6 and as listed in hardware sets.

B. Materials: Fabricate from stainless steel, unless otherwise indicated.

C. Acceptable Manufacturers:

1. Hager Companies (HAG).
2. IVES Hardware; an Ingersoll-Rand Company (IVE).
3. Rockwood Manufacturing Company (ROC).
4. Trimco (TRI).

2.9 CLOSERS

A. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." ANSI A117.1. FED-STD-795, "Uniform Federal Accessibility Standards." 2003 Michigan Building Code.

1. Comply with the following maximum opening-force requirements:

    a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
    b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

B. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf (133 N) to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.

C. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

D. Surface Closers: BHMA A156.4, Grade 1. Listed under Category C in BHMA's "Certified Product Directory." Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.

1. Acceptable Manufacturer:
    a. LCN Closers; an Ingersoll-Rand Company (LCN). "No-Substitution".

E. Size: 2 inches (38 mm) less than door width on push side and 1 inch (13 mm) less than door width on pull side, by height specified in door hardware sets.

F. Fasteners: Manufacturer's standard machine or self-tapping screws.

G. Metal Protective Trim Units: BHMA A156.6; beveled top and 2 sides; fabricated from material indicated in door hardware sets.

1. Material: 0.050-inch- (1.3-mm-) thick stainless steel.
2. Available Manufacturers:
    a. Hager Companies (HAG).
    b. IVES Hardware; an Ingersoll-Rand Company (IVE).
    c. Rockwood Manufacturing Company (ROC).
    d. Trimco (TRI).

2.10 STOPS AND HOLDERS

A. Stops and Bumpers: BHMA A156.16, Grade 1.

1. Provide wall stops for doors unless floor or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where wall or floor stops are not appropriate, provide overhead holders.

B. Mechanical Door Holders: BHMA A156.16, Grade 1.

C. Silencers for Metal Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum diameter 1/2 inch (13 mm); fabricated for drilled-in application to frame.

D. Acceptable Manufacturers:

1. Architectural Builders Hardware Mfg., Inc. (ABH).
2. Glynn Johnson; an Ingersoll-Rand Company (GLY).
3. Hager Companies (HAG).
4. IVES Hardware; an Ingersoll-Rand Company (IVE).
5. Rockwood Manufacturing Company (ROC).
6. Trimco (TRI).

2.11 THRESHOLDS

A. Standard: BHMA A156.21. Listed under Category J in BHMA's "Certified Product Directory."

B. Accessibility Requirements: Where thresholds are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." ANSI A117.1. FED-STD-795, "Uniform Federal Accessibility Standards."

1. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.

C. Thresholds for Means of Egress Doors: Comply with NFPA 101. Maximum 1/2 inch (13 mm) high.

D. Available Manufacturers:

1. Hager Companies (HAG).
2. National Guard Products (NGP).
3. Pemko Manufacturing Co. (PEM).
4. Reese Enterprises (RE).

2.12 FABRICATION

A. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

B. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means

of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Steel Machine or Wood Screws: For the following fire-rated applications:

   a. Mortise hinges to doors.
   b. Strike plates to frames.
   c. Closers to door frames.

3. Steel Through Bolts: For the following fire-rated and non-rated applications even if door blocking is provided:

   a. Closers to doors.

4. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
5. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
6. Install door closers and door holders with sex-bolts.

2.13 FINISHES

A. Standard: BHMA A156.18, as indicated in door hardware sets.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: Comply with DHI A115 Series.

1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.

B. Wood Doors: Comply with DHI A115-W Series.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

3.4 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 1 Section "Demonstration and Training."

3.8 DOOR HARDWARE SETS

SPECWORKS # 62071-B6E22YFCW

HW SET: 01
DOOR NUMBER:
109

EACH TO HAVE:

6	EA	WIDE THROW HINGE	BB1168-WT 4.5 X 6	652	HAG
2	EA	FIRE EXIT DEVICE	FL2203LBR	630	PRE
2	EA	SURFACE CLOSER	4111 EDA X ST2456 TB	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LTDW B3E	630	IVE
2	EA	DOME STOP W/RISER	FS436 X 435	626	IVE

HW SET: 02
DOOR NUMBER:
112

EACH TO HAVE:

6	EA	WIDE THROW HINGE	BB1168-WT 4.5 X 6	652	HAG
2	EA	FIRE EXIT DEVICE	FL2203LBR	630	PRE
2	EA	SURFACE CLOSER	4111 EDA X ST2456 TB	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LTDW B3E	630	IVE
1	EA	DOME STOP W/RISER	FS436 X 435	626	IVE
1	EA	WALL STOP	WS401CVX	626	IVE

HW SET: 03
DOOR NUMBER:
113A 113B

EACH TO HAVE:

3	EA	HINGE	BB1279 4.5 X 4.5	652	HAG
1	EA	CLASSROOM LOCK	ML2055 LWA X1-67	630	C-R
1	EA	KICK PLATE	8400 10" X 1-1/2" LTDW B3E	630	IVE
1	EA	WALL STOP	WS33X	626	IVE

HW SET: 04
DOOR NUMBER:
114 115

EACH TO HAVE:

3	EA	HINGE	BB1279 4.5 X 4.5	652	HAG
1	EA	PRIVACY LOCK	ML2030 LWA	630	C-R
1	EA	SURFACE CLOSER	4011 X TB	689	LCN
1	EA	KICK PLATE	8400 10" X 1-1/2" LTDW B3E	630	IVE
1	EA	WALL STOP	WS33X	626	IVE

HW SET: 05
DOOR NUMBER:
116

EACH TO HAVE:

3	EA	HINGE	BB1279 4.5 X 4.5	652	HAG
1	EA	STOREROOM LOCK	ML2057 LWA X1-67	630	C-R
1	EA	SURFACE CLOSER	4011 X TB	689	LCN
1	EA	KICK PLATE	8400 10" X 1-1/2" LTDW B3E	630	IVE
1	EA	WALL STOP	WS33X	626	IVE

HW SET: 06
DOOR NUMBER:
NOT USED

EACH TO HAVE:

HW SET: 07
DOOR NUMBER:
200A 200B 202A 202B

EACH TO HAVE:

3	EA	HINGE	BB1279 4.5 X 4.5	652	HAG
1	EA	CLASSROOM LOCK	ML2055 LWA X1-67	630	C-R
1	EA	SURFACE CLOSER	4111 EDA X TB	689	LCN
1	EA	KICK PLATE	8400 10" X 1-1/2" LTDW B3E	630	IVE
1	EA	WALL STOP	WS401CVX	626	IVE

HW SET: 08
DOOR NUMBER:
315

EACH TO HAVE:

3	EA	HINGE	BB1279 4.5 X 4.5	652	HAG
1	EA	CLASSROOM LOCK	ML2055 LWA X1-67	630	C-R
1	EA	SURFACE CLOSER	4111 EDA X TB	689	LCN
1	EA	KICK PLATE	8400 10" X 1-1/2" LTDW B3E	630	IVE
1	EA	WALL STOP	WS401CVX	626	IVE
1	SET	SEALS	9850 1/36" 2/86"	AL	NGP

HW SET: 09
DOOR NUMBER:
201A 201B

EACH TO HAVE:

3	EA	HINGE	BB1279 4.5 X 4.5	652	HAG
1	EA	CLASSROOM LOCK	ML2055 LWA X1-67	630	C-R
1	EA	SURFACE CLOSER	4011 X TB	689	LCN
1	EA	KICK PLATE	8400 10" X 1-1/2" LTDW B3E	630	IVE
1	EA	WALL STOP	WS33X	626	IVE

HW SET: 10
DOOR NUMBER:
201C

EACH TO HAVE:

6	EA	HINGE	BB1279 4.5 X 4.5	652	HAG
1	SET	AUTO FLUSH BOLT	FB41P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ML2057 LWA X1-67	630	C-R
1	EA	COORDINATOR	COR52 X FL20	689	IVE
1	EA	MOUNTING BRACKET	MB2	689	IVE
1	EA	SURFACE CLOSER	4031 EDA XTB	689	LCN
2	EA	WALL STOP	WS401CVX	626	IVE

CLOSER ON LHR INACTIVE TO HOLD DOOR CLOSED

HW SET: 11
DOOR NUMBER:
400

EACH TO HAVE:

6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
2	EA	FIRE EXIT DEVICE	FL2208 X V4908C X LBR	VFY	PRE
2	EA	RIM CYLINDER	3000-200 X1-67	626	C-R
1	SET	ASTRAGAL	9115A 84"	AL	NGP
2	EA	SURFACE CLOSER	4111 EDA X 62G	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LTDW B3E	630	IVE
2	EA	MAGNETIC HOLD-OPEN	SEM 7850 24V	AL	LCN
1	SET	SEALS	107NA 1/72" 2/84"	AL	NGP
2	EA	DOOR BOTTOM	225N	AL	NGP

MOUNT CLOSER FOOT BEHIND STOP TO CLEAR SEAL

HW SET: A01
DOOR NUMBER:
100

EACH TO HAVE:

1	EA	CONTINUOUS HINGE	SL11 HD	628	SEL
1	EA	PANIC DEVICE	2101	630	PRE
1	EA	SURFACE CLOSER	4111 EDA X ST3447	689	LCN
1	EA	OVERHEAD STOP	814S	630	GLY
1	EA	KICK PLATE	8400 10" X 1-1/2" LTDW B3E	630	IVE
1	EA	THRESHOLD	896N 36"	AL	NGP
1	SET	WEATHER SEAL	SUPPLY WITH DOOR AND FRAME ASSEMBLY		

HW SET: A02
DOOR NUMBER:
220

EACH TO HAVE:

1	EA	CONTINUOUS HINGE	SL11 HD	628	SEL
1	EA	PANIC DEVICE	2103	630	PRE
1	EA	RIM CYLINDER	3000-200 X1-67	626	C-R
1	EA	FLUSH PULL	1111A	630	TRI
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	WALL STOP	WS33X	626	IVE
1	EA	THRESHOLD	424 36"	AL	NGP
1	EA	DOOR SWEEP	C627A	AL	NGP
1	SET	WEATHER SEAL	SUPPLY WITH DOOR AND FRAME ASSEMBLY		

END OF SECTION 08710

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 08800
GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.
3. Glazed entrances.
4. Storefront framing.

1.3 DEFINITIONS

A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

a. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.

b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.

1) Load Duration: 60 seconds or less.

c. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.

1) For monolithic-glass lites heat treated to resist wind loads.
2) For insulating glass.

d. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

e. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: For the following products, in the form of 12-inch- square Samples for glass.

1. Each color of tinted float glass.
2. Ceramic-coated spandrel glass.
3. Fire-resistive glazing products.
4. Insulating glass for each designation indicated.

C. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

D. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass, coated float glass and insulating glass.

C. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.

D. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

E. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

F. Glazing for Fire-Rated Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.

G. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.

1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.

2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

H. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.9 WARRANTY

A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2.2 GLASS PRODUCTS

A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
2. For uncoated glass, comply with requirements for Condition A.
3. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
4. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.

C. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.
3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
4. Sealing System: Dual seal, with primary and secondary sealants as follows:

    a. Manufacturer's standard sealants.

5. Spacer Specifications: Manufacturer's standard spacer material and construction.

2.3 FIRE-RATED GLAZING PRODUCTS

A. Monolithic Ceramic Glazing Material: Proprietary product in the form of clear flat sheets of 3/16-inch nominal thickness weighing 2.5 lb/sq. ft., and as follows:

1. Fire-Protection Rating: As indicated for the fire window in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.

B. Laminated Ceramic Glazing Material: Proprietary Category II safety glazing product in the form of 2 lites of clear ceramic glazing material laminated together to produce a laminated lite of 5/16-inch nominal thickness; polished on both surfaces; weighing 4 lb/sq. ft.; and as follows:

1. Fire-Protection Rating: As indicated for the assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
2. Polished on both surfaces, transparent.

C. Specially Tempered Monolithic Glass: Proprietary Category II safety glazing product in the form of a specially tempered 1/4-inch- thick monolithic lite, and as follows:

1. Fire-Protection Rating: 20 minutes, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.

2.4 GLAZING GASKETS

A. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.5 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.6 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

2.7 MONOLITHIC FLOAT-GLASS UNITS

A. Uncoated Clear Float-Glass Units: Class 1 (clear) Kind FT (fully tempered) float glass.

2.8 INSULATING-GLASS UNITS

A. Passive Solar Low-E Insulating-Glass Units **MATCH COLOR OF NEW BAKER MIDDLE SCHOOL**:

1. Basis-of-Design Product: Viracon or a comparable product by one of the following:

   a. LOF
   b. PPG
   c. Pilkington

2. Overall Unit Thickness and Thickness of Each Lite: 25 and 6.0 mm.
3. Interspace Content: Air.
4. Outdoor Lite: Class 2 (tinted) float glass complying with ceramic-coated vision-glass requirements.

   a. Tint Color: Bronze.
   b. Kind FT (fully tempered).

5. Indoor Lite: Class 1 (clear) float glass.

   a. Kind FT (fully tempered).

6. Low-E Coating: Pyrolytic on second surface.
7. Visible Light Transmittance: .40 percent minimum.
8. Winter Nighttime U-Factor: 0.31 maximum.
9. Summer Daytime U-Factor: 0.32 maximum.
10. Solar Heat Gain Coefficient: 0.40 maximum.
11. Outdoor Visible Reflectance: .34 percent maximum.

B. Vision-Control Low-E Insulating-Glass Units **MATCH COLOR OF NEW BAKER MIDDLE SCHOOL**:

1. Basis-of-Design Product: Viracon or a comparable product by one of the following:

   a. LOF
   b. PPG
   c. Pilkington

2. Overall Unit Thickness and Thickness of Each Lite: 25 and 6.0 mm.
3. Interspace Content: Air.
4. Outdoor Lite: Class 2 (tinted) float glass complying with ceramic-coated vision-glass requirements.

   a. Tint Color: Bronze.
   b. Kind FT (fully tempered).

5. Indoor Lite: Patterned Glass, pattern on 3rd surface, frosted.

   a. Kind FT (fully tempered).

6. Visible Light Transmittance: 40 percent minimum.

7. Winter Nighttime U-Factor: 0.31 maximum.
8. Summer Daytime U-Factor: 0.32 maximum.
9. Solar Heat Gain Coefficient: 0.40 maximum.
10. Outdoor Visible Reflectance: 0.34 percent maximum.

2.9 METAL-FACED INSULATED COMPOSITE PANELS

A. General: Provide factory formed and assembled metal faced insulated composite panels fabricated from two metal facings bonded to insulated core; formed into profile for installation method indicated. Include attachment system components and accessories required for weathertight system.

1. Available Manufacturers:

a. Citadel Architectural Products. Glazeguard 1000 WR
b. Laminators, Inc. Thermolite
c. Mapes Architectural Products. Corelite

B. Aluminum-Faced Composite Wall Panels: Formed with 0.032 inch thick, painted aluminum sheet facings.

1. Panel Thickness: 1"
2. Core: Non-absorbent and water insensitive face sheet backer with isocyanurate insulation core.
3. Exterior Finish: Kynar 500 on aluminum with 20 year finish warranty.

a. Interior and Exterior Color: Match Valspar Fluoropon 397 F 220, Herring Bone.

4. Surface: Smooth/flat.

C. Attachment System Components: Glazed in window frame.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Install gaskets so they protrude past face of glazing stops.

3.5 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system, unless otherwise indicated.

3.6 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 08800

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 09111
NON-LOAD-BEARING STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes non-load-bearing steel framing members for the following applications:

1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

B. Related Sections include the following:

1. Division 5 Section "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.
2. Division 7 Section "Building Insulation" for insulation installed with Z-shaped furring members.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
2. Protective Coating: manufacturer's standard corrosion-resistant zinc coating, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.

B. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.

a. Type: Postinstalled, chemical anchor.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.

D. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.
2. Steel Studs: ASTM C 645.

a. Minimum Base-Metal Thickness: 0.0312 inch.
b. Depth: 3-5/8 inches.

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.

a. Minimum Base Metal Thickness: 0.0312 inch.

E. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Armstrong World Industries, Inc.; Drywall Grid Systems.
b. USG Corporation; Drywall Suspension System.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0312 inch.

B. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.

C. Firestop Track: As specified in Division 7 Section "Fire-Resistive Joint Systems."

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.0179 inch.

E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0312 inch.
2. Depth: 1-1/2 inches.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb, unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

    a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

D. Direct Furring:

1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

E. Z-Furring Members:

1. Erect insulation (specified in Division 7 Section "Building Insulation") vertically and hold in place with Z-furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 09111

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 09250
GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Interior gypsum board.

B. Related Sections include the following:

1. Division 05 Section "Cold-Formed Metal Framing" for load-bearing steel framing that supports gypsum board.
2. Division 07 Section "Thermal Insulation" for insulation and vapor retarders installed in assemblies that incorporate gypsum board.
3. Division 07 Section "Fire-Resistive Joint Systems" for head-of-wall assemblies that incorporate gypsum board.
4. Division 09 Section "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board.
5. Division 09 painting Sections for primers applied to gypsum board surfaces.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

1.5 STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American Gypsum Co.
b. G-P Gypsum.
c. National Gypsum Company.
d. USG Corporation.

B. Type X:

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

C. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.

1. Thickness: 1/2 inch.
2. Long Edges: Tapered.

D. Abuse-Resistant Type: Manufactured to produce greater resistance to surface indentation, through-penetration (impact resistance), and abrasion than standard, regular-type and Type X gypsum board. 5/8 inch, Type X

1. Long Edges: Tapered.

E. High-Impact Type: Manufactured with Type X core, fiberglass mesh laminated to back side for greater resistance to through-penetration (impact resistance).

1. Core: 5/8 inch thick.
2. National Gypsum Hi-Impact XP Level 3-Heavy Duty.

F. Moisture and Mold-Resistant Type: With moisture and mold-resistant core and surfaces.

1. Core: 5/8 inch thick, Type X.
2. Long Edges: Tapered.

2.3 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Paper-faced galvanized steel sheet.
2. Shapes:

a. Cornerbead.
b. Bullnose bead.
c. LC-Bead: J-shaped; exposed long flange receives joint compound.
d. L-Bead: L-shaped; exposed long flange receives joint compound.
e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
f. Expansion (control) joint.

2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.
3. Glass-Mat Gypsum Sheathing Board: 10 by 10 glass mesh.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.

    a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Type X: Vertical surfaces, unless otherwise indicated.
2. Ceiling Type: Ceiling surfaces unless noted as fire rated.
3. Abuse-Resistant Type: All studwall in classrooms from floor to 8'-0" above floor.
4. High-Impact Type: Corridor, shop and storage room walls from floor to 4'-0" above finished floor with abuse-resistant board from 4'-0" to 8'-0" A.F.F.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.

2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners, unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.
4. U-Bead: Use at exposed panel edges.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.

3. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.

    a. Primer and its application to surfaces are specified in other Division 09 Sections.

3.6 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09250

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 09310
CERAMIC TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Quarry tile.
2. Paver tile.
3. Stone thresholds installed as part of tile installations.
4. Waterproof membrane for tile installations.
5. Crack-suppression membrane for thin-set tile installations.
6. Metal edge strips installed as part of tile installations.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for tile substrates.
2. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
3. Division 9 Section "Gypsum Board Assemblies" for cementitious backer units.

1.3 DEFINITIONS

A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.

B. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

1.4 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.6.

2. Step Treads: Minimum 0.6.
3. Ramp Surfaces: Minimum 0.8.

1.5 SUBMITTALS

A. Samples for Verification:

1. Chip-size units of each type and composition of tile and for each color and finish required.

1.6 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain all tile of same type and color or finish from one source or producer.

1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:

1. Stone thresholds.
2. Waterproofing.
3. Joint sealants.
4. Cementitious backer units.
5. Metal edge strips.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store liquid latexes and emulsion adhesives in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:

1. As indicated by manufacturer's designations.

D. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless otherwise indicated.

F. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.3 TILE PRODUCTS

A. Available Manufacturers:

1. American Olean; Div. of Dal-Tile International Corp.
2. Crossville Ceramics Company, L.P.
3. Daltile; Div. of Dal-Tile International Inc.
4. Royal Mosa.

B. Glazed Paver Tile **CTF-1, CTF-1A**: Flat tile as follows:

1. Composition: Porcelain.
2. Facial Dimensions: 6" x 6" and 18" x 18" .
3. Thickness: 5/16".
4. Face: Plain with square or cushion edges.
5. Finish: Mat, opaque glaze.
6. Provide epoxy grout.
7. Products:

   a. CTF-1: Crossville, Pompeii Series, Color: Forum Stone VS50 (18" x 18")
      CTF-1A: Crossville, Pompeii Series, Color: Forum Stone VS50 (6" x 6")

C. Glazed Wall Tile Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:

1. Base for Thin-Set Mortar Installations: Straight, module size 6 by 6 inches.
2. Wainscot Cap for Portland Cement Mortar Installations: Bullnose cap, module size 6 by 6 inches.
3. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose, module size 6 by 6 inches.
4. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above.
5. External Corners for Portland Cement Mortar Installations: Bullnose shape with radius of at least 3/4 inch, unless otherwise indicated.
6. External Corners for Thin-Set Mortar Installations: Surface bullnose.

7. Internal Corners: Field-butted square corners except with coved base and cap angle pieces designed to fit with stretcher shapes.
8. Color: CTW-5.

D. Ceramic Mosaic Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:

1. Tapered Transition Tile at Showers: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch across nominal 4-inch dimension.

2.4 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.

B. Marble Thresholds: ASTM C 503 with a minimum abrasion resistance of 10 per ASTM C 1353 or ASTM C 241 and with honed finish.

1. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.5 WATERPROOFING AND CRACK-SUPPRESSION MEMBRANES FOR THIN-SET TILE INSTALLATIONS

A. General: Manufacturer's standard product that complies with ANSI A118.10, selected from the following.

B. Fabric-Reinforced, Modified-Bituminous-Sheet Product: Self-adhering SBS-modified-bituminous sheet with woven reinforcement facing for adhering to latex-portland cement mortar; 36 inches wide by 0.040-inch nominal thickness.

1. Available Product: National Applied Construction Products, Inc.; Strataflex.

C. Fabric-Reinforced, Fluid-Applied Product: System consisting of liquid-latex rubber and fabric reinforcement.

1. Available Products:

a. Custom Building Products; Trowel & Seal Waterproofing and Anti-Fracture Membrane.
b. LATICRETE International Inc.; Laticrete 9235 Waterproof Membrane.
c. MAPEI Corporation; PRP M19.
d. Summitville Tiles, Inc.; S-9000.

D. Latex-Portland Cement Product: Flexible mortar consisting of cement-based mix and acrylic-latex additive.

1. Available Products:

    a. Boiardi Products Corporation; Elastiment 323.
    b. MAPEI Corporation; PRP 315.
    c. Southern Grouts & Mortars, Inc.; Southcrete 1100.
    d. TEC Specialty Products Inc.; TA-324, Triple Flex.

2.6 SETTING AND GROUTING MATERIALS

A. Available Manufacturers:

1. DAP, Inc.
2. LATICRETE International Inc.
3. MAPEI Corporation.
4. TEC Specialty Products Inc.

B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:

1. Prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added at Project site.
2. Prepackaged dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive.

    a. For wall applications, provide nonsagging mortar that complies with Paragraph F-4.6.1 in addition to the other requirements in ANSI A118.4.

C. Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy: ANSI A118.3.

1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F and 212 deg F, respectively, and certified by manufacturer for intended use.

2.7 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 7 Section "Joint Sealants."

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

1. Available Products:

    a. Dow Corning Corporation; Dow Corning 786.
    b. GE Silicones; Sanitary 1700.

c. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
d. Tremco, Inc.; Tremsil 600 White.

D. Chemical-Resistant Sealants: For chemical-resistant floors, provide chemical-resistant elastomeric sealant of type recommended and produced by chemical-resistant mortar and grout manufacturer for type of application indicated, with proven service record and compatibility with tile and other setting materials, and with chemical resistance equivalent to mortar/grout. Include primer and backer rod recommended by manufacturer.

2.8 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications, white zinc alloy exposed-edge material.

C. Temporary Protective Coating: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.
2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.9 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Provide concrete substrates for tile floors installed with adhesives or thin-set mortar that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.

1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

D. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

H. Grout tile to comply with requirements of the following tile installation standards:

1. For ceramic tile grouts (sand-portland cement; dry-set, commercial portland cement; and latex-portland cement grouts), comply with ANSI A108.10.
2. For chemical-resistant epoxy grouts, comply with ANSI A108.6.
3. For chemical-resistant furan grouts, comply with ANSI A108.8.

I. At showers, tubs, and where indicated, install cementitious backer units and treat joints to comply with ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.4 WATERPROOFING AND CRACK-SUPPRESSION MEMBRANE INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.

B. Install crack-suppression membrane to comply with manufacturer's written instructions to produce membrane of uniform thickness bonded securely to substrate.

C. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.

1. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.

    a. Tile floors in wet areas.
    b. Tile swimming pool decks.
    c. Tile floors composed of tiles 8 by 8 inches or larger.
    d. Tile floors composed of rib-backed tiles.

B. Joint Widths: Install tile on floors with the following joint widths:

1. Ceramic Mosaic Tile: 1/16 inch.
2. Paver Tile: 1/4 inch or less.

C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

D. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

3.6 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.

B. Install metal lath and scratch coat for walls to comply with ANSI A108.1A, Section 4.1.

C. Joint Widths: Install tile on walls with the following joint widths:

1. Glazed Wall Tile: 1/16 inch.

3.7 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove epoxy grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect

metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

3.8 FLOOR TILE INSTALLATION SCHEDULE

A. Tile Installation: Chemical-resistant interior floor installation on concrete; chemical-resistant, water-cleanable, tile-setting and -grouting epoxy; epoxy grout; TCA F131 and ANSI A108.6.

1. Tile Type: Unglazed ceramic mosaic, Unglazed paver tile.
2. Grout: Chemical-resistant, water-cleanable, tile-setting and -grouting epoxy.

3.9 WALL TILE INSTALLATION SCHEDULE

A. Tile Installation: Exterior or interior wall installation over sound, dimensionally stable masonry or concrete; thin-set mortar; TCA W202 and ANSI A108.5.

1. Tile Type: Glazed wall tile.
2. Thin-Set Mortar: Latex-portland cement mortar.
3. Grout: Polymer-modified sanded grout.

END OF SECTION 09310

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 09511
ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes acoustical panels and exposed suspension systems for ceilings.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.3 DEFINITIONS

A. AC: Articulation Class.

B. CAC: Ceiling Attenuation Class.

C. LR: Light Reflectance coefficient.

D. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.

C. Qualification Data: For testing agency.

D. Field quality-control test reports.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.

F. Maintenance Data: For finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
b. Identify materials with appropriate markings of applicable testing and inspecting agency.

2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:

a. Smoke-Developed Index: 450 or less.

C. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:

1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.8 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

C. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or

bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

D. Antimicrobial Fungicide Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING **(APC-1) (General)**

A. Products: Subject to compliance with requirements, provide one of the following:

1. Armstrong World Industries, Inc.; Fine Fissured #1831 (24" x 24") **(Media Center)** Armstrong World Industries, Inc.; Fine Fissured #1830 (48" x 24") **(Classrooms, Corridors, Misc.)**
2. USG Interiors, Inc.; Equal.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.

C. Color: White.

D. LR: Not less than 0.85.

E. NRC: Not less than 0.55.

F. CAC: Not less than 35.

G. Edge/Joint Detail: Square.

H. Thickness: 5/8 inch.

I. Modular Size: 24 by 24 inches and 24 x 48 inches. **(Refer to Plans)**

2.3 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING **(APC-2)**

A. Products: Subject to compliance with requirements, provide one of the following:

1. Armstrong World Industries, Inc.; Clean Room Mylar #1715. **(Kitchen)**
2. USG Interiors, Inc.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type IV, mineral base with membrane faced overlay; Form 2.

C. Color: White.

D. LR: Not less than 0.79.

E. NRC: Not less than 0.55.

F. CAC: Not less than 35.

G. Edge/Joint Detail: Square.

H. Thickness: 1 inch.

I. Modular Size: 24 by 24 inches.

J. Antimicrobial Treatment: Panel based.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

E. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

F. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.

G. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

2.5 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

A. Products: Subject to compliance with requirements, provide suspension systems that comply with specified ceiling panels.

B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished 15/16-inch- wide metal caps on flanges.

1. Structural Classification: Intermediate-duty system.
2. End Condition of Cross Runners: Butt-edge type.
3. Face Design: Flat, flush.
4. Cap Material: Steel or aluminum cold-rolled sheet.
5. Cap Finish: White.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Products: Subject to compliance with requirements, provide one of the following:

1. Armstrong World Industries, Inc.
2. USG Interiors, Inc.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:

1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 for Alloy and Temper 6063-T5.
2. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
3. Conversion-Coated Finish: AA-M12C42 (Chemical Finish: cleaned with inhibited chemicals; acid-chromate-fluoride-phosphate conversion coating).
4. Conversion-Coated and Factory-Primed Finish: AA-M12C42R1x (Chemical Finish: cleaned with inhibited chemicals; acid-chromate-fluoride-phosphate conversion coating; organic coating as follows):

    a. Manufacturer's standard, factory-applied prime-coat finish ready for field painting.

5. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.
6. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; organic coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.

a. Organic Coating: Thermosetting, primer/topcoat system with a minimum dry film thickness of 0.8 to 1.2 mils.

2.7 ACOUSTICAL SEALANT

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

B. Products: Subject to compliance with requirements, provide one of the following:

1. Acoustical Sealant for Exposed and Concealed Joints:

a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
b. USG Corporation; SHEETROCK Acoustical Sealant.

2. Acoustical Sealant for Concealed Joints:

a. OSI Sealants, Inc.; Pro-Series SC-175 Rubber Base Sound Sealant.
b. Pecora Corporation; BA-98.
c. Tremco, Inc.; Tremco Acoustical Sealant.

C. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
6. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
7. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
8. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
9. Do not attach hangers to steel deck tabs.
10. Do not attach hangers to steel roof deck. Attach hangers to structural members.
11. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
12. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Arrange directionally patterned acoustical panels as follows:

    a. As indicated on reflected ceiling plans.
    b. Install panels in a basket-weave pattern.

2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
6. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.
7. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
8. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09511

SECTION 09651
RESILIENT FLOOR TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Vinyl composition tile (VCT).

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: Chip-size units of each color and pattern of resilient floor tile required.

C. Maintenance Data: For resilient products to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store tiles on flat surfaces.

1.6 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 48 hours after floor covering installation.

E. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products listed in other Part 2 articles.

B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 COLORS AND PATTERNS

A. Colors and Patterns: As indicated by manufacturer's designations.

2.3 VINYL COMPOSITION TILE **VCT-1**

A. Vinyl Composition Tile (VCT): ASTM F 1066.

1. Armstrong World Industries, Inc.; Standard Excelon, Imperial Texture, #51853 Sandrift White.

B. Class: 2 (through-pattern tile).

C. Wearing Surface: Smooth.

D. Thickness: 0.125 inch.

E. Size: 12 by 12 inches.

F. Fire-Test-Response Characteristics:

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. VCT and Asphalt Tile Adhesives: 50 g/L.

C. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.

1. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

2.5 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

    a. VCT and Asphalt Tile Adhesives: 50 g/L.

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
3. Moisture Testing:

    a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.

E. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

F. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

1. Do not install resilient products until they are same temperature as space where they are to be installed.

G. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 TILE INSTALLATION

A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

B. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern).

C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.

D. Extend tiles into toe spaces, door reveals, closets, and similar openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

G. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

a. Do not wash surfaces until after time period recommended by manufacturer.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

1. Do not apply protective floor polish. All floor finishes to be by Owner.
2. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
3. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 09651

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 09653
RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient molding accessories.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of product indicated.

C. Samples for Verification: For each type of product indicated, in manufacturer's standard chip size Samples of each resilient product color, texture, and pattern required.

D. Product Schedule: For resilient products.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE RB-1

A. Resilient Base:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Johnsonite.
b. Nora Rubber Flooring; Freudenberg Building Systems, Inc.
c. Roppe Corporation, USA.

B. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TS (rubber, vulcanized thermoset) or Type TP (rubber, thermoplastic).
2. Manufacturing Method: Group I (solid, homogeneous).
3. Style: Cove (base with toe).

C. Minimum Thickness: 0.125 inch.

D. Height: 4 inches and 6 inches. Refer to color plans.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed or preformed.

G. Inside Corners: Job formed or preformed.

H. Finish: Satin.

I. Colors and Patterns: As selected by Architect from Manufacturer's full line.

2.2 RESILIENT MOLDING ACCESSORY

A. Resilient Molding Accessory:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Johnsonite.
   b. Roppe Corporation, USA.

B. Description: Transition strips.

C. Material: Rubber.

D. Profile and Dimensions: As indicated.

E. Colors and Patterns: Match rubber base.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

   a. Cove Base Adhesives: Not more than 50 g/L.
   b. Rubber Floor Adhesives: Not more than 60 g/L.

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Treads and Accessories: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
4. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

    a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products until Substantial Completion.

END OF SECTION 09653

SECTION 09681
CARPET TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes modular, fusion-bonded carpet tile.

B. Related Sections include the following:

1. Division 9 Section "Resilient Floor Tile and Resilient Wall Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.

B. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Type of subfloor.
3. Type of installation.
4. Pattern of installation.
5. Pattern type, location, and direction.
6. Type, color, and location of insets and borders.
7. Type, color, and location of edge, transition, and other accessory strips.
8. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

E. Qualification Data: For Installer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.

G. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

H. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."

B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.7 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge, and delamination.
3. Warranty Period: 15 years from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 - PRODUCTS

2.1 CARPET TILE **CT-1**

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

B. Products: Subject to compliance with requirements, provide one of the following:

1. Interface Carpet; Inc.

a. Color: Yen 2696.
b. Pattern: Kamala Ni 16633.
c. Source: Interface.

C. Fiber Content: 100 percent nylon 6, 6.

D. Fiber Type: Invista Antron Lumena, Invista Antron Legacy.

E. Pile Characteristic: Level-loop pile.

F. Pile Density: 7,543

G. Stitches: 8.4/inch.

H. Surface Pile Weight: 23 oz. sq. yd.

I. Total Weight: 148 oz./sq. yd. for finished carpet tile.

J. Backing System: Glasbac RE.

K. Size: 19.69" x 19.69".

L. Applied Soil-Resistance Treatment: Protekt.

M. Lifetime Antimicrobial Treatment: Intersept.

N. Performance Characteristics: As follows:

1. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
2. Dry Breaking Strength: Not less than 100 lbf per ASTM D 2646.
3. Delamination: Not less than 3.5 lbf/in. per ASTM D 3936.
4. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
5. Dimensional Stability: 0.2 percent or less per ISO 2551 (Aachen Test).
6. Resistance to Insects: Comply with AATCC 24.
7. Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC 165.
8. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) per AATCC 16, Option E.
9. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria; not less than 1-mm halo of inhibition for gram-negative bacteria; no fungal growth; per AATCC 174.

2.2 CARPET TILE **CT-2**

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

B. Products: Subject to compliance with requirements, provide one of the following:

1. Interface Carpet; Inc.

a. Color: Yen 2526.
b. Pattern: Sumurai Ni 16638.
c. Source: Interface.

C. Fiber Content: 100 percent nylon 6, 6.

D. Fiber Type: Invista Antron Lumena, Invista Antron Legacy.

E. Pile Characteristic: Level-loop pile.

F. Pile Density: 7,543

G. Stitches: 8.4/inch.

H. Surface Pile Weight: 23 oz. sq. yd.

I. Total Weight: 148 oz./sq. yd. for finished carpet tile.

J. Backing System: Glasbac RE.

K. Size: 19.69" x 19.69".

L. Applied Soil-Resistance Treatment: Protekt.

M. Lifetime Antimicrobial Treatment: Intersept.

N. Performance Characteristics: As follows:

1. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
2. Dry Breaking Strength: Not less than 100 lbf per ASTM D 2646.
3. Delamination: Not less than 3.5 lbf/in. per ASTM D 3936.
4. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
5. Dimensional Stability: 0.2 percent or less per ISO 2551 (Aachen Test).
6. Resistance to Insects: Comply with AATCC 24.
7. Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC 165.
8. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) per AATCC 16, Option E.
9. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria; not less than 1-mm halo of inhibition for gram-negative bacteria; no fungal growth; per AATCC 174.

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. VOC Limits: Provide adhesives that comply with the following limits for VOC content when tested according to ASTM D 5116:

a. Total VOCs: 10.00 mg/sq. m x h.
b. Formaldehyde: 0.05 mg/sq. m x h.
c. 2-Ethyl-1-Hexanol: 3.00 mg/sq. m x h.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other

conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. For wood subfloors, verify the following:

1. Underlayment over subfloor complies with requirements specified in Division 6 Section "Rough Carpentry."
2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protection of Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09681

SECTION 09911
EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:

1. Steel.
2. Galvanized metal.

B. Related Sections include the following:

1. Division 5 Sections for shop priming of metal substrates with primers specified in this Section.
2. Division 9 Section "Interior Painting" for surface preparation and the application of paint systems on interior substrates.
3. Division 15 Section "Facility Natural Gas Piping" for painting of roof mounted exterior gas piping.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Benjamin Moore & Co.
2. ICI Paints.
3. PPG Architectural Finishes, Inc.
4. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: Match specified coping color.

2.3 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.

1. VOC Content: E Range of E2.

B. Cementitious Galvanized-Metal Primer: MPI #26.

1. VOC Content: E Range of E1.

2.4 EXTERIOR LATEX PAINTS

A. Exterior Latex (Semigloss): MPI #11 (Gloss Level 5).

1. VOC Content: E Range of E2.

2.5 EXTERIOR ALKYD PAINTS

A. Exterior Alkyd Enamel (Semigloss): MPI #94 (Gloss Level 5).

1. VOC Content: E Range of E2.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance of paint materials with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Steel Substrates:

1. Alkyd System: MPI EXT 5.1D.

    a. Prime Coat: Alkyd anticorrosive metal primer.
    b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
    c. Topcoat: Exterior alkyd enamel (semigloss).

B. Galvanized-Metal Substrates:

1. Latex System: MPI EXT 5.3A.

    a. Prime Coat: Cementitious galvanized-metal primer.
    b. Intermediate Coat: Exterior latex matching topcoat.
    c. Topcoat: Exterior latex (semigloss).

END OF SECTION 09911

SECTION 09912
INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete.
2. Concrete masonry units (CMU).
3. Steel.
4. Galvanized metal.
5. Wood.
6. Gypsum board.

B. Related Sections include the following:

1. Division 9 Section "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.

C. Product List: For each product indicated, include the following:

1. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

B. Mockups: Apply benchmark samples of each finish system indicated and each color selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate as follows:

a. Existing casework at Smith M.S. Home Skills Room – veneer repair and refinishing.
b. Vertical surface sample of at least 10 sq. ft.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co.
2. ICI Paints.
3. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
   a. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Colors: As indicated in a color schedule.

2.3 BLOCK FILLERS

A. Interior/Exterior Latex Block Filler: MPI #4.

2.4 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer: MPI #50.

B. Interior Alkyd Primer/Sealer: MPI #45.

2.5 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.

2.6 WOOD PRIMERS

A. Interior Latex-Based Wood Primer: MPI #39.

2.7 STAINS

A. Interior Wood Stain (Semitransparent): MPI #90.

2.8 POLYURETHANE FINISHES

A. Interior, Oil-Modified, Clear Urethane (Satin): MPI #57, Gloss Level 4.

2.9 LATEX PAINTS

A. Interior Latex (Flat): MPI #53 (Gloss Level 1).

B. Interior Latex (Semigloss): MPI #54 (Gloss Level 5).

2.10 ALKYD PAINTS

A. Interior Alkyd (Semigloss): MPI #47 (Gloss Level 5).

2.11 WATERBORNE ACRYLIC DRY FALL PAINT

A. Basis of Design product: Sherwin Williams Waterborne Dry Fall #6015-11264 (B42WJS).

1. Recommended spread rate per coat:

a. Wet Mils: 3.5-5.0
b. Dry Mils: 1.5-2.0

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Gypsum Board: 12 percent.
5. Plaster: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
2. For finishing over existing clear finishes, remove or encapsulate incompatible finishes with a sealer recommended by finish coat manufacturer

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Clay Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content of surfaces or alkalinity of mortar joints to be painted exceed that permitted in manufacturer's written instructions.

F. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

G. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

H. Surface Preparation for Existing Bare and Painted Metal: Ferrous Metals: Clean ungalvanized ferrous-metal surfaces; remove rust, oil, grease, dirt, and other foreign substances. Use removal or cleaning methods that comply with paint manufacturer's written recommendations. Sand smooth areas where existing paint is blistered, cracked, orange-peeled or otherwise blemished.

1. Touch up bare areas and prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and fill voids with patching compound.

Touch up bare and patched areas with primer. Lightly sand or rub with steel wool before applying finish coats.

I. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

J. Aluminum Substrates: Remove surface oxidation.

K. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

L. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

M. Plaster Substrates: Do not begin paint application until plaster is fully cured and dry.

N. Spray-Textured Ceiling Substrates: Do not begin paint application until surfaces are dry.

O. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints and varnishes according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints and varnishes to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:

1. Mechanical Work:

    a. Uninsulated metal piping.
    b. Uninsulated plastic piping.
    c. Pipe hangers and supports.
    d. Tanks that do not have factory-applied final finishes.
    e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
    f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical Work:

    a. Switchgear.
    b. Panelboards.
    c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

A. Finish Carpentry Substrates:

1. Polyurethane Varnish Over Stain System: MPI INT 6.3E. For use on bare wood.

   a. Stain Coat: Interior wood stain (semitransparent).
   b. Two Finish Coats: Interior, oil-modified, clear urethane satin.

2. Polyurethane Varnish System: MPI INT 6.3K. For use on previously finished and unstriped wood.

   a. Two Field-Applied Finish Coats: Interior, oil-modified, clear urethane satin.

B. Exposed Wood Panel-Product Substrates:

1. Polyurethane Varnish Over Stain System: MPI INT 6.4E. For use on bare wood.

   a. Stain Coat: Interior wood stain (semitransparent).
   b. Two Finish Coats: Interior, oil-modified, clear urethane satin.

2. Polyurethane Varnish System: MPI INT 6.4.J. For use on previously finished and unstriped wood.

   a. One Factory-Applied Finish Coat: Matching field-applied finish coats.
   b. Two Field-Applied Finish Coats: Interior, oil-modified, clear urethane satin.

3.7 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Traffic Surfaces:

1. Clear Sealer System: MPI INT 3.2F.

   a. First Coat: Interior/exterior clear concrete floor sealer (solvent based).
   b. Topcoat: Interior/exterior clear concrete floor sealer (solvent based).

B. CMU Substrates:

1. Latex System: MPI INT 4.2A.

   a. Prime Coat: Interior/exterior latex block filler.
   b. Intermediate Coat: Interior latex matching topcoat.
   c. Topcoat: Interior latex (semigloss).

C. Steel Substrates:

1. Alkyd System: MPI INT 5.1E.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Interior alkyd matching topcoat.
c. Topcoat: Interior alkyd (semigloss).

D. Galvanized-Metal Substrates:

1. Alkyd System: MPI INT 5.3C.

a. Prime Coat: Cementitious galvanized-metal primer.
b. Intermediate Coat: Interior alkyd matching topcoat.
c. Topcoat: Interior alkyd (semigloss).

E. Dressed Lumber Substrates: Including architectural woodwork doors.

1. Latex Over Alkyd Primer System: MPI INT 6.3U.

a. Prime Coat: Interior alkyd primer/sealer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex (gloss).

2. High-Performance Architectural Latex System: MPI INT 6.3A.

a. Prime Coat: Interior latex-based wood primer.
b. Intermediate Coat: High-performance architectural latex matching topcoat.
c. Topcoat: High-performance architectural latex (semigloss).

F. Gypsum Board Substrates:

1. Latex System: MPI INT 9.2A.

a. Prime Coat: Interior latex primer/sealer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex (flat) and (semigloss).

2. Flat finish only on gypsum board bulkheads and ceilings. Semigloss finish at walls.

PAINT SCHEDULE

IPS-1	PAINT	ICI	CHALK	817	(FIELD, WALLS)
IPS-2	PAINT	ICI	FEDERAL BLUE	1526	
IPS-3	PAINT	ICI	WALES GREEN	953	

*Verify paint colors with Owner. Owner may choose to match their existing colors.

END OF SECTION 09912

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 10101
VISUAL DISPLAY SURFACES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Markerboards.
2. Tackboards.

1.3 DEFINITIONS

A. Visual Display Boards: Markerboards and tackboards.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Include motor capacities and individual panel weights for sliding visual display units.
2. Include computer system requirements for electronic markerboards.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Show location of panel joints.
2. Show location of special-purpose graphics for visual display surfaces.
3. Include sections of typical trim members.
4. Include wiring diagrams for motor-operated, sliding visual display units.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for surface-burning characteristics of vinyl fabrics.

D. Qualification Data: For Installer.

E. Maintenance Data: For visual display surfaces to include in maintenance manuals.

F. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative of motor-operated, sliding visual display unit manufacturer for installation and maintenance of units required for this Project.

B. Source Limitations: Obtain each type of visual display surface through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of visual display surfaces and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Fire-Test-Response Characteristics: Provide fabrics with the surface-burning characteristics indicated, as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display boards, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.

B. Store visual display units vertically with packing materials between each unit.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating visual display surfaces without field measurements. Coordinate wall construction to ensure that actual dimensions correspond to established dimensions.
2. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.8 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Surfaces lose original writing and erasing qualities.
b. Surfaces become slick or shiny.
c. Surfaces exhibit crazing, cracking, or flaking.

2. Warranty Period: Life of the building.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 MATERIALS, GENERAL

A. Porcelain-Enamel Face Sheet: ASTM A 424, enameling-grade steel, uncoated thickness indicated; with exposed face and edges coated with primer, 1.7-to-2.5-mil- thick ground coat, and color cover coat; and concealed face coated with primer and 1.7-to-2.5-mil- thick ground coat.

1. Gloss-Finish Cover Coat: Gloss as indicated; dry-erase markers wipe clean with dry cloth or standard eraser. Minimum 3.0-to-4.0-mil- thick cover coat. Cover and ground coats shall be fused to steel at manufacturer's standard firing temperatures but not less than 1475 deg F.

a. Product: PolyVision Corporation; P^3 ceramicsteel Markerboard.

B. Hardboard: AHA A135.4, tempered.

C. Vinyl Fabric: FS CCC-W-408, Type II, burlap weave; weighing not less than 13 oz./sq. yd.; with flame-spread index of 25 or less when tested according to ASTM E 84.

D. Extruded Aluminum: ASTM B 221, Alloy 6063.

2.3 MARKERBOARD ASSEMBLIES

A. Porcelain-Enamel Markerboard Assembly: Balanced, high-pressure, factory-laminated markerboard assembly of 3-ply construction consisting of backing sheet, core material, and 0.021-inch- thick, porcelain-enamel face sheet with high-gloss finish.

1. Available Manufacturers:

    a. Best-Rite Manufacturing.
    b. Claridge Products & Equipment, Inc.
    c. Egan Visual Inc.
    d. PolyVision Corporation.

2. Hardboard Core: 1/4 inch thick; with 0.005-inch- thick, 0.0129-inch- thick backing.
3. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.

B. Markerboard Sheet Assembly: Fabricated from 0.0209-inch- thick, porcelain-enamel face sheets for direct application to wall surface.

2.4 TACK ASSEMBLIES

A. Available Manufacturers:

1. Best-Rite Manufacturing.
2. Claridge Products & Equipment, Inc.
3. Egan Visual Inc.
4. PolyVision Corporation.

B. Vinyl-Fabric-Faced Tack Assembly: 1/4-inch- thick, vinyl-fabric-faced cork sheet factory laminated to 1/4-inch- thick hardboard backing.

2.5 MARKERBOARD AND TACKBOARD ACCESSORIES

A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- thick, extruded aluminum; of size and shape indicated.

1. Field-Applied Trim: Manufacturer's standard snap-on trim with no visible screws or exposed joints.

B. Chalktray: Manufacturer's standard, continuous.

1. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.

C. Map Rail: Provide the following accessories:

1. Display Rail: Continuous and integral with map rail; fabricated from cork approximately 1 to 2 inches wide.
2. End Stops: Located at each end of map rail.
3. Map Hooks: Two map hooks for every 48 inches of map rail or fraction thereof.

2.6 FABRICATION

A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

B. Visual Display Boards: Factory assemble visual display boards, unless otherwise indicated.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display boards at manufacturer's factory before shipment.

C. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
2. Provide manufacturer's standard mullion trim at joints between markerboards and tackboards of combination units.
3. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.

D. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to neat, hairline closure.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

2.7 ALUMINUM FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

D. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of motor-operated, sliding visual display units.

C. Examine walls and partitions for proper backing for visual display surfaces.

D. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove dirt, scaling paint, projections, and depressions that will affect smooth, finished surfaces of visual display boards.

B. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, and substances that will impair bond between visual display boards and surfaces.

1. Seal wall surfaces indicated to receive visual display fabric.

C. Prepare recesses for sliding visual display units as required by type and size of unit.

3.3 INSTALLATION, GENERAL

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

3.4 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY UNITS

A. Visual Display Boards: Attach visual display boards to wall surfaces with egg-size adhesive gobs at 16 inches o.c. horizontally and vertically.

B. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches o.c. Secure both top and bottom of boards to walls.

1. Field-Applied Aluminum Trim: Attach trim over edges of visual display boards and conceal grounds and clips. Attach trim to boards with fasteners at not more than 24 inches o.c.

    a. Attach chalktrays to boards with fasteners at not more than 12 inches o.c.

C. Display Rails: Install rails in locations and at mounting heights indicated on Drawings, or if not indicated, at height indicated below. Attach to wall surface with fasteners at not more than 16 inches o.c.

3.5 CLEANING AND PROTECTION

A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display surfaces after installation and cleaning.

3.6 VISUAL DISPLAY SURFACE SCHEDULE

A. Visual Display Board: Factory assembled.

1. Markerboard: Porcelain-enamel markerboard assembly.

    a. Color: White.

2. Field-Applied Aluminum Trim: With clear anodic finish.
3. Accessories:

    a. Chalktray: Solid type.
    b. Map rail with end stops and map hooks.

4. Width: As indicated on Drawings.
5. Height: As indicated on Drawings.
6. Mounting: Wall, mechanically fastened.
7. Mounting Height: As indicated on Drawings.

B. Tackboard: Factory assembled.

1. Tack Surface: Vinyl-fabric-faced tack assembly.

    a. Vinyl Fabric: As selected by Architect from manufacturer's full line.

2. Edges: Concealed by trim.

    a. Field-Applied Aluminum Trim: With clear anodic finish.

END OF SECTION 10101

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 10155
TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes phenolic-core units as follows:

1. Toilet Enclosures: Overhead braced.
2. Entrance Screens: Overhead braced.
3. Urinal Screens: Wall hung.

B. Related Sections include the following:

1. Division 6 Section "Miscellaneous Carpentry" for blocking.
2. Division 10 "Toilet and Bath Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show contractor field verified layouts for existing toilet room partition replacements.

C. Samples for Verification: Of each type of color and finish required for units, prepared on 6-inch- square Samples of same thickness and material indicated for Work.

1.4 QUALITY ASSURANCE

A. Comply with requirements in CID-A-A-60003, "Partitions, Toilets, Complete."

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating toilet compartments without field measurements. Coordinate wall, floor, ceilings, and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 SOLID PHENOLIC-SOLID COLOR REINFORCED COMPOSITE (SCRC) UNITS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Bobrick Washroom Equipment, Inc. – Sierra Series
2. Pre-approved equal.

B. Door, Panel and Pilaster Construction: SCRC panel material with eased and polished edges. Provide minimum 3/4-inch- thick doors and pilasters and minimum 1/2-inch- thick panels.

1. Color: SC04 FOREST GREEN.

C. Pilaster Shoes: Stainless steel, ASTM A 666, Type 304, not less than 0.0312 inch specified thickness and 3 inches high, finished to match hardware.

D. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; aluminum.

2.2 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Material: Heavy gauge 304 satin-finish stainless steel.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Doors: Unless otherwise indicated, provide 24-inch- wide in-swinging doors for standard toilet compartments and 36-inch- wide out-swinging doors with a minimum 32-inch- wide clear opening for compartments indicated to be accessible to people with disabilities.

1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities.
3. Coat Hook: Manufacturer's standard hook.
4. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors and entrance screen doors.
5. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

a. Pilasters and Panels: 1/2 inch.
b. Panels and Walls: 1 inch.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than two fasteners. Hang doors to align tops of doors with tops of panels and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Wall-Hung Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb and to resist lateral impact.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and doors in entrance screens to return doors to fully closed position.

END OF SECTION 10155

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 10200
LOUVERS AND VENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Fixed, extruded-aluminum louvers.

B. Related Sections include the following:

1. Division 7 Section "Joint Sealants" for sealants installed in perimeter joints between louver frames and adjoining construction.
2. Division 15 Section "HVAC Instrumentation and Controls" for electric, electronic, and pneumatic control of adjustable metal louvers.
3. Division 15 Sections for louvers that are a part of mechanical equipment.
4. Division 16 Sections for electrical power connections for motor-operated adjustable metal louvers.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide louvers capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act on vertical projection of louvers.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

B. Provide louvers complying with performance requirements indicated, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

C. Airborne Sound Transmission Loss: Provide acoustical louvers complying with airborne sound transmission loss ratings indicated, as demonstrated by testing manufacturer's stock units identical to those specified, except for length and width according to ASTM E 90.

1.5 SUBMITTALS

A. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other Work. Show blade profiles, angles, and spacing.

1. For installed louvers and vents indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Wiring Diagrams: Power, signal, and control wiring for motorized adjustable louvers.

B. Samples for Initial Selection: For units with factory-applied color finishes.

C. Qualification Data: For professional engineer.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.2, "Structural Welding Code--Aluminum."

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify louver openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating louvers without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Louvers:

a. Airline Products Co.
b. Airolite Company (The).
c. American Warming and Ventilating, Inc.
d. Arrow United Industries.
e. Carnes Company, Inc.
f. Cesco Products.
g. Construction Specialties, Inc.
h. Dowco Products Group; Safe-Air of Illinois, Inc.
i. Greenheck.
j. Industrial Louvers, Inc.
k. Louvers & Dampers, Inc.
l. Metal Form Manufacturing Company, Inc.
m. NCA Manufacturing, Inc.
n. Nystrom Building Products.
o. Reliable Products; Hart & Cooley, Inc.
p. Ruskin Company; Tomkins PLC.
q. Vent Products Company, Inc.

2.2 MATERIALS

A. Aluminum Extrusions: ASTM B 221, alloy 6063-T5 or T-52.

B. Aluminum Sheet: ASTM B 209, alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Aluminum Castings: ASTM B 26/B 26M, alloy 319.

D. Fasteners: Of same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use hex-head or Phillips pan-head screws for exposed fasteners, unless otherwise indicated.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION, GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

C. Maintain equal louver blade spacing to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: Channel unless otherwise indicated.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Where indicated, provide subsills made of same material as louvers or extended sills for recessed louvers.

G. Join frame members to each other and to fixed louver blades with fillet welds concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

H. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer, concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.4 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Drainable-Blade Louver:

1. Basis-of-Design Product: Greenheck, #ESD-603 or a comparable product of one of the following:

a. Louver Depth: 4 inches in masonry walls. 2 inches in door frames.
b. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.080 inch.
c. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.5 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
2. Screen Location for Adjustable Louvers: Interior face, unless otherwise indicated.
3. Screening Type: Bird screening.

B. Secure screens to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Mill finish, unless otherwise indicated.
3. Type: Non-rewirable, U-shaped frames for permanently securing screen mesh.

D. Louver Screening for Aluminum Louvers:

1. Bird Screening: Aluminum, 1/2-inch- square mesh, 0.063-inch wire.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish louvers after assembly.

2.7 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

F. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 7 Section "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.

B. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

D. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 10200

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 10350
FLAGPOLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes wall-mounted flagpoles made from aluminum.

B. Related Sections:

1. Division 16 Section "Exterior Lighting" for site lighting fixtures.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to the following design criteria:

1. Wind Loads: Provide wind speed and exposure factor for location according to NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles." SEI/ASCE 7.
2. Base flagpole design on polyester, nylon or cotton flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.

B. Shop Drawings: For flagpoles. Include plans, elevations, details, and attachments to other work. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.

1. Include details of wall-mounted connections and mountings.

C. Delegated-Design Submittal: For flagpole assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Include loads, point reactions, and locations for attachment of flagpoles to building's structure.

D. Qualification Data: For qualified professional engineer.

E. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Flagpole; a Kearney-National Inc. company.
2. Pole-Tech Company Inc.
3. U.S. Flag & Flagpole Supply, LP.

2.2 FLAGPOLES

A. Flagpole Construction, General: Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:

1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
3. Provide self-aligning, snug-fitting joints.

B. Exposed Height:

1. U.S. Flag 25 feet – FP-1
2. Color flags 20 feet – FP-2 (R) Red, (Y) Yellow, (BL) Blue, (G) Green, (BK) Black

2.3 FITTINGS

A. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter. 0.063-inch spun aluminum, finished to match flagpole

B. Internal Halyard, Cam Cleat System: 5/16-inch- diameter, braided polypropylene halyard; cam cleat; and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

1. Halyard Flag Snaps: Provide two stainless-steel swivel snap hooks per halyard.

2.4 POLYESTER FLAGS

A. Flags

1. U.S. Flag – 5 x 8
2. Color Flages 4 x 6 – 1 each, Blue, Red, Yellow, Green, Black.

2.5 WALL MOUNT BRACKET

A. Basis of Design: Pole-Tech PTV-30 finish to match pole.

2.6 MISCELLANEOUS MATERIALS

A. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, including foundation; accurate placement, pattern, orientation of anchor bolts, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FLAGPOLE INSTALLATION

A. General: Install flagpoles where shown and according to Shop Drawings and manufacturer's written instructions.

END OF SECTION 10350

SECTION 10505
METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Knocked-down, quiet metal lockers.

B. Related Sections include the following:

1. Division 6 Section "Miscellaneous Carpentry" for concealed wood support base, furring, blocking, and shims required for installing metal lockers and concealed within other construction before metal locker installation.

1.3 DEFINITIONS

A. Uncoated Steel Sheet Thicknesses: Indicated as the minimum thicknesses.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Show sloping tops, filler panels and other accessories.
2. Include locker identification system.

C. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

D. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative of metal locker manufacturer for installation and maintenance of units required for this Project.

B. Source Limitations: Obtain metal lockers and accessories through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal lockers and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Regulatory Requirements: Where metal lockers are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

1. Provide not less than 1 shelf located no higher than 48 inches above the floor for forward reach.
2. Provide 1 shelf located at bottom of locker no lower than 15 inches above the floor for forward reach.
3. Provide hardware that does not require tight grasping, pinching, or twisting of the wrist, and that operates with a force of not more than 5 lbf.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for metal locker installation.

B. Deliver master and control keys, and combination control charts to Owner by registered mail or overnight package service.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify the following by field measurements before fabrication and indicate measurements on Shop Drawings:

1. Concealed framing, blocking, and reinforcements that support metal lockers before they are enclosed.
2. Recessed openings.
3. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish recessed opening dimensions and proceed with fabricating metal lockers without field measurements. Coordinate wall and floor construction to ensure that actual recessed opening dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate size and location of concrete bases for metal lockers.

B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation of latches and other door hardware.

2. Damage from deliberate destruction and vandalism is excluded.
3. Warranty Period for Knocked-Down Metal Lockers: Two years from date of Substantial Completion.

B. Furnish extra materials described below, before construction begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Full-size units of the following metal locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than 5 units:

a. Locks.
b. Identification plates.
c. Hooks.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS) Type B, suitable for exposed applications.

B. Fasteners: Zinc- or nickel-plated steel, slotless-type exposed bolt heads, and self-locking nuts or lock washers for nuts on moving parts.

C. Anchors: Select material, type, size, and finish required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance.

2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.3 KNOCKED-DOWN, QUIET METAL LOCKERS

A. Products:

1. Art Metal Products, Div. of Fort Knox Storage Co.; Standard Quiet Lockers.
2. List Industries Inc.; Standard Quiet Lockers.
3. Republic Storage Systems Company; Quiet Lockers.

B. Locker Arrangement: Single tier.

C. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated, cold-rolled steel sheet with thicknesses as follows:

1. Tops, Bottoms, and Intermediate Dividers: 0.0209 inch, with single bend at sides.
2. Backs and Sides: 0.0209 inch thick, with full-height, double-flanged connections.
3. Shelves: 0.0209 inch thick, with double bend at front and single bend at sides and back.

D. Frames: Channel formed; fabricated from 0.0528-inch- thick, cold-rolled steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral door strike full height on vertical main frames.

1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical frame members.

E. Doors: One-piece; fabricated from 0.0528-inch- thick, cold-rolled steel sheet; formed into channel shape with double bend at vertical edges, and with right-angle single bend at horizontal edges.

1. Doors less than 12 inches wide may be fabricated from 0.0428-inch- thick, cold-rolled steel sheet.
2. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
3. Stiffeners: Manufacturer's standard full-height stiffener fabricated from 0.0428-inch-thick, cold-rolled steel sheet; welded to inner face of doors.
4. Sound-Dampening Panels: Manufacturer's standard, designed to stiffen doors and reduce sound levels when doors are closed, of die-formed metal with full perimeter flange and sound-dampening material; welded to inner face of doors.
5. Door Style: Unperforated panel.

    a. Concealed Vents: Slotted perforations in top and bottom horizontal return flanges of doors.

F. Hinges: Self-closing; welded to door and attached to door frame with not less than 2 factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.

1. Knuckle Hinges: Steel, full loop, 5 or 7 knuckles, tight pin; minimum 2 inches high. Provide not less than 3 hinges for each door more than 42 inches high.

G. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond face of door; pry resistant.

1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in key locks, or padlocks; positive automatic and prelocking.

    a. Latch Hooks: Equip doors 48 inches and higher with 3 latch hooks and doors less than 48 inches high with 2 latch hooks; fabricated from minimum 0.0966-inch- thick steel; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
    b. Latching Mechanism: Manufacturer's standard rattle-free latching mechanism and moving components isolated with vinyl or nylon to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

H. Combination Padlocks: Provided by Owner.

I. Built-in Combination Locks: Key-controlled, three-number dialing combination locks; capable of at least five combination changes made automatically with a control key.

1. Bolt Operation: Automatically locking spring bolt.

J. Equipment: Equip each metal locker with identification plate and the following, unless otherwise indicated:

1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.

K. Accessories:

1. Continuous Sloping Tops: Fabricated from cold-rolled steel sheet, 0.0428 inch thick.

    a. Closures: Vertical-end type.
    b. Sloped top corner fillers, mitered.

2. Filler Panels: Fabricated from cold-rolled steel sheet, 0.0428 inch thick.
3. Boxed End Panels: Fabricated from 0.0528-inch- thick, cold-rolled steel sheet.

L. Finish: Baked enamel or powder coat.

1. Color(s): As selected by Architect from manufacturer's full range.

2.4 FABRICATION

A. General: Fabricate metal lockers square, rigid, and without warp; with metal faces flat and free of dents or distortion. Make exposed metal edges free of sharp edges and burrs, and safe to touch.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet, unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for a complete installation.

B. Unit Principle: Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments.

C. Knocked-Down Construction: Fabricate metal lockers for nominal assembly at Project site using nuts, bolts, screws, or rivets. Factory weld frame members together to form a rigid, one-piece assembly.

D. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.

E. Identification Plates: Manufacturer's standard etched, embossed, or stamped aluminum plates; with numbers and letters at least 3/8 inch high.

F. Continuous Sloping Tops: Fabricated in lengths as long as practicable, without visible fasteners at splice locations; finished to match lockers.

1. Sloped top corner fillers, mitered.

G. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip joint filler angle formed to receive filler panel.

H. Boxed End Panels: Fabricated with 1-inch- wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.

2.5 STEEL SHEET FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Factory finish steel surfaces and accessories except stainless-steel and chrome-plated surfaces.

C. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond. Use manufacturer's standard methods.

D. Baked-Enamel Finish: Immediately after cleaning, pretreating, and phosphatizing, apply manufacturer's standard thermosetting baked-enamel finish. Comply with paint manufacturer's written instructions for application, baking, and minimum dry film thickness.

E. Powder-Coat Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard baked-polymer thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion, using concealed fasteners.
2. Anchor single rows of metal lockers to walls near top of lockers and to floor.
3. Anchor back-to-back metal lockers to floor.

B. Knocked-Down Metal Lockers: Assemble knocked-down metal lockers with standard fasteners, with no exposed fasteners on door faces or face frames.

C. Equipment and Accessories: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach hooks with at least two fasteners.
2. Attach door locks on doors using security-type fasteners.
3. Identification Plates: Identify metal lockers with identification indicated on Drawings.

    a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.

4. Attach filler panels with concealed fasteners. Locate fillers panels where indicated on Drawings.
5. Attach sloping top units to metal lockers, with closures at exposed ends.
6. Attach boxed end panels with concealed fasteners to conceal exposed ends of nonrecessed metal lockers.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.

B. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit metal locker use during construction.

C. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal locker manufacturer.

3.4 METAL LOCKER SCHEDULE

MWL-1 9"w x 15d" x 72"h single tier quiet metal lockers with combination lock.

END OF SECTION 10505

SECTION 10520
FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Portable fire extinguishers.

B. Related Sections include the following:

1. Division 7 Section "Through-Penetration Firestop Systems" for firestopping sealants at fire-rated cabinets.
2. Division 15 Section "Commercial Kitchen Hoods" for fire extinguishing systems provided as part of commercial kitchen exhaust hoods.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.

1. Fire Extinguishers: Include rating and classification.
2. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Maintenance Data: For fire extinguishers and fire-protection cabinets to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.5 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

1.6 SEQUENCING

A. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:

1. Sheet: ASTM B 209.
2. Extruded Shapes: ASTM B 221.

C. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.3 PORTABLE FIRE EXTINGUISHERS

A. Available Manufacturers:

1. Badger Fire Protection.
2. JL Industries, Inc.
3. Kidde Fyrnetics.
4. Larsen's Manufacturing Company.

B. General: Provide fire extinguishers of type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

1. Valves: Manufacturer's standard.
2. Handles and Levers: Manufacturer's standard.
3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

C. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

D. Multipurpose Dry-Chemical Type in Aluminum Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-aluminum container.

2.4 MOUNTING BRACKETS

A. Available Manufacturers:

1. Badger Fire Protection.
2. JL Industries, Inc.
3. Larsen's Manufacturing Company.

B. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

1. Color: Red.

C. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

a. Orientation: Vertical.

2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

C. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.

1. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of 1.5 mils, medium gloss.

2.7 STEEL FINISHES

A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.

B. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged units.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.

B. Identification: Apply vinyl lettering at locations indicated.

3.3 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.

B. Touch up marred finishes. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.

END OF SECTION 10520

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 10801
TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Mirrors.
2. Grab bars.

B. Owner-Furnished Material:

1. Soap dish.
2. Paper towel dispenser.
3. Waste receptacles.
4. Sanitary napkin disposal.
5. Toilet paper dispenser.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated on Drawings.
2. Identify products using designations indicated on Drawings.

C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch minimum nominal thickness.

C. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

D. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. General Accessory Manufacturing Co. (GAMCO).

B. Toilet Tissue (Roll) Dispenser **TA-01**:

1. Provided and installed by Owner

C. Paper Towel Dispenser **TA-02**:

1. Provided and installed by Owner

D. Liquid-Soap Dispenser **TA-03**:

1. Provided and installed by Owner

E. Sanitary-Napkin Disposal Unit **TA-04**:

1. Provided and installed by Owner.

F. Mirror Unit **TA-05**:

1. Basis-of-Design Product: Bobrick B-165-24x36
2. Frame: Stainless-steel channel.

    a. Corners: Welded and ground smooth.

3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.

    a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
    b. Size: 24"W x 36"H.
    c. Mounting: Mount mirror with bottom at 40" above floor.

G. Coat Hook **TA-06**:

1. Basis-of-Design Product: Bobrick b-76717
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel.

    a. Finish: Smooth, satin finish.

4. Mounting height: Provide in pair, mount one at 46" and one at 50".

H. Grab Bar **TA-07**:

1. Basis-of-Design Product: Bobrick B-6806 36"
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.

    a. Finish: Smooth, No. 4, satin finish on ends and slip-resistant texture in grip area.

4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: Wall mount straight bar 36" long.
6. Mounting height: mount bar 34" from top to floor.

I. Grab Bar **TA-08**:

1. Basis-of-Design Product: Bobrick b-6806 42"
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.

    a. Finish: Smooth, No. 4, satin finish on ends and slip-resistant texture in grip area.

4. Outside Diameter: 1-1/2 inches.

5. Configuration and Length: Wall mount straight grab bar 42" long.
6. Mounting height: mount bar 34" from top to floor.

J. Grab Bar **TA-09**:

1. Basis-of-Design Product: Bobrick b-6806 48"
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.

    a. Finish: Smooth, No. 4, satin finish on ends and slip-resistant texture in grip area.

4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: Wall mount straight bar 48" long.
6. Mounting height: mount bar 34" from top to floor.

2.3 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 10801

SECTION 11400 - FOODSERVICE EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Foodservice Equipment: Standard manufactured and custom fabricated items.

B. Inclusive of Job: The work under this section consists of providing all labor, material, products, and equipment that are necessary and required for the complete installation of the food service equipment, as indicated on drawings, and as herein specified.

1.02 RELATED SECTIONS

A. Architectural Documents: All work described in these documents must be carefully coordinated with the work of those other trades directed by the terms and conditions of the Architect's and Engineer's documents. The drawings and specifications of the Architect shall direct the Foodservice Equipment Contractor with respect to the project schedule, contract issues, coordination and payment requirements. These documents can be obtained by contacting the Architect.

B. Contract: All work by the Foodservice Equipment Contractor shall be performed under the contract and payment terms and conditions as defined in the American Institute of Architects document: A101 Standard Form of Agreement Between Owner and Contractor, 1987 edition, modified by substituting the words "Foodservice Consultant" in place of the word "Architect" and amended to include all of the work as outlined in the project documents of the Foodservice Consultant, for primary requirements, and Architect, for building and engineering reference information. Execute this contract agreement after notice of award of contract, prior to start of work, but not later than 15 days after Notice to Proceed. Provide a copy of the contract to The BAKER Group Inc..

1.03 COORDINATION WITH OTHER TRADES

A. The Foodservice Equipment Contractor shall perform the following:

1. Furnish loose to the Mechanical Contractor; gas hoses, pressure regulators, vacuum breakers, water filters, faucets, waste valves, overflows, swirl sprays, solenoid valves and floor troughs where specified.

2. F.E.C. shall coordinate location of grease traps with the Mechanical Contractor. Grease traps must be easily accessible for cleaning and maintenance. Under no circumstances will legs, bases, cross bracing, supports or undershelves be cut or modified in the field. Modifications or adjustments will be made at the factory.

3. F.E.C. shall coordinate location of soda chases with installing trades. All chases will be located under counters and cabinets and free of obstructions. Under no circumstances will any part of the chase be exposed or counters modified in field.

4. F.E.C. shall coordinate roll down shutter doors with installing trades. The tracks must be incorporated into backsplashes, counters, tables, equipment, etc. for a clean and finished look. Under no circumstances will counters be modified in field.

B. The Mechanical Contractor shall perform the following:

1. Make all final utility connections between the rough-in point and the equipment.

2. Provide all final interconnections including; faucets, sink drains, sink waste valves, overflow connections, disposer piping, trough veyors, hot food wells and floor troughs.

3. Provide traps, connecting pipe, valves, stops, floor drains, floor sinks, grease traps, and all other hardware, supplies and parts necessary for the performance of work under this contract; unless specified otherwise in the item specification. All exposed plumbing above the counter and in direct line of site shall be stainless steel or chrome plated.

4. Properly install all drain assemblies and shut-off valves for sinks, hot food wells, etc. All drain assemblies must be installed per all local health department prevailing codes.

5. All work must meet all applicable state and local codes and conditions.

6. Provide and obtain all permits, licences and approvals required. Permit fees will be paid by the Mechanical Contractor.

C. The Electrical Contractor shall perform the following:

1. Make all final connections between the rough-in point and the equipment.

2. Provide all final interconnections including; disposers, cold pans, food wells, walk-ins, ventilation systems, serving counters, etc.

3. Furnish all safety cut-outs, line disconnect devices, shunt trip breakers, power panels, power cords, receptacles, outlets, conduit, wire and other electrical controls, fittings, and connections necessary for food service equipment, with the exception of controls, disconnects and fittings integral to the food service equipment, which shall be furnished by the Food service Equipment Contractor.

4. All work must meet all applicable state and local codes and conditions.

5. Provide and obtain all permits, licences and approvals required. Permit fees will be paid by the Electrical Contractor.

D. The Other Contractors shall perform the following:

1. The Other Trades shall provide necessary flues and/or vents of size and capacity required to operate fixtures. Roof openings, flashing and sealing for food service ventilation shall be provided by the Other Trades.

2. The Other Trades shall provide necessary sleeves or chases of size and capacity required for refrigeration lines and wiring harnesses. Roof openings, flashing and sealing for food service refrigeration lines shall be provided by the Other Trades.

1.04 DEFINITIONS AND ABBREVIATIONS

A. General Explanation: Certain terms and abbreviations used in Contract Documents are defined generally in this article. Definitions and explanations of this section are not necessarily either complete or exclusive, but are general for the work to the extent not stated more explicitly in another provision of Contract Documents.

B. F.E.C.: Food service Equipment Contractor. "F.E.C." abbreviates "Food service Equipment Contractor."

C. C.M.: Construction Manager. "C.M." abbreviates "Construction Manager." As read, work by the Construction Manager refers to work by the Construction Manager and their subcontractors.

D. B.I.B.: Base Item Bid. "B.I.B." abbreviates "Base Item Bid." The Base Item Bid is material, product, or equipment identified in the specifications as the standard to be provided. In the Item Specifications for foodservice equipment, each item identifies a single manufacturer as the Base Item Bid. The Base Item Bid is to be distinguished from Contractor's Options, Alternates, and Substitutions.

E. M.A.: "M.A." abbreviates "Mandatory Alternate." must be quoted to fulfill the requirements of the bid.

F. Alternate: A different material, product, equipment, specialty, system, or other part of the work than that which is the Base Item Bid, and for which the Owner desires a comparative quotation. An alternate carries no presumption of being equal to the Base Item Bid. Rather, it represents a different product, system, specialty or approach under consideration for use in the work. Alternates are governed by the terms and conditions of Part 1.06 of this Section.

G. Furnish: Except as otherwise defined in greater detail, term "furnish" shall mean and intend supply and delivery to project site, unloading, unpacking, assembly, installation, calibration and operator training as appropriate in each instance.

H. Install: Except as otherwise defined in greater detail, term "install" shall mean and intend that the contractor shall perform all work as outlined in the Contract Documents, shall assemble all specified equipment of the contract in one piece in the required locations of the building, and shall make necessary connections as specified within these Contract Document Specifications.

I. Provide: Except as otherwise defined in greater detail, term "provide" shall mean and intend furnish and install, tested and clean, complete and ready for intended use, as appropriate in each instance.

J. Indicated: The term "indicated" is a cross-reference to graphics, notes or schedules on drawings, to other paragraphs, or schedules in the specifications, and to similar means of recording requirements in Contract Documents. Use of terms such as "shown," "noted," "scheduled," and "specified" used in lieu of "indicated," is intended only to help reader locate cross-reference and not limitation of location is intended.

K. Directed, Requested, etc.: Where not otherwise explained, terms such as "directed," "requested," "selected," "approved," "required," "accepted," and "permitted" mean "directed by The BAKER Group, Inc.," "requested by The BAKER Group, Inc.," and the like. However, no such implied meaning shall extend responsibility of The BAKER Group, Inc. into Contractor's area of supervision.

L. Project Site, Job Site: The space available to Contractor for performance of the Work, either exclusively or in conjunction with others performing other work as part of the Project.

M. Or: Used in inclusive sense to indicate alternatives of any item or any combination or items in a list unless otherwise indicated.

N. Include: The word include and its forms is not meant to limit provisions to a list nor to exclude other, unnamed items from a list which it precedes. The phrase, "but not limited to," may be assumed to follow uses of the word include and including.

O. Installer: The entity (person or firm) engaged by Contractor or its subcontractor for performance of

a particular unit of work at project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (Installers) be expert in operations they are engaged to perform.

P. RPZ: Abbreviates reduced pressure zone backflow preventers.

Q. Cross Connection: Means a connection or arrangement of piping or appurtenances through which a backflow could occur. Cross connections may be made "directly" or "indirectly".

R. Backflow: Means water of questionable quality, wastes, or other contaminants entering a public water supply system due to a reversal of flow. Backflow can occur by either backpressure or backsiphonage conditions.

S. Backpressure: Backpressure conditions occur when the downstream pressure exceeds the upstream pressure.

T. Backsiphonage: Backsiphonage is caused by a vacuum or partial vacuum in a water supply system.

1.05 RESPONSIBILITY AND INSURANCE

A. Insurance requirements are as defined in the bid documents of the Architect AND Construction Manager. Do not commence Contract work until these minimum insurance requirements are active and in force. Establishment of these minimum requirements shall not be construed to mean same are adequate for the type and method of work to be performed and/or that the contractor can rely on the type and limit established for his operations. The Food Service Equipment Contractor is completely responsible for broadening the scope and limits as necessary to cover the maximum potential exposure and risk for all parties involved in the project.

1.06 SPECIFIED MANUFACTURERS & ALTERNATES

A. Specified Products & Materials: Certain, definite brands of materials, products, and equipment are specified as the standard of quality. These brands constitute the base item bid (abbreviated hereinafter as B.I.B.) Where one or more additional brands are named as B.I.B., the bid may be based on any one of the named brands.

B. Mandatory Alternates: Alternates specified within this section are mandatory. No representation is made that the alternate identified is equal to the B.I.B. Rather, the alternate is taken because project conditions or other factors cause it to be in the Owner's interest to evaluate a different material, product, or type of equipment.

1. Where an alternate is indicated in the bid documents as "Mandatory," or if it is not further qualified, provide a quote for the material, products and/or equipment identified in the alternate.

2. Proposals for mandatory alternates shall include all costs necessary to include them into the work. Review each alternate to determine its effect on your work. Include in the proposal miscellaneous devices, appurtenances, and other items incidental to or required for a complete installation whether or not directly mentioned as part of the alternate.

3. The Owner reserves the right to accept or reject any alternate at the time of awarding the Contract. If, during the progress of the Work, it should become desirable to reinstate any alternate not included in the Contract, the Owner reserves the right to reinstate the alternate at the price bid by the F.E.C. provided that such action is taken in sufficient time as not to delay the progress of the Work or cause additional expense to the F.E.C.

C. **Voluntary Alternates:** Bidders are encouraged to suggest and quote other brands of the same quality that they may desire to substitute. It is not the intention to discriminate against other brands or manufacturers whose materials, products or equipment is equal or better to what has been specified. Rather, the naming of a specific brand is intended to establish a definite standard. These shall be submitted as Voluntary Alternates.

1. Voluntary Alternates must be proposed independently of the base bid. and mandatory alternate bid.

2. The Owner reserves the right to accept or reject any alternate bid. Bids must be based on B.I.B. items as specified, not per mandatory or voluntary alternates.

C. **Substitutions:** Substitutions will not be accepted. Requests for substitutions will be considered before award of Contract when extensive revisions to contract documents are not required and changes are in keeping with general intent of Contract Documents, when fully documented and properly submitted, when any conditions stated elsewhere in the bid documents are satisfied, and when one or more of the following conditions are satisfied, all as judged by The BAKER Group, Inc.

1. Where the required product, material, or method cannot be provided within Contract Time, but not as a result of F.E.C.'s failure to pursue the work promptly or coordinate various activities properly;

2. Where required product, material, or method cannot be provided in a manner which is compatible with other materials of the work, or cannot be properly coordinated therewith, or cannot be warranted as required, or cannot be used without adversely affecting Owner's insurance coverage on completed work, or will encounter other substantial non-compliances which are not possible to otherwise overcome except by making requested substitution, which F.E.C. thereby certifies to overcome such non-compatibility, non-coordination, non-warranty, non-insurability or other non-compliance as claimed;

3. Where substantial advantage is offered Owner, in terms of cost, time, energy conservation or other valuable considerations, after deducting offsetting responsibilities Owner may be required to bear, including additional compensation to The BAKER Group, Inc. for redesign and evaluation services, increased cost of other work by Owner or separate contractors, and similar considerations.

4. Request for a substitution constitutes representation that F.E.C. has investigated proposed substitution and determined that it meets or exceeds specified product in all respects unless deficiencies are conspicuously noted; will provide same warranty for substitution as for specified product; will coordinate installation and make other changes which may be needed for work to be complete in all respects and do so at his expense; and waives claims for additional costs which may subsequently become apparent. Where such modifications require work by others, such as but not limited to the Owner, to the Construction Manager, to Other Trades, to the Architect, Engineer, or The BAKER Group, Inc., the cost of said work will be billed ("back charged") against the F.E.C.'s contract.

5. Only one request for substitution will be considered for any single product. If substitution is not accepted, provide specified product.

6. F.E.C.'s submittal of (and The BAKER Group, Inc.'s acceptance of) shop drawings, product data, or samples which relate to work not complying with requirements of contract documents, does not constitute an acceptable or valid request for a substitution, nor approval thereof.

7. No substitutions will be permitted subsequent to award of Contract except under emergency conditions such as the sudden and unexpected discontinuance of an item of equipment by the

manufacturer. Determination of what conditions warrant emergency substitutions shall be at The BAKER Group, Inc.'s judgment.

a. Identification of product or equipment being replaced by substitution, including related specification section and drawing numbers, product data, drawings, and catalog sheets and fully documented to show compliance with requirements for substitutions.

8. Because of the practice of certain foodservice equipment manufacturers of offering rebates, gifts, "spiffs," bonuses, premiums, and other benefits to foodservice equipment dealers as well as individual sales people, and because the eligibility for such benefits may have an influence on the decision by a F.E.C. to propose a substitution, the receipt of and the eligibility for such benefits must be explicitly described. For each proposed substitution, provide statement fully answering the following questions:

   a. Is your firm eligible for any benefit, including but not restricted to, rebate programs based on quantities purchased in a given period, reductions in future prices, discounts, cash rewards, or credits, should the proposed substitution be accepted?

   b. Is any individual in your firm eligible for a cash payment, gift, reward, "spiff," or any other form of benefit if the proposed substitution is accepted?

9. Be prepared to attest to accuracy and completeness of this disclosure if requested by The BAKER Group, Inc. Said attestation shall be in the form of a written statement from an officer of the manufacturer attesting to the accuracy and completeness of the F.E.C.'s disclosure. Where the manufacturer is represented by another firm for marketing purposes (commonly referred to as a manufacturer's rep), an officer of the representing firm also shall provide a signed statement attesting to the accuracy and completeness of the F.E.C.'s disclosure. Refusal or inability to provide said statements when requested shall be considered a withdrawal of the proposed substitution.

   The fact that a F.E.C. or individual related to him are eligible for benefits should the proposed substitution be accepted does not provide sufficient cause for the proposed substitution to be declined. However, where there is a difference in judgment between the Owner or The BAKER Group, Inc. and the F.E.C. as to whether the proposed substitution is in fact an equal to the B.I.B., said benefits will be considered in the decision of whether to accept the proposed substitution.

10 The substitution may require changes in the other parts of the work. By acceptance of a proposed substitution no representation is made that the nature or extent of such modifications have been determined except as specifically identified by the F.E.C. in his proposal. All changes to the work required by the proposed substitution, whether or not they are identified in the proposal or subsequently become apparent, shall be completed at the expense of the F.E.C.

11 Should a substitution be accepted and should the substitute material, product, or equipment prove to be defective or otherwise unsatisfactory for the service intended, as evaluated by The BAKER Group, Inc. and within the guarantee period as defined in these specifications, the Foodservice Equipment Contractor shall replace this material, product or equipment at no cost to the Owner, with that originally specified.

12 If a substitution is accepted it is the F.E.C.'s responsibility to insure the electrical and mechanical requirements are correct for the substituted item.

D. Inability to Meet Project Requirements Without Modification: If base item bid products or equipment must be altered to meet the Specifications, and Bidders make no mention that these alterations cannot be made, it will be interpreted that the bids include the alterations as specified. If

Bidders cannot make the alterations that would be required, they must condition their bids with a cover letter stating in what ways the specifications cannot be met and why.

1.07 SUBMITTALS

A. Distribution: Submittals shall be in conformance to the requirements set forth below; all submittals shall be to the parties designated by the Construction Manager; copied to The BAKER Group, Inc.

B. The review of submittals is only for compliance to design intent. **The BAKER Group, Inc. SHALL NOT BE RESPONSIBLE FOR CHECKING DEVIATIONS FROM CONTRACT DOCUMENT REQUIREMENTS OR CHANGES FROM EARLIER SUBMISSIONS UNLESS CONSPICUOUSLY AND SPECIFICALLY NOTED.** Where such changes are indicated on shop drawings, note the drawing changes conspicuously and clearly describe the changes in the transmittal that accompanies the drawing.

The number of copies to be submitted and the deadline for submittal shall be as determined by The BAKER Group, Inc. If the number of copies is not specified, eight (8) copies shall be provided. The F.E.C. will be responsible for distribution of drawings and material documents to parties designated by the Construction Manager.

C. Product Data: Submit buy out brochures, each item shall have a cover sheet with the following information; Item number, manufacturer, quantity, model numbers, service connection requirements, performances, materials, furnished accessories, power and fuel requirements, water and drainage requirements and other similar information. Second sheet shall be a manufacturers cutsheet showing technical data, and installation recommendations, service connection requirements, performances, materials, model numbers, furnished accessories, power and fuel requirements, water and drainage requirements and other similar information.

1. Where equipment is fabricated, provide cover sheet with the following information; Item number, manufacturer, quantity, the words "SEE MANUFACTURERS SHOP DRAWINGS", service connection requirements, materials, furnished accessories, power and fuel requirements, water and drainage requirements and other similar information.

D. Shop Drawings of Fabricated Equipment: Submit dimensioned fabrication drawings for custom fabricated equipment including plans, elevations, and sections, showing materials and gauges used. Cross sections and elevations shall be detailed to a scale of 1-1/2" = 1'-0". Show complete details and dimensions of each item of equipment. Drawings shall be based upon and follow the design drawings and these specifications, without reference to field measurements.

E. Utility Drawings: Submit drawings indicating; item numbers, equipment schedule including item number, quantity and description of each item, specific points and types of final connection for all utility requirements for foodservice equipment. Utility connections shall be located both horizontally and vertically and indicate details of connection required on each item. Prepare these drawings at **1/4" = 1'-0" scale**. Submit separate drawings for equipment lay-out, electrical, plumbing and ventilation.

F. Setting Drawings and Templates: Submit setting drawing and templates for installation of anchorage devices and for any item where so required in the specifications. Submit setting drawings and templates at full scale.

G. Verifying Field Conditions: When field measurements have been taken, revise mechanical, electrical and ventilation and fabrication drawings to reflect accurately project conditions. Submit in a timely manner for final review, in quantities as specified for original submittals. It is the F.E.C.'s responsibility to make sure all trades are using the most current drawings.

H. **Operator's Manuals:** Submit three (3) sets of dimensional prints, data sheets, manuals and instructions for properly operating equipment. Instructions for operating each piece of equipment, together with written guarantee and warranty for each piece of equipment shall be bound in a booklet, and presented to The BAKER Group, Inc.. These shall be submitted prior to final payment or as determined by The BAKER Group, Inc.

1. Provide a list; Provide item number quantity, description, manufacturer, model number, of each piece of equipment and service agency contact, complete with name, and phone numbers.

2. Provide manuals, and instructions for each piece of equipment.

3. Provide manufacturers written guarantee and warranty forms for each piece of equipment.

4. Provide as part of the manual three (3) sets of as-built drawings of each drawing that was supplied by the F.E.C.

I. **Samples:** Submit samples of materials and products where indicated.

1. Submit three of each sample, two of which shall be returned.

2. Samples shall be of sufficient size and quantity to illustrate the functional characteristics of the product with integral related parts and attachment devices; and to clearly express the full range of color, texture, and pattern.

3. Do not use products in the work until required sample review is complete.

J. **Final Distribution:** F.E.C. shall be responsible for distributing the most current, up to date information which include, all shop drawings, utility drawings, buy-out books and all other documentation to all parties.

1.08 QUALITY ASSURANCE

A. **Manufacturer's Qualifications:** The manufacturer must be able to show that it has been regularly engaged in manufacturing of food service equipment of types, capacities, and sizes required, and that its products have been in satisfactory use in similar service for not less than five years.

B. **Foodservice Equipment Contractor's Qualifications:** Only those firms who can meet the following qualifications will be considered for this work:

1. The F.E.C. shall have at least five years successful experience furnishing and installing foodservice equipment on projects similar in size and scope to that required for this project.

2. The F.E.C. shall be the recognized distributor for the items of equipment specified herein, if of other manufacture than his own.

3. F.E.C. shall have the financial resources to enable him to handle the work in a satisfactory manner and to deliver the required items of equipment so as not to delay the progress of the work.

4. The F.E.C. shall be fully capable of fulfilling the terms and conditions of the warranty provisions required by this contract.

5. The F.E.C. shall be capable of providing a performance bond when and if required.

6. Upon demand, the Foodservice Equipment Contractor being considered for possible negotiation shall submit to The BAKER Group, Inc. evidence of his ability to fulfill these requirements.

C. Fabricator's Qualifications: Where specified units require custom fabrication, provide units fabricated by shop with a minimum of five years of experience in similar work. Fabricate all custom equipment items at same shop. Where units cannot be fully shop-fabricated, complete fabrication work at project site in conformance to specification.

Approved Fabricators are: Other fabricators to be considered must be submitted to the BAKER Group for approval in writing prior to submitting bid, or offered as a voluntary alternate and listed separately from the base bid.

MCM Stainless, 21306 John R Road, Hazel Park, MI. 48030, (810)-547-9280
Midwest Stainless, 31120 West 8 Mile, Farmington Hills, MI. 48336, (810)-476-4502
Northern Stainless, 1701 Park Drive, Travelers City, MI. 49685, (616)-947-4580
Great Lakes Stainless, 3666 Rennie School Road, Traverse City, MI. 49684, (231)-943-7648

1.09 REFERENCE STANDARDS

A. Sanitary Construction and NSF Standards: Comply with applicable National Sanitation Foundation (NSF) standards and recommended criteria. Provide each principal item of food service equipment with a NSF "Seal of Approval".

B. UL Labels: Where available, provide UL labels on prime electrical components of food service equipment. Provide UL "recognized marking" on other items with electrical components, signifying listing by UL, where available.

C. ANSI Standards: Comply with applicable ANSI standards for electric powered and gas-burning appliances, for piping to compressed gas cylinders, and for plumbing fittings including vacuum breakers and air gaps to prevent siphonage in water piping.

D. NFPA Codes: Install food service equipment in accordance with the following National Fire Protection Codes (NFPA) Codes:

NFPA 54 - National Fuel Gas Code.
NFPA 70 - National Electrical Code.
NFPA 96 - Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment.

E. ASME Boiler Code: Construct steam generating and closed steam heated equipment to comply with American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code; Section IV for units not exceeding 15 PSI or 250 degrees F, Section I for higher pressure or temperature units.

F. Health Code: Install food service equipment in accordance with local health department applicable regulations.

G. Architectural Millwork: Casework construction shall be of custom grade in accord with the standards of the Architectural Woodworking Institute, or better. Casework will be considered any construction or fabrication requiring the use of wood or laminate.

H. Overlapping and Conflicting Requirements: Where compliance with two or more industry standards or sets of requirements is specified, and overlapping of those different standards or requirements establishes different or conflicting minimums or levels of quality, the most stringent requirement (whether most costly or not) is intended and will be enforced, unless specifically detailed language written into contract documents clearly indicates that a less stringent requirement may be

fulfilled. Refer instances of uncertainty as to apparent conflicts of standards to The BAKER Group, Inc. before proceeding.

I. **Minimum Quality or Quantity:** In every instance, quality level or quantity shown or specified is intended as minimum for the work to be performed or provided. Except as otherwise specifically indicated, actual work may either conform exactly to that minimum (within specified tolerance levels), or may exceed that minimum (within reasonable limits). Refer instances of uncertainty as to quality or quantity intended to The BAKER Group, Inc. before proceeding.

1.10 STORAGE, DELIVERY AND HANDLING

A. **Storage:** F.E.C. shall provide at his own expense a safe and secure area in which foodservice equipment can be stored. Provide adequate protection from damage to or loss of foodservice equipment. Store foodservice equipment in original containers.

1. Should the Owner provide a facility for the receiving and storage of foodservice equipment, the F.E.C. shall nevertheless retain full responsibility for the condition of the equipment, shall fully insure it and name the Owner as additionally insured, and shall hold the Owner harmless from any damages or loss that should occur while stored in the Owner's premises.

B. **Delivery:** Do not deliver foodservice equipment until project conditions permit prompt installation. If the Owner, The BAKER Group, Inc. or Construction Manager determine that the site is not ready for any equipment shipped to same, the F.E.C. will retain said equipment in his storage facilities until the site is ready for installation. Deliver food service equipment to the project site in factory-fabricated containers designed to project equipment and finish until final installation.

1. Any piece of equipment that proves impractical for delivery in one piece may be delivered in sections, but all working surfaces shall be fitted and field welded, with working surfaces ground and polished on premises, so that upon completion each item of equipment will have true, smooth and even surfaces. Butt jointing and filling with solder will not be permitted.

C. **Handling:** Handle food service equipment carefully to avoid damage to components, enclosures, and finish. Do not remove covering until required to clean, test, calibrate and demonstrate, the unit. Do not install damaged food service equipment; replace and return damaged components to equipment manufacturer.

D. **Scheduling and Timeliness:** Delivery and storage of all equipment shall be done at such time when construction, finish and mechanical work have progressed to a point permitting such installation. The details of setting and installation shall be so arranged that work of other contractors shall progress without being unnecessarily interfered with, or damaged.

E. **Protection of Equipment:** All equipment shall be received at the building or construction site fully insured. It will be the responsibility of the Foodservice Equipment Contractor to protect the equipment until completely installed, connected, and approved by The BAKER Group, Inc., subsequent to the completion of the contract work.

1.11 PROJECT CONDITIONS

A. **Verification:** Check electrical characteristics, and water, steam, and gas pressure. F.E.C. shall provide pressure regulating valves where required for proper operation of equipment.

B. **Existing Food Service Equipment (if applicable):** F.E.C. shall tag or mark all equipment scheduled to be re-used. This shall be done prior to disconnecting of the equipment. The F.E.C. shall be held accountable for any missing equipment for failure to tag or mark the equipment. All existing

equipment shall be removed from the facility prior to construction or at a date specified by the Owner or The BAKER Group, Inc..

1. Equipment scheduled for reuse shall be taken to the F.E.C.'s storage area, and stored until it can be transported to the project site and installed. During the time said equipment is in the F.E.C.'s possession, it shall be protected from loss and damage, and shall be delivered to the project site in perfect operating condition.

   a) Equipment shall be cleaned.

   b) Painted when specified.

   c) Repaired or modified to its best working condition when specified.

2. Equipment not scheduled for reuse shall be removed to location(s) designated by the Owner by others not by the F.E.C. With the Owner's concurrence, the F.E.C. may submit an offer to purchase all or part of the remaining equipment; and/or a cost proposal for removing and disposing of scrap equipment.

3. Disconnects of existing equipment shall be completed by Other Trades.

C. Protection of Work and Property: The Foodservice Equipment Contractor will be held responsible for any damage to Owner's property caused by delivering, uncrating or installing of the Kitchen Equipment. If any damage is caused by the Foodservice Equipment Contractor, his agents, or subcontractors, the Owner's property shall be restored to its original condition at the expense of the Foodservice Equipment Contractor.

D. Use of Premises: The Foodservice Equipment Contractor shall confine the storage of equipment, materials, tools, and all other things related to his work to space allotted to him by the Owner.

PART 2 -- PRODUCTS

2.01 GENERAL STANDARDS OF QUALITY

A. Quality of Material: Unless otherwise specified or shown on drawings, all material shall be new, of best quality, perfect and without flaws. It shall be of the best of their respective kind, equal to the standards of manufacture used by the Southern Equipment Company of St. Louis, Missouri; S. Blickman & Company, Weehawken, New Jersey; or Ruslander & Son, Inc., Buffalo, New York. All labor shall be performed in a thorough workmanlike manner. Work to be performed by qualified, efficient, skilled mechanics of the trades involved.

2.02 MATERIALS

A. New Materials: All materials shall be new, of first grade, no seconds will be acceptable.

B. Gauge: Gauges herein specified shall refer to United States Standard Gauge for sheet metal and plate.

C. Stainless steel: All stainless steel shall be of the gauge specified (U.S. Standard) 18.8 composition which is generally known as Type 302 or Type 304, and shall have a Number 4 Finish (125-150 grit) as manufactured within the continental limits of the United States. Each piece of equipment shall be specified by gauge with either a general specification form or under the item specifications. All

sheets shall have a genuine mill finish of not less than 150 grit on one side and not less than 80 grit on the back side. All stainless steel sheets shall bear the manufacturers trade mark, designation of type, and heat number. All stainless steel sheets shall have the following content:
Chromium - 18 percent minimum
Nickel - 8 percent minimum
Carbon - .2 percent maximum

Straight chrome iron or copper bearing straight chrome steel is not acceptable. All stainless steel sheets shall be stretcher leveled. All sheets shall be free of buckles, warps, and surface imperfections. A hard ground finish will not be acceptable.

D. Stainless steel sheets: shall be of cold rolled stock.

E. Stainless steel pipe and tubing: ASTM A 554, Type 304 with No. 4 polished finish; shall be seamless or welded, of gauge specified, of true roundness. Seamless tubing shall be thoroughly and properly annealed, pickled and ground smooth. Welded tubing shall be thoroughly heat-treated and properly quenched to eliminate carbide precipitation. V-Clad shall not be permitted.

F. Galvanized iron: Wherever specified, galvanized iron shall be of an approved grade of either low carbon steel or copper bearing steel. All sheets are to be commercial quality, stretcher leveled, bonderized and re-rolled to insure a smooth surface.

G. Galvanized Sheet Steel: ASTM A 526, except ASTM A 527 for extensive forming; ASTM A 525, G90 zinc coating, chemical treatment.

H. Sheet Steel: ASTM A 569 hot-rolled carbon steel.

I. Aluminum: ASTM B 209 sheet and plate, ASTM B 221 extrusions, 0.40-mill clear anodized finish where exposed, unless otherwise indicated.

J. Galvanized Iron: Shall be approved grade of either pure wrought iron or copper bearing steel.

K. White Metal: Corrosion-resistant metal containing not less than 21 percent nickel. Make castings free from pit marks, runs, checks, burrs, and other imperfections; rough grind, polish, and buff to bright luster.

L. Plastic Materials and Components: Provide plastic materials and components which conform to NSF 51.

M. High Pressure Decorative Laminate (HPDL): HPDL shall be selected by the Architect from manufacturer's standard palette of colors, unless otherwise indicated. Provide HPDL conforming to NEMA Standard LD3-1985.

1. Where the use of HPDL with a wear resistant finish is indicated, provide such (e.g. Nevamar's ARP Surface, Wilsonart "Tufsurf 2," etc.) of a nominal thickness of .060"

2. Where the use of HPDL of solid color or "color through" is indicated, provide such (e.g. "Solicor" by Wilsonart).

3. F.E.C. shall provide fire rated laminate where required by code.

N. Hardwood Work Surfaces: Laminated edge-grained hard maple (Acer saccharum), NHLA First Grade with knots, holes and other blemishes culled out, kiln dried at eight percent or less moisture, waterproof glue, machined, sanded, and finished with NSF-approved oil-sealer.

O. High Density Particle board. Where indicated in counter or cabinet construction, provide high density Particle board such as "Novoply."

1. F.E.C. shall provide fire rated laminate where required by code.

P. Plywood. Where cabinet or counter construction calls for plywood, use birch grade paint finish standard or grade as indicated.

Q. Sound Deadening: Sound deaden underside of table with premium type mastic, that "skins" on surface when dry. Surface of mastic coating shall be smooth, equal to the standard for hot-rolled steel finish, 3M Coating #1000 E/C or equivalent.

1. Apply two (2) coatings of sound deadening material to underside of tops, drain boards, dishtables, counters, and sinks.

2. Apply sound deadening during fabrication. Touch up on project site if required.

R. Sealants: ASTM C 920, Type S Grade NS, Class 25, Use NT. Provide sealant that when fully cured and washed meets requirements of Food and Drug Administration Regulation 21 CFR 177.2600 for use in areas where it comes in contact with food.

1. Color: As selected by The BAKER Group, Inc. from manufacturer's standard colors.

2. Backer Rod: Closed-cell polyethylene rod stock, larger than joint width.

S. Gaskets: Solid or hollow (not cellular) neoprene or PVC; light gray, minimum of 40 Shore A hardness, self-adhesive or prepared for either adhesive application or mechanical anchorage.

2.03 MANUFACTURED OR FABRICATED COMPONENTS

A. Wall Anchors: Wherever it is necessary to mount fixtures that are supported from the wall, the fixtures shall be securely attached thereto by means of stainless steel tapped screws into stainless steel face and anchor type grounds that are built into the walls. Furnish these grounds to other trades at proper time so other trades can build them into the walls as work progresses. Itemized specifications note fixtures requiring such grounds. It is the responsibility of the F.E.C. to coordinate and provide these anchors in a timely manner.

B. Chair Carriers: Furnish chair carriers as needed for hanging wall-mounted equipment. Provide guarantee that chair carriers are of sufficient strength and quantity to support specified load. Chair carrier shall be of all-welded stainless steel construction and mounted within half or full wall so that weight of table and equipment is transferred to floor. Chair carriers may be fabricated or purchased from outside manufacturer. Provide The BAKER Group with drawings of this item for approval prior to fabrication and installation.

C. Floor Anchors: Wherever it is necessary to mount fixtures to the floor, the fixtures shall be securely attached thereto by means of stainless steel tapped screws

D. Faucets: Furnish all faucets including spray rinse units and wall brackets. Drill and finish fixtures in preparation for installation. Provide loose to installing contractors. Faucet nozzles are to be centered over sink drain.

1. Deck mounted faucets with 4" centers shall be T & S Brass & Bronze Works #B-0225 or approved equal, ½" inlet.

2. Deck mounted faucets with 8" centers shall be T & S Brass & Bronze Works #B-0221 or approved equal, ½" inlet.

3. Backsplash mounted faucets shall be T & S Brass & Bronze Works B-0231 or approved equal, ½" inlet.

4. Potsink faucets shall be T & S Brass & Bronze Works B-0291 or approved equal, 3/4" inlet.

5. Wall mounted pot and kettle tilting faucet; dual temp. - T & S, B-0597; single temp. - T & S, B-0592, ½" inlet.

6. Built-in dipperwell, faucet and sink - Fisher Faucets #304.

7. Pre-Rinse faucets; deck mounted - T & S, B-0113, splash mounted - T & S, B-0133 or approved equal.

8. Other faucets such as swing spouts for kettles, et cetera, are also included in this contract. Types required will be stated in itemized specifications.

E. Potable Water Protection & Vacuum Breakers: Furnish all protection devices unless otherwise indicated in the item specifications. Drill and finish fixtures in preparation for installation. Provide loose to installing contractors.

1. Air Gap: The distance of a water inlet or opening above the maximum high water level or overflow rim in a fixture, device, or container. A "safe air gap" is at least 2 times the diameter of the water inlet pipe, but not less than 1 inch and need not be more than 12 inches.

2. Reduced Pressure Principle Devise (RPZ): It consists of 2 independently acting internally loaded check valves separated by a reduced pressure zone. A differential pressure relief valve is located within the zone to maintain the reduced pressure and also discharge water to atmosphere during periods of backflow. This device is used as protection for all direct or indirect cross connections. The device may be subject to backpressure or backsiphonage of toxic chemicals, sewage, or other lethal substances.

3. Pressure Vacuum Breaker: This device allows air to enter the waterline when the pressure in the public system or the service line is reduced to 0 or below. The device has a vacuum relief valve which is internally loaded, normally by means of a spring. May be installed for use under continuous line pressure. Must be installed at least 12" above the highest outlet it is to serve.

4. Atmospheric Vacuum Breaker: Allows air to enter the waterline when the pressure in the public system or the service line is reduced to 0 or below, however, since the vacuum relief is not internally loaded the device must be installed on a discharge side of the shut off valve. Should not be subjected to continuous flows for periods of more than 12 hours and must be installed at least 6" inches above the highest outlet it is to serve.

5. Double Check Valve Assembly: Consists of (2) two independently acting internally loaded check valves. This device may be used for backpressure or backsiphonage situations, only if the cross connection protection is from substances that do not constitute a health hazard.

F. Rotary Waste Valves: Provide two-inch, heavy cast-bronze body, removable flat stainless steel strainer, twist handle waste outlet, and one-piece connected chrome-plated brass overflow, unless otherwise stated in the item specifications. Provide waste and overflow by Fisher Faucets, 6100 series, or approved equal.

G. Casters: Provide four-inch minimum diameter wheel casters, with 1-1/8 inch tread width,

conforming to NSF standards, unless otherwise noted in item specifications. Provide sealed, self-lubricating bearings, cadmium-plated or bright zinc-plated steel disc wheels, and solid synthetic rubber tires. Provide foot brakes on (2) two casters per unit unless otherwise specified.

2.04 ELECTRICAL REQUIREMENTS - GENERAL

A. Electric Heating Equipment: Verify to project conditions.

B. Wiring: In general, equipment shall be provided with all necessary internal wiring, properly carried externally where required, for termination in junction box, motor starter, et cetera. All wiring provided under this contract shall be in full accordance with the latest edition of the National Electric Code. Further, all wiring provided shall be contained in a metallic raceway, approved by engineer, consisting of a specially fabricated wireway as in the case of work built into counter work, or in conduit of proper material, or Greenfield flexible conduit, all with necessary provisions for grounding continuity. All conductors provided shall have proper temperature ratings.

C. Thermal overload protection: All motors of equipment provided shall have the thermal overload protection provided.

D. Control equipment: Provide all necessary electrical control equipment and wiring, except as otherwise outlined, mounted on equipment where practicable, or where shown on plan.

E. Receptacles: Receptacles to be provided shall be as Bryant #5261, where single, and #5262, where duplex, with matching caps on associated equipment as Bryant #5266; 30 amp outlets shall be 4 wire Hubbell #20403 receptacle, with matching cap Hubbell #20415 on associated equipment.

1. Receptacles larger than 30 amperes to be as Hubbell 60 ampere #9-1059 porcelain face with matching cap, 3 wire, and #7714 brass chrome plated or stainless steel face plate.

2. Receptacles for 240 volt, shall be 3 or 4 wires as required, of twice normal capacity. Twist lock receptacles to be Hubbell #7310 with matching cap #7311. All caps to be for heavy duty applications. All receptacles to have grounding conductor.

3. Receptacles for cashier's stands to serve cash registers shall be as for dedicated circuits.

F. Cover plates: All receptacles to have 1040 stainless steel or chrome plated brass cover plates with stainless steel or chrome plated brass screw for all outlets provide in equipment.

G. Cords: Flexible cords to be provided on equipment shall have grounding conductor and shall be of best quality available to industry, equal to Simplex-Tryex, selenium neoprene.

H. Motor starters: Provide required starters for all motors. Motor starters required for foodservice equipment and not provided by Other Trades shall be thermal overload protective type, manual wherever possible, equal to New Series Allen Bradley Bulletin #709 magnetic with necessary accessory equipment where required for proper operation. Where required fully magnetic type W.P.B. station shall be furnished. All manual and magnetic type motor starters provided under this contract for 3 phase motors shall be 3 thermal element type, requiring special coordination with starter manufacturer. This requirement is not repeated elsewhere in the detailed specifications.

I. Motor Thermal Protection: In instances in which motor thermal protection cannot be built-in where specified into motors provided with equipment, the Food service Equipment Contractor shall provide externally mounted overload devices of proper number of poles and capacity equal to Turnbull "TT" or Allen Bradley, and shall carry wiring from motor terminals to these devices in manner approved by inspection authorities as being in full accord with applicable electrical codes and engineers plans.

J. Wire: Except as otherwise required, all wire provided shall be type THW dual rating. Wire in counter raceways to be heat resistant type, AVA or equal.

L. Openings: Provide proper openings through all equipment and shelves for piping and electrical conduits. All openings are to located as close to the rear of the counter and sized just big enough for the pipe or wire. All openings shall be smooth, so not to damage or cut the piping or electrical wires.

M. Panelboards: Panelboards shall be UL listed and properly sized in compliance with National Electric Code.

N. Floor Based Electrical Connections: shall be made in a manner that will allow portable equipment connected to the floor electrical supply to pass over the point of connection without interference.

O. Code Compliance: All electric work to be performed in accordance with the National Electric Code and local regulations.

P. Other Conditions: If not provided by other contractors, F.E.C. to provide all electrical parts including but not limited to contactor strips, line shunts, relays, disconnects (both mechanical and electrical), loose parts and labor required for installation of same not provided by other contractors and pertinent to the installation of equipment under this section. A non-limiting example of this type of equipment would be contactor strips required for the proper operation of fire protection systems.

2.05 STEAM PRESSURE, STEAM THERMOSTATS, STEAM COILS

A. Steam Pressure: All steam operated pressure vessels such as Kettles, Steamers, Urns, et cetera, shall be constructed to A.S.M.E. and the Code requirements of the State in which the project occurs and shall bear labels and certificates of compliance therewith.

B. Steam Thermostats: Provide steam thermostats or temperature regulators for steam heated equipment if required for proper operation of the piece of equipment, or if so required in the Itemized Specifications.

C. Steam Coils: All steam coils shall be installed in sufficient quantity to provide ample heat at the available steam pressure (Verify project conditions). They shall be tested for 100 pounds per square inch working pressure.

1. In fixtures having coils under more than one shelf, all coils shall be connected together with inlet and outlet extended down through base of fixture to point indicated on drawings for installation of stop valves and final connection.

2. Unless otherwise specified, coils are to be 7/8" O.D. hard copper tubing with brass fittings. Where immersed in water, coils are to be mounted on strap type brackets or feet with a clearance of not less than 1" below coils for cleaning purposes. These feet are to be soldered water-tight to the bottom of the pan in which coils are mounted. Couplings shall be welded or braised in the bottom or sides of fixtures for steam inlet and outlet, and shall extend through fixture ready for final connections.

3. Boiler permits shall acquired by the installing contractor and all fee's shall be paid by the installing contractor.

2.06 LOCKS

A. Cabinets and Refrigerated Units: Provide integral locks on all cabinets and refrigerated units. Locks shall be of sufficient strength to prevent unauthorized entry into the locked space. Locks shall be of the key and cylinder type with tamper-proof mechanisms. Furnish Owner with three (3) sets of keys to each lock at the conclusion of the project, accurately labeled and turned over to the Owner all at one point in time. This lock standard applies to all cabinets unless otherwise indicated in item specifications.

2.07 FABRICATION, GENERAL

A. Welds: All workmanship shall be done with welded rod of same composition as sheets or parts welded. Welds shall be strong, ductile, with excess metal ground off and finished smooth to match adjacent surface. Welds shall be free of imperfections as pits, runs, spatter, cracks, et cetera, and shall have the same color as adjacent sheet surfaces. All joints in top fixtures, tables, drainboard, exposed shelving, sinks, et cetera, shall be electrically welded. Butt welds made of spot welding straps under seams and filling in with solder will not be acceptable. It is the intention of these specifications that all welded joints shall be homogeneous with the sheet metal itself. Where sheet sizes necessitate a joint, such joints shall be welded. Tops of fixtures shall be fabricated at the factory with welded joints to reduce field welding.

Under no circumstances are any welds to be spray painted. All welds are to be ground and polished smooth.

B. Field Joints (Welded): Where field joints are necessary, the tops shall be continuous. Items shall be made in maximum length sections as possible and with as few joints as necessary. Provide proper joint preparation and location. Access shall be provided, where possible, to the back side of the welds. Joints shall be located to provide the minimum length of seam. Field joints are to be provided only for the convenience of installation and shall be held to an absolute minimum. Show proposed field welds on shop fabrication drawings.

C. Field Joints (Bolted): Bolted field joints, if specified as acceptable, are to be drawn tight leaving a hair-line seam and shall not have any exposed screws or rivets. Joints shall be neatly and carefully fabricated to make the very best appearing joint possible. After equipment is set in place, all field joints shall be tightly pulled together leaving only a hair-line seam. The alignment of the joints shall be made in such a manner that they shall be tightened both horizontally and vertically. Show proposed bolted field joints on shop fabrication drawings.

D. Surfaces: All surfaces shall be completely free of burrs, rough edges, slag, or any other debris.

E. Other Exposed Surfaces: All coved corners, legs, table tops and all other exposed surfaces to be ground smooth and polished to a #4 finish.

F. Exposed Joints: All exposed welded joints including field joints shall be suitably ground flush with the adjoining material and neatly finished to harmonize and appear the same.

G. Depressions: Wherever material has been depressed or sunken in by the welding operation, such depressions shall be suitably hammered and peened flush with the adjoining surfaces and, if necessary, again ground to eliminate low spots. All ground surfaces shall then be polished or buffed to match adjoining surfaces consistent with good workmanship.

H. Discoloration, etc. Care shall be exercised in all grinding operations to avoid excessive heating of the metal and metal discoloration. In all cases the grain of rough grinding shall be removed by successive finer polishing operations.

I. Finished Texture: The texture of the final polishing operation shall be uniform and smooth consistent with reasonable care and good workmanship. The general finish of all metal shall be of

high grade.

J. **Break Bends:** Wherever break bends occur, they shall be free of open texture or orange peel appearance; and where such break does not mar the uniformity of the appearance of the material, all such marks shall be removed by suitable grinding, polishing, and finishing.

K. **Sheared Edges:** Wherever sheared edges occur, they shall be free of burrs, projections, and fins to obviate all danger of cutting and laceration when the hand is drawn over such sheared edges.

L. **Miters and Bullnose Corners:** Where miters or bullnose corners occur, they shall be neatly finished with the under edge of the material neatly ground to a uniform condition and in no case will overlapping material be acceptable.

M. **Finish:** It is the intention of these specifications to describe fabrication of a quality finish consistent with the highest grade of manufacturing practices in the industry. Edges of tops and overshelves shall be highly polished or "Hi-Lited" where required by the Item specifications. Final approval of surface finishes shall be by The BAKER Group.

2.08 PIPE CHASES

A. **Pipe Chase Panels:** Where top arrangement of enclosed base tables make it necessary for plumbing and supply piping to be passed through the base, this piping shall be enclosed in a suitable pipe chase with easily removable access panels. These access panels are not to be held in place with screws or latches, but are to be formed up in a pan shape, removable without the use of tools. The foregoing only applies to fixtures where an access is required from the front of the fixture, as in the case of pipe chases at end of fixtures containing bottom and intermediate shelves need not be enclosed unless specifically called for in the Itemized Specifications. Unless otherwise specified, shelves in these fixtures will be turned up a minimum of 3" at the edge of the pipe chase.

B. **Access Panels:** Where access panels are specified, the panels shall be used for access to drains and electrical junction boxes only. The access panels are used for cleaning and maintenance only they shall not be used for electrical, plumbing, chases and rough-in penetrations. The access panel shall be made of matching material and removable with out tools.

C. **Consult with Piping Contractors:** In detailing fixtures, consult with piping contractors to be certain that due space allowance is made for traps and other controls, particularly under lower shelves.

D. **Shelf Penetration:** Where plumbing and supply piping pass through shelves on open base tables, shelves shall be neatly punched or die-stamped for the piping. Show the location of such pipe chases, or stamped pipe openings, on plan and/or detail drawings. Provide sufficient size to accommodate all necessary risers so that additional holes need not be cut in the field. Coordinate with plumbing contractors, cautioning them that all piping must be run through chases or slots as provided.

E. **Utilities Housing:** All utilities for counters and fabricated equipment will be housed in chases constructed for same, pre-wired to minimize field wiring and plumbing.

2.09 SANITARY CONSTRUCTION

A. **Approvals:** All fabricated equipment is to be constructed in strict compliance with the standards of the National Sanitation Foundation as outlined in their bulletin on Food Service Equipment entitled "Standard No. 2" dated September, 1978, and in full compliance with the Public Health Regulations of the locality in which the installation is to be made. All fabricated equipment shall have the seal of approval of the National Sanitation Foundation and if required by code UL approval seal of approval.

2.10 SINKS

A. Construction: Sinks and frames shall be constructed of 14 gauge stainless steel. The front shall extend up 2-3/4" higher than the drainboard line and shall be finished with a 1-3/4" wide channel rim, running full length, with ends of sink frame constructed for welding to drain boards where such are specified. Sink bowls, unless otherwise indicated in item specifications, shall be 14 gauge stainless steel fully welded to frames so that no joint is visible. Where required, provide sinks with drain boards, backsplashes, heaters, or water circulation systems.

1. Where drain boards are required, they shall be electrically welded to the sink frame to provide an integral unit.

2. Where the sink is free standing without drain boards, the channel rims shall continue around both ends with the corners of the channel edge rounded to conform with the radius of the inside vertical corner of the sink. Corners shall be electrically welded.

3. Where a backsplash is required, the rear of the backsplash shall extend to the specified height above the drainboard work surface, with the top edge returning to the wall at a 45 degree angle and forming a 2-1/4" clear pipe chase.

4. The ends of the sinks shall be electrically welded to the body of the sink with all vertical and horizontal corners formed on a 3/4" radius with welds ground and polished smooth to a #4 finish.

5. Bottom of sinks shall be depressed and slope to a twist handle waste with handle constructed of 3/8" stainless steel rod extending to the front of the sink. This twist handle drain shall have a built-in connection for an overflow pipe. Rear of overflow connection to have a polished nickel allow front plate and shall be completely connected to the drain with nickel plated brass tubing. The Twist handle shall be supported by a stainless steel bracket welded to the underside of the sink.

6. Provide at top center rear of each compartment, below the drainboard line, a polished cast nickel bronze overflow with 1-1/4" O.D. brass tubing connection to outlet at back of drain.

7. Where multiple sink bowls are welded to a frame, a minimum 2" between bowls shall be provided to prevent temperature transfer and front of sinks shall be clad in 14 gauge stainless steel frontispiece.

8. Where sinks are specified to set into counter tops, the sinks shall be electrically welded to top with continuous weld, ground smooth so that no seam is visible and surfaces match. Drop in sinks with hardware fasteners will not be accepted unless specifically called for in the Item Specifications.

9. All interior and exterior horizontal and vertical bonds and corners shall be rounded on a 3/4" radius with all joints welded.

10. Mount fill faucets in backsplash. Single compartment sinks shall be fitted with two (2) holes on 8" centers over the center compartment. Where sinks have two or more compartments, provide two (2) holes on 8" centers over the partition(s). Fit sink(s) with combination chromium plated swing spout faucet(s).

B. Drain boards: Construct of #14 gauge polished stainless steel welded integral to the body of the sink with continuous rolled rims and splash of the same height and design as the sink. Roll rim heights at the shallow end shall be 1" high sloping approximately ½" to the sink body, unless otherwise specified. All drain boards shall have horizontal corners coved on 1/4" radius with the vertical

corners coved on 1/4"radius. Drain boards must slope in the direction of the sink, so water will not pool.

C. **Legs:** Sink legs shall be as specified under "Table and Sink Legs". Legs shall be attached with a #14 gauge stainless steel gusset to the underside of the sink body. The gusset shall be conical shaped and provided with an allen head dog point set screw.

D. **Additional Considerations:** Where so indicated by the Item Specifications, provide sinks as follows:

1. Where "plug and chain drain" is specified, sink bowls shall slope to a drain which shall be a standard 1-1/2" drain with plug and chain.

2. Where "basket strainer drain" is specified, sink shall be fitted with a 1-1/2" cup strainer assembly.

3. Where "sink compartment heater" is specified, sink compartment shall be heated with electric immersion elements with low water cutout and thermostatic control, as manufactured by Hatco or approved equal, and of sufficient wattage to assure 180°F rinse water.

2.11 COUNTER AND TABLE TOPS - METAL CONSTRUCTION

A. **Tops and Edges:** Counter and table tops shall be fabricated with type of edge as specified. The definite choice as to the type of edge profile to be used shall be made before the time of bidding. If unspecified, the edge will be metal edge profile No.3. All tops, unless otherwise specified, shall be 14 gauge stainless steel.

B. **Top Bracing:** Tops shall be braced with 1-1/2" x 1-1/2" x 1/8" galvanized angles and 1-1/2" x 3" x 1-1/2" #14 gauge galvanized channels. On open base tables, one channel shall be placed at each pair of legs. A longitudinal angle shall be placed between the channels for additional top support.

C. **Underbracing:** Underbracing, will be constructed of stainless steel channels, size same as in A & B above. When stainless steel underbracing is utilized, the above sized channel will be used throughout for underbracing.

D. **Top Fastening:** Tops shall be fastened to the framing members with protruding studs. Studs shall be welded to the underside of the table top and fastened by means of chrome plated lock washers and acorn nuts.

E. **Backsplashes**: Backsplashes shall be of the height specified with the standard height being 6" on serving counters, 10" overall on worktables and 10" on dishtables. The splash shall be returned 2" on a 45° angle. All corners of tops formed by bending and/or welding shall have a radius of 3/4".

2.12 SOUND DEADENING

A. **Application:** Apply sound deadening material to all tables, counters, sinks, etc. per section 2.02.

2.13 TABLE AND SINK LEGS

A. **Materials:** All legs for open base tables, sinks, and dishtables shall be constructed of stainless steel, 14 gauge, seam welded and polished to a #4 finish, unless otherwise specified. Cross rails, where required, shall be of 1-1/4" #14 gauge wall welded tubing of stainless steel. Cross rails shall be welded to legs with the resulting welds ground and polished to a smooth finish. All legs shall be

fitted with a stainless steel adjustable bullet foot having a minimum of 1" adjustment. All feet furnished shall be vermin proof having closed bottoms of stainless steel with unexposed threads and a minimum clearance between the foot and the leg of 1/32".

B. Tops: Tops of legs shall be welded to 14 gauge stainless steel section of channel, closing top of leg, and this channel section shall be sized to nest inside table reinforcing channel and then is bolted in place with stainless steel bolts and lock washers through both vertical channel legs and gusset if open leg type table. Wherever threads of bolts and screws on the inside of fixtures, which are either visible or might come in contact with the hand or wiping cloth, such bolts and screw threads shall be capped with suitable lock washer and chrome plated brass or bronze acorn nut. Where screw threads are not visible or readily accessible, they might be capped with a standard lock washer and steel nut treated to prevent rusting or corroding.

C. Gussets: All gussets shall be fully enclosed stainless steel and provided at all leg locations. These gussets shall be one hundred percent (100%) welded to channels in a water-proof, vermin-proof manner. Where gussets occur at angle iron framework provide triangular 12 gauge stainless steel corner plates, welded to bottom edge of angle frame, and weld gusset to triangular plate. These gussets shall have 16 gauge stainless steel exterior case complete with galvanized interior case. Legs shall slip fit into internal case and be held in place with stainless steel set screw.

D. Cabinet and warmer legs: All cabinets, warmers, and/or other enclosed bodies unless otherwise specified are to be mounted on round pattern adjustable legs. Legs shall be of 1-5/8" o.d. stainless steel seamless tubing having a stainless steel adjustable bullet shaped foot with a minimum of 1" of adjustment. Legs shall not be less than 6" high overall. Legs shall be welded to a 14 gauge die-formed stainless steel mounting plate. This plate shall telescope into a 14 gauge galvanized channel welded to the underside of the body. This channel shall extend the full length of the cabinet. The leg mounting plate shall slide in the channel to permit relocation and removal of the leg. The die forming plate shall have a center embossing for the 1-5/8" o.d. leg tubing and shall have a clinch nut inset screw for locking the leg in place.

E. When to Omit Front Cross Rails: Only where indicated, legs are to be without lower tubing cross-bracing in order to provide space for mobile item storage.

F. Lower Shelves: Where lower shelves are specified, these shelves shall be permanently welded to legs except when removable shelves are specified, and the stainless steel tubing cross rails will be omitted.

G. Quantity: Unless otherwise specified, tables and open base fixtures up to 6'-0" in length shall have four (4) legs. Tables from 6'-0" to 12'-0" in length shall have six (6) legs and tables from 12'-0" in length to 18'-0" in length shall have eight (8) legs or more as required to make a substantial fixture to accommodate special construction.

2.14 CABINETS - BASE UNITS; METAL CONSTRUCTION

A. Construction Standards: To be constructed to standards indicated in section 2.02 of these specifications. All casework to be stainless steel construction, unless otherwise noted.

B. Countertops: All countertops to be 14 gauge stainless steel, unless noted otherwise. Provide square rim edge, unless noted otherwise. 4" high splash at all back and side walls, unless noted otherwise. Countertops to be constructed to sizes and profiles shown on plans.

C. Support: All cabinets having a clear span below, shall be capable of sustaining a 300-pound load at the front edge of the counter at midspan.

D. Base: Cabinet bases shall be mounted on 12 gauge galvanized steel channel. All base cabinets shall have a 6" high toe space. The finish base applied thereto shall be the same base as in the rest of the room, and shall be applied thereto by that respective contractor, other than the Food Service Equipment Contractor).

E. Legs: Cabinet legs shall be of stainless steel with adjustable stainless steel feet. Welded to counter support.

F. Hardware: The following hardware is specified to establish the desired design and level of quality. Alternative manufacturers of equivalent products may be used. Fabricator shall utilize the correct quantity and spacing of hardware items as recommended by the specific manufacturers:

1. Door Hinges: Adjustable Tension Concealed Hinge, 125 degree opening, US26D finish.
2. Door Locks: HAFELE Inlaid Lock, US26D finish.
3. Door Catch: Adjustable heavy duty tension chrome plated catch, Component Hardware model M27-2490 or approved equal.. Provide non magnetic type.

G. Shelves: Provide shelving per section 2.16 of these specifications.

2.15 CABINETS - BASE UNITS; MILLWORK CONSTRUCTION

A. Construction Standards: All casework to be constructed to standard indicated in section 1.09-G of these specifications. All casework to be plastic laminate construction, unless otherwise noted. All plastic laminate cabinets are to be one color, unless otherwise noted. All cabinets shall utilize flush overlay construction.

B. Countertops: All countertops to be plastic laminate (different color from cabinets), unless noted otherwise. Provide 1-1/2" shelf edge, and 4" high splash at all back and side walls. All Corian to be FOUNTAINHEAD or Laminate to be FORMICA 2000 countertops to be constructed to sizes and profiles shown utilizing standard colors and finishes; provide fusion seaming.

C. Support: All cabinets having a clear span below, shall be capable of sustaining a 300-pound load at the front edge of the counter at midspan.

D. Base: All cabinet bases shall be mounted on 12 gauge galvanized steel channel. All base cabinets shall have a 6" high toe space. The finish base applied thereto shall be the same base as in the rest of the room, and shall be applied thereto by that respective contractor, other than the Food Service Equipment Contractor.

E. Hardware: The following casework hardware is specified to establish the desired design and level of quality. Alternative manufacturers of equivalent products may be used. Casework fabricator shall utilize the correct quantity and spacing of hardware items as recommended by the specific manufacturers:

1. Door Hinges: BLUM Premium Concealed Hinge, 125 degree opening, US26D finish.
2. Door Locks: HAFELE Inlaid Lock, US26D finish.
3. Adjustable Shelf Brackets and Standards: KV Recessed Pilaster and Supports, US26D finish.
4. Door Catch: Adjustable heavy duty tension chrome plated catch, Component Hardware model M27-2490 or approved equal.. Provide non magnetic type.

2.16 UNDERSHELVING (METAL)

If undershelving is not specified provide all tables, dishtables and sinks with tubular undershelves running the full length of unit.

A. **Stationary Shelving:** Stationary shelving under open base tables shall set approximately 8" above the floor with all edges rolled down on a 3/4" radius approximately 1-3/4". The profile of these shelves shall match metal edge profile No. 1. Where shelving intersects the leg, the joint shall be formed without openings. The shelving shall be attached by welding the underside. Where shelving abuts walls, turn edge up 2", round corners and finish smooth. Shelving shall be 16 gauge stainless steel.

B. **Removable shelving:** Removable shelving under open base tables will be supported on 1-1/4" stainless steel tubing. The resulting shelving shall be rolled down over the rails in maximum 20" wide sections. Where shelving abuts walls, turn edge up 2", round corners and finish smooth. Shelves shall be turned down 90° square where the resulting sections abut one another. Shelving shall be 18 gauge stainless steel.

C. **Tubular Shelves:** Tubular shelving under open base tables will be set approximately 8" above the floor on 6" centers, where shelving intersects the leg or a cross brace it shall be fully welded and polished smooth, the joint shall be formed without openings.

D. **Enclosed Shelving:** Enclosed cabinet shelving shall be of 18 gauge stainless steel, back and ends turned up 1-1/2" against body panels and spot welded. Front edge shall be turned down 1-1/2" and returned ½" on 75° angle on intermediate shelf. Lower shelf to be turned down 1-1/2" on front and back 11/16".

E. **Enclosed Shelving, Construction:** Enclosed cabinet removable shelving shall be made in maximum 20" wide sections having all edges flanged down 1-1/2". The corners of these shelves shall be left open so as to provide an easy to clean corner. Heated cabinet shelves shall be perforated with ½" diameter holes spaced on 3" centers. These shelves shall be removable and supported on angle framework as specified.

F. **Elevated Shelving:** Elevated Shelving 12" wide or less shall be of 16 gauge stainless steel or 14 gauge stainless steel in widths greater than 12". The front and ends shall be rolled down on a 3/4" radius - 1-1/2" diameter roll approximately 180°. This shall be metal edge profile No. 3. Where shelves are up against the wall or adjacent to fixtures, the edges shall be turned up 1-1/2". All flanges shall be coved on a minimum 1/8" radius with the intersecting turned up flanges at the back and ends also coved. The corners shall be welded, ground, and polished to form a fillet of the same radius as other bends.

G. **Table Mounted Shelves:** Table mounted shelves shall be supported from the top of the fixtures on 1-1/4" o.d. diameter stainless steel tubular uprights attached to the shelving with stainless steel ferruled plates and/or stainless steel triangular brackets. The feruled plates shall be spot welded to the underside of the shelves and the stainless steel brackets shall be attached with stainless steel studs, lock washers, and acorn nuts. Tubular supports shall be attached to the counter top without visible bolts and/or screws. It is extremely important that on dishtables the supports be located so as not to be placed in working areas. Supports on dishtables shall be extended through the return of the backsplash to a bracket below the working surface of the table. This bracket, whenever possible, shall be bracketed to an existing table leg.

2.17 WALL SHELVING

A. **Stainless Steel Wall Mounted Shelves:** Wall mounted shelves shall be supported on #14 gauge stainless steel cantilever type brackets. These brackets shall be steady and shall be provided with two holes for securely anchoring to the masonry at the job site. Triangular shapes brackets shall be attached to the underside of the shelf with studs, lock washers, and chrome plated acorn nuts.

2.18 PROTECTOR CASES

A. Protector Cases: Protector case shall be of the size shown on plan and shall be approved by the BAKER Group and Health Department codes and standards.

B. Top shelf: Top shelf shall be 16 gauge stainless steel serving shelf with the front being formed down on a slope to match the slope of the front glass and bracket. The rear and ends of the serving shelf to be turned down 1-3/4" on a 90° angle. The rear edge of the shelf shall be returned approximately 1". This channel shall form a housing for a built-in fluorescent light or heatlamp, where so specified. This channel shall accommodate Tombstone type fluorescent lamp holders which shall have the wiring completely enclosed and extended through tubular support into the base of the fixture, to a remote switch. All corners of the shelf shall be welded, ground, and polished smooth. The protector shelf shall be approximately 16" high

C. Uprights: Shelf shall be mounted on 16 gauge round stainless steel uprights unless otherwise specified. The uprights will be designed so as to be adjustable up-down 8", in a concealed manner without visible means of attachment.

D. Glass units: Provided with a removable polished stainless steel trim for holding the glass. This trim and bracket shall be provided with a cushioning material so as to prevent glass from cracking when it is being fastened in place. All exposed edges of the protector glass shall be trimmed with stainless steel channel. The bracket shall slope approximately 15° from vertical. Front glass to be 1/4" thick polished plate glass. The end of the protector shelf shall be enclosed with 1/4" thick polished plate glass having all exposed edges trimmed with stainless steel channel where specified. This trim is to be completely welded, with no rough or unpolished edges or seams.

E. Lights: Where lights are specified under the item, a base mounted switch will be provided. This switch shall be mounted in a recessed stainless steel pan, located on or in counter as directed by The BAKER Group, Inc.. A ballast and ballast box shall be provided in the base of the counter as required.

F. Heat Lamps: Where heat lamps are specified under the item, remote infinite controls will be provided. These controls shall be mounted in a recessed stainless steel pan, located on or in counter as directed by The BAKER Group, Inc.. A ballast and ballast box shall be provided in the base of the counter as required.

2.19 DRAWERS

A. Construction: All drawers shall be 18 gauge stainless steel body measuring 20" x 20" x 5" deep, or of size called for in Item Specifications.

B. Insert: Drawer pan insert shall be constructed of stainless steel and die-stamped with bottom corners rolled on a 1" radius and vertical corners rounded on a 2" radius, removable with-out the use of tools, measuring 20" x 20" x 5" deep, or of size called for in Item Specifications.

C. Slides: #14 gauge stainless steel channel type slides formed with nylon tired ball bearing rollers. Slide shall be of telescoping channels with a minimum of four rollers per pair. Slide shall be welded to the drawer face and cross bracing forming a cradle to accept the removable drawer body. This slide shall be pitched to allow the drawer to close via gravity. Complete drawer frame and slide assembly will be removable for cleaning.

D. Fronts and pulls: Fronts or Face shall be double pan construction shaped of #16 gauge stainless steel having all sides turned back with the corners welded. . The face shall be supplied with a stainless

steel recessed grip with hand pull, chrome plated pull. Double panel faces will be sound deadened and insulated. Front shall be attached to drawer body with brackets.

E. Locks: Locks will be supplied as specified in item specifications. Locks shall be of sufficient strength to prevent unauthorized entry into the locked space. Locks shall be of the key and cylinder type with tamper-proof mechanisms. Furnish Owner with three (3) sets of keys to each lock at the conclusion of the project, accurately labeled and turned over to the Owner all at one point in time.

F. Bumpers and Stops: All drawers shall have rubber bumpers for quiet operation and shall have positive stops to prevent accidental withdrawal.

2.20 WORK TABLE TOPS - WOOD; CUTTING BOARDS

A. Wood Work Table Tops: Wood tops shall be of the highest quality northern grown hard rock maple. Thickness shall be as specified. Tops shall be constructed of selected strips of edge grain maple electronically bonded to exact dimension with one clear finely finished face. Hardwood curbs or riser to be supplied with 1" radius cove.

B. Cutting Boards, "Richlite": When "Richlite" cutting surfaces are specified, cutting boards will be N.S.F. approved phenolic fiber laminate tops under the trademark "Richlite." Coved risers are ½" thick with a ½" radius cove. Standard height of risers is 4".

C. Cutting Boards: N.S.F approved thermoplastic tops and cutting boards can be used in areas where cutting or carving surfaces are required. Material shall not warp, crack, bend, chip or peel. Material shall be high density polyethylene; pure natural polypropylene; copolymer natural polypropylene. Material shall be acceptable to N.S.F., U.S.D.A & F.D.A. specifications.

2.21 REFRIGERATED BASES

A. Controls: F.E.C. shall provide all switches, controls, valves, thermostats and all necessary hardware for a complete system.

2.22 FOOD WARMERS AND PLATE SHELF

A. Heating Wells: Electric food warmers consist of the number of wells as shown on plan. Heating wells shall be of one piece die-stamped heavy gauge type 302 stainless steel. Wells shall be heated with 1600 watt stainless steel heating element connected to a thermostat equipped with an off position. Each well shall have a pilot light indication when the well is on. Food warmers shall be installed the counter top having a die-formed headed edge which shall flange down into the food well and be attached with stainless steel flat head screws. The joint between the counter top and the food well shall be sealed with high temperature sealastic to prevent any escape of vapors.

B. Food Well Controls: Food well controls shall be mounted on the operator's side of the counter or shall be mounted in a stainless steel recessed panel below the plate shelf as required per item specifications. Food warmers are to be supplied in 115-208-230 volt electrical characteristics. Food wells are to be completely interwired terminating in two or three leads. Wire sizes shall be as specified and required under the National Electric Code.

C. Plate Shelf: Plate shelf: Each food warmer, where required, shall be stainless steel with a dish shelf mounted to the rear of the food wells and below counter top. This shelf shall be fabricated of #16 gauge stainless steel and shall be approximately 9-1/2" wide front to back. This dish shelf shall be so formed in contour as per detail drawing providing apron for mounting of food well controls and pilots. The plate shelf will also provide a necessary electrical chase for all wiring. Note: If counter

containing food wells is to be constructed so that dish carts will roll underneath, shelf is not to be constructed unless specified, and then constructed in such a manner so as not to interfere with the dish cart passage.

D. Drain Valve: All drain valves are to be mounted in a stainless steel recessed pan mounted in the apron of the counter.

2.23 COLD PANS

A. Non- Refrigerated Cold Pans: Shall be of the size shown on drawing. Cold pans shall have an interior liner of 20 gauge polished stainless steel having all interior corners coved on a minimum 1/4" radius. The exterior of the cold pan shall be constructed of 18 gauge stainless steel. The bottom of the interior pan shall be creased to 1" chrome plated drain. The bottom and sides of the cold pan shall be provided with a minimum of 2" foamed-in-place insulation. The foam insulation shall have a 1.9 pound density and shall have a "K" factor of .12. Where the counter top is turned down into the cold pan, the metal contact shall be broken with breaker strips. Provide cold pan with 1" condensate drain.

B. Refrigerated Cold Pan: Refrigerated cold pan shall be constructed as outlined above having stainless steel interior pan covered with 3/8" o.d. copper refrigeration coils in a serpentine pattern approximately 2" o.d. fastened to the underside of the inner liner for mechanical refrigeration. These coils shall be die-formed and shaped so as to provide good contact between the copper coil and the stainless steel liner. A conductive mastic will be applied between the coils and the liner so as to insure uniform transfer of heat from the pan to the coil. The exterior of the pan will be provided with a valve box for cold pan expansion valve. Extend coil leads to the refrigeration condensing unit. Cold pan controls are to be mounted in a recessed stainless steel pan mounted where shown on plans or stated in the item specifications. Provide cold pan with 1" condensate drain.

2.24 WALK-IN REFRIGERATORS AND FREEZERS

A. Condensation drains: Drain lines shall have a trap to prevent humidity from entering unit.

B. Freezer Compartments: Any drain lines located in freezer compartments shall be fully insulated and wrapped with heat tape to prevent condensation from freezing.

END OF GENERAL SECTION

2.25 ITEM SPECIFICATIONS

ITEM 1
Potsink

QUANTITY: One (1)

MANUFACTURER: Approved Fabricator

FEATURES:

1) Size and shape per plan.

2) Construct per details and General Standards. Construct entirely of stainless steel; top and sink bowls shall be 14 gauge. Rolled rim along all outside edges. 1-5/8" diameter legs. Stainless steel cross rails per General Standards.

3) Sink shall slope to drains with coved corners.

4) Sound deadening per General Standards.

5) Provide backsplash rising 8" and sloping back to wall 2" at a 45 degree angle and turned-down ½" toward floor, with enclosed ends. Fasten to wall with Z-clips, and seal with silicone caulk.

6) Stainless steel adjustable feet and leg gussets.

7) All welded drainboards. Drainboards and sink must slope to drain so that no water pools.

8) 2" air gap between sinks. Provide front apron in front of sink bowls.

9) Provide two (2) T&S swing spout backsplash mounted faucets, model B-291 or approved equal. Provide rotary wastes with connected chrome tailpiece and overflow. Provide stainless steel mounting clip for each rotary waste valve.

10) Provide removable undershelving.

11) F.E.C. is to coordinate location of Grease Trap with M.C. Grease trap is to be easily accessible for cleaning and maintenance.

12) Fabricate in disposer cone and disposer control panel mounting bracket. Relocate existing Disposer and controls to this table. Provide penetrations for vacuum breaker. With the exception of pipe, provide all necessary plumbing components for a complete installation of the disposer.

13) Provide 18 gauge stainless steel wall panel on wall the entire length of potsink, 24" above backsplash. Wall paneling shall be joined together with t-strips and sealed with silicon caulk.

14) As a part of this item, remove and relocate the existing wall-mounted "Pathways" water filtration system.

Mandatory Alternates: Advance Tabco
Eagle

ITEM 2
Convection Oven

QUANTITY: One (1)

MANUFACTURER: Blodgett (Burlington, VT)

MODEL: DFG-100XCEL Double Stack

FEATURES:

1) Stainless exterior, glass doors.

2) Standard painted black draft diverter.

3) Infinite solid state temperature controls.

4) Provide with two speed motor.

5) Provide with casters, two (2) locking.

6) Manifold ovens together to one rear gas connection. Provide gas shut off valve for each compartment.

7) As part of this item provide one (1) 48" Dormont gas hose with plastic cover and restraint cord. Provide each gas hose with two (2) brass super swivel ends and quick disconnect couplings with internal fusible links. Size to match equipment. Mount restraining cord to wall not floor. Provide pressure regulator if required.

MANDATORY ALTERNATE: Blodgett DFG-100
Vulcan
Southbend

ITEM 3
Griddle w/Burners & Stand

QUANTITY: One (1) each

MANUFACTURER: Vulcan (Louisville, KY)

MODEL: 936REgriddle
MG12 Range

FEATURES:

1) Stainless steel construction with front grease trough.

2) Thermostat controlled with electric ignition. Provide 6'-0" long cord and plug.

3) Stainless steel 4" legs.

4) Stainless steel stand for griddle and range with stainless steel undershelf and 5" diameter swivel casters with locking brakes.

5) As part of this item provide two (2) 48" Dormont gas hose with plastic cover and restraint cord. Provide each gas hose with two (2) brass super swivel ends and quick disconnect couplings with internal fusible links. Size to match equipment. Mount restraining cord to wall not floor. Provide pressure regulator if required.

MANDATORY ALTERNATE: Southbend, must meet all features as listed above.

ITEM 4
Fryers w/Filtration System

QUANTITY: One (1) 3-Fryer Banked

MANUFACTURER: Frymaster (Shreveport, LA)

MODEL: MJ-45E series

FEATURES:

1) Stainless steel front and door.

2) Stainless steel fry pot with cover.

3) Provide a total of six (6) twin (oblong) fry baskets.

4) 5" diameter swivel casters two (2) locking.

5) Provide gas pressure regulator if required.

6) As part of this item provide one (1) 48" Dormont gas hose with plastic cover and restraint cord. Provide each gas hose with two (2) brass super swivel ends and quick disconnect couplings with internal fusible links. Size to match equipment. Mount restraining cord to wall not floor. Provide pressure regulator if required.

7) Provide built-in filtration system

ALTERNATES: A) MANDATORY: Pitco, same features as listed above.

ITEM 5
Fryers w/Filtration System – included in Item 4

ITEM 6
Fryers w/Filtration System – included in Item 4

ITEM 7
Open Number

Fire Protection System

QUANTITY: One (1)

MANUFACTURER: Ansul Fire Protection or Range Guard or Fire Pro's

MODEL: R-102

FEATURES:

1) Provide a complete fire protection system, properly sized, consisting of releasing mechanism, wall mounting rack, agent tank, detectors, nozzles, remote pull stations, propellant, and all necessary components required for code approved installation. Note that this installation will require that the pull stations must be mechanically linked to system.

2) Furnish required mechanical fuel shut-off valve(s) that will automatically cut-off fuel to the equipment located beneath the hood in the event of fire; system interconnected to equipment. Provide with two (2) micro switches for each system.

3) Provide certificate of charge and test by a States authorized Ansul dealer 2 weeks prior to final foodservice inspection by BAKER.

4) Unit to be installed in conformance with NFPA-96, UL300 and all applicable codes.

5) System shall be capable of automatic and manual mechanical operation.

6) Systems designed to protect ventilation systems, including ductwork, and equipment under hood, unless otherwise specified.

7) E.C. is to wire micro switch to shut down hood make up air only, fan is to remain on to remove smoke.

8) Piping shall not be run horizontally with-in the exposed hood capture area.

9) Any and all plumbing exposed to view shall be stainless steel or chrome plated. This requirement includes all fixtures, elbows, et cetera.

10) Provide required UL-300 extinguishing nozzles for all grease producing equipment.

11) E.C. to provide and install shunt trip breakers to shut down every electrical outlet under hood.

MANDATORY ALTERNATE:

Cost to rework existing fire protection system to properly protect the under-hood equipment. This work includes the removal and relocation of the existing fire protection nozzles so that they are properly aimed. All plumbing for this system to be either stainless steel or chrome.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify Project Conditions: The Foodservice Equipment Contractor, before beginning his work, shall examine the space and existing conditions, and shall report to The BAKER Group, Inc. any conditions which prevents him from executing his work as required under the contract.

B. Take Field Dimensions: The F.E.C. shall take all field dimensions and shall be responsible thereafter.

C. Coordinate with Other Trades: The F.E.C. shall coordinate the locations of chases, grease traps, troughs, floor recesses, roll-up doors and passage ways to insure that the locations are correct and not conflicting with equipment, columns, footings, equipment bases, legs, et cetera.

D. Verify Installation: The F.E.C. shall verify that products furnished under this Section for installation and under another Specification section have been correctly installed.

1. F.E.C. is solely responsible for delivering the food service equipment. The F.E.C. shall visit the site to insure that large pieces of equipment will fit through doors, into elevators, down steps, et cetera.

2. F.E.C. shall make certain that all equipment is delivered to the site in time to fit through access passages to their final locations.

E. Coordinate Counter Detailing: In detailing fixtures, the F.E.C. shall consult with piping contractors to be certain that due space allowance is made for traps and other controls, particularly under lower shelves of cabinets and counters.

F. Walk-in Refrigeration: The F.E.C. shall verify the size of the space allocated for walk-in cooler and freezer units. If a recessed floor is being used, verify the size and slope of the recess. Floor is to be level. Do not proceed if conditions are unsatisfactory for a proper installation. Follow manufacturer's recommendations in determining relevant requirements. F.E.C. shall make certain that refrigeration systems supplied is of sufficient capacities to maintain proper temperatures.

G. Base and Curb Dimensions: F.E.C. shall measure to verify that curbs and bases are level, properly sized and correctly located. Do not proceed if conditions are unsatisfactory.

H. Utility Rough-In Points: F.E.C. shall measure to determine the precise location of utility rough-in points; verify against plans and drawings. Revise shop drawings to show actual locations of utility services.

I. Timing of Examinations: F.E.C. shall examine field conditions in a timely manner, so as not to impede the progress of the project. Perform on-site inspection of utilities as they are roughed-in to make certain that specified locations are appropriate and in keeping with the design. This inspection shall be made before floors are poured or walls covered. The F.E.C. shall be responsible thereafter.

J. Equipment Operations: F.E.C. will make certain that all equipment specified will operate in the correct direction. If any piece of equipment will not function correctly where drawn, the F.E.C. will be responsible for advising The BAKER Group, Inc. of the conflict. The F.E.C. has final responsibility for making certain that the equipment will function in the direction intended.

3.02 INSTALLATION

A. Notice to Proper Authorities: Foodservice Equipment Contractor, at such time so as not to impede the progress of the project, shall give to the proper authorities all notices as required by law relative to the work in his charge including the Public Health Department or State Regulatory Agencies, and State Fire Marshal; obtain all official permits, licenses, et cetera, and pay such proper and legal fees to public officers and others as may be necessary for the faithful performance of the work.

B. Sealing, Closed Bases: Certain fixtures and counters will have closed bases. The Foodservice Equipment Contractor shall erect these items, using approved mastic or silicone compound to effectively seal out all space for vermin and eliminate spaces for water to stand.

1. Openings for pipes in walls or bottom of food compartments shall be tightly sealed against the entry of vermin.

2. Reinforcing and framing members that are not totally enclosed or within walls are to be used in such a manner as to be easily cleanable.

3. All framing members shall be constructed and installed so as to eliminate raceways, for harboring of vermin.

4. The ends of all hollow sections shall be sealed.

5. Where fixed panels are applied to the outside or inside or set into an angle or other reinforced body or counter frame, the method of fastening shall be such as to minimize projections and openings.

C. Access Panels: Access panels are to be used for access to drains and junction boxes **ONLY**. They are used for cleaning drains and accessing the junction boxes. They are not to be used for any plumbing or electrical chases. The plumbing and electrical lines shall be drilled or punched through sides, tops, shelves and bottom of counters and cabinets. These holes will be the same diameter as the pipe or conduit and sealed with silicone. The penetrations shall be made as far back and off to the sides as possible. Piping shall not interfere with the operation of equipment or storage of product. All piping shall be secured in-place.

D. Set in Place: Set each item of non-mobile and non-portable equipment securely in place; level and adjust to correct height.

E. Support Equipment: Anchor equipment to supporting substrate where indicated or where needed for sustained operation and use without shifting or dislocation. Conceal anchorages where possible.

F. Anchors and Chair Carriers: Where indicated or needed for safety of equipment operator, anchor equipment to floor or wall with stainless steel screws or bolts.

G. Coordination with Other Trades: Deliver to other contractors all loose plumbing parts; floor troughs, steam fitting, ventilation and electrical parts that are a part of the equipment or the work under this contract, or required for their proper installation, and give instructions for their proper installation of each item.

H. Level Counters and Tables: Adjust counter tops and other work surfaces to level tolerance of 1/16 inch maximum offset, and maximum variation from level or indicated slope of 1/16 inch per four (4) foot.

I. Field Joints: Complete field-assembly joints in work (joints which cannot be completed in shop) by welding, bolting-and-gasketing, or similar methods as required. Set or trim gaskets flush, except for

"T" gaskets as indicated. Field joints in fabricated equipment shall be welded, and work surfaces ground and polished on premises, so that upon completion each item of equipment will have true, smooth and even surfaces. Filling with solder is not permitted.

J. **Connected Equipment:** As distinct from field joints, where a single item of equipment must be shipped and brought into the project site in two or more sections that are welded into one unit, there are instances when two separate pieces of equipment are to be connected. For example, a dishwashing machine and the clean dishtable need to be attached. The F.E.C. shall make these connections rigid and strong by bolting the units together and sealing the joint with minimal amounts silicone caulking. Under no circumstances shall caulking alone, or excessive caulking to fill voids, be acceptable. Joints are to be watertight.

K. **Enclosed Spaces:** Treat spaces that shall be inaccessible after equipment installation, by covering horizontal surfaces with powdered borax at rate of 4 ounces per square foot.

L. **Closure Plates and Strips:** Install where required, with joints coordinated with units of equipment.

M. **Cut-Outs:** The F.E.C. shall provide cut-outs in Foodservice equipment where needed to run soda, plumbing, electric, gas, or steam lines through equipment items for final connections. These cutouts are to be made at the factory when possible. If a field cut-out is required it will be made just large enough for the piping and in a concealed location. All cut-outs will be sealed and vermin proof. F.E.C. shall provide rubber grommets where electrical cords penetrate metal.

N. **Sealants and Gaskets:** Install all around each unit to make joints air-tight, watertight, vermin-proof, and sanitary for cleaning purposes. Where necessary, use backer rod to shape sealant bead properly, at 1/4 inch depth. Shape exposed surfaces of sealant slightly concave, with edges flush with faces of materials at joint. At internal-corner joints, apply sealant or gaskets to form a sanitary cove, of not less than 3/8 inch radius.

O. **Existing/Relocated Equipment:** F.E.C. shall remove existing/relocated equipment from storage and set in place. Final connections shall be by other trades. Test each existing item for proper operation, and deliver to Owner in proper working condition or in specified condition.

P. **Refrigeration Lines:** F.E.C. shall connect refrigeration lines from all evaporator coils to condensing units. F.E.C. is to locate; refrigerant lines, evaporator coils, condensing units and all necessary components. All penetrations shall be sealed.

Q. **Existing Refrigeration Removal:** Existing refrigeration equipment that is not scheduled to be reused shall be removed and disposed of properly by the F.E.C. The F.E.C. shall capture refrigerant and dispose of in a lawful manner.

3.03 FIELD QUALITY CONTROL

A. **Supervision:** Foodservice Equipment Contractor is to provide a competent field supervisor during the installation of this part of the Work.

1. The field supervisor shall attend scheduled progress meetings.

2. The field supervisor shall supervise the installation of the equipment and connections and will counsel with other contractors in regard to those connections and installation.

3. This representative will work closely with the site supervisor of the Owner; and will establish with the site supervisor of the Owner his schedule of Foodservice equipment installation that will be satisfactory to all contractors affected by his work; a copy of this schedule sent, within two (2) weeks of contract award, to The BAKER Group, Inc..

4. If the F.E.C. falls behind in the performance of his work, as determined by The BAKER Group, Inc., the F.E.C. supervisor will perform his work according to the priorities established by the Owner.

5. The F.E.C. supervisor shall instruct the operators of each piece of equipment in its proper use; training to the satisfaction of Owner; repeat visits to the site may be required and should be anticipated.

B. Weather, Labor Issues, etc.: Foodservice Equipment Contractor is cautioned to anticipate the required work required for this project. Consideration should be given to weather, labor issues, factory production schedules, and other issues relating to the performance of his work or work under the Foodservice Equipment contract. No additional monies will be paid for delayed work resulting from the Foodservice Equipment Contractor's failure to anticipate the scope of the work required for this project.

C. Equipment Fit: The Foodservice Equipment Contractor will make certain that all equipment specified will fit into the spaces provided. If any piece of equipment will not fit where drawn, the F.E.C. will be responsible for advising The BAKER Group, Inc. of the conflict. The Foodservice Equipment Contractor has final responsibility for making certain that equipment will fit as shown and specified.

1. Where racks or storage shelving are specified to be a certain length, height, and width, the Foodservice Equipment Contractor will verify that the specified racks will fit as shown and specified, and will not interfere with plumbing lines, evaporators, electric conduit or other obstructions to the placement of the rack as shown.

2. Should the F.E.C. find that any item may not fit as drawn, he must send a letter to The BAKER Group, Inc. describing the situation and the proposed solution. Verbal communication does not constitute adequate notification of said problem.

D. Installation: The Foodservice Equipment Contractor shall install the equipment at the site in full compliance with all applicable codes, rules and regulations of the Local, State, and Federal governing agencies. If, because of jurisdictional trade agreements or other conditions, any work specified to be performed under this contract must be done by others, the Foodservice Equipment Contractor shall sub-let such work to those who may be qualified to do such work or make other arrangements at his own expense as may be approved by The BAKER Group, Inc.

E. Delivery of Fabricated items: If it becomes necessary to schedule construction so that all partitions will be erected prior to the delivery of the Foodservice Equipment, bidders are cautioned that all equipment must be fabricated so that it can be handled through finished door openings.

It is recommended that the F.E.C. document the condition of the fabricated equipment upon installation at the site with detailed photographs. If photographs are to be used, they must be taken after installation with color film. One (1) set each of the photographs should be forwarded to BAKER and the Owner for record. The photographs will be accepted by BAKER as a record of the condition of the equipment at installation and may be used to assign responsibility when damages are noted in site inspections.

F. Inspections by Regulatory Authorities: The authorized representative of State and Local municipal inspectors and/or The BAKER Group, Inc. shall have access to the work at all times wherever it is in progress or preparation. The Foodservice Equipment Contractor shall arrange a convenient time and access for such inspection.

G. Inspection By The BAKER Group, Inc.: The BAKER Group, Inc. shall have free access to the Foodservice Equipment Contractor's shop or shops during the construction of this equipment for the

purpose of making inspections to see that plans, specifications and detail drawings are being adhered to carefully. The Foodservice Equipment Contractor shall correct any errors found during these inspections to the extent and within the scope of the plans, specifications, detail drawings, and within the conditions of this contract.

H. Condemnation Procedures: Material delivered to the site shall be carefully inspected by The BAKER Group, Inc. The Foodservice Equipment Contractor shall, within 24 hours after receiving written notice from The BAKER Group, Inc. to that effect, proceed to remove from the grounds or building all materials, fixtures, or apparatus condemned by The BAKER Group, Inc. whether the same shall be worked or unworked, or take down and remove all portions of the work which The BAKER Group, Inc. shall deem as failing to conform to the drawings and specifications and to the conditions of the contract.

3.04 TESTING

A. Testing: Delay start-up of food service equipment until service lines have been tested, balanced, and adjusted for pressure, voltage, and similar considerations; and until water and steam lines have been cleaned and treated for sanitation. Before testing, lubricate each equipment item in accordance with manufacturer's recommendations. Testing shall be performed by a certified service agency.

1. Test each item of operational equipment to establish that it is operating properly, and that controls and safety devices are functioning.

2. Replace equipment or components of equipment which are found to be defective in its operation, including units which are below capacity or operating with excessive noise or vibration.

3.05 CLEANING

A. Cleaning During Project Progress: Clean up all debris made by F.E.C. personnel as work progresses, leaving all work spaces as clear as reasonable. At the close of each work day, secure the work site so to prevent injury or accident to others. The Foodservice Equipment Contractor will be responsible for injuries resulting from failure to secure the work environment.

B. Remove Coverings and Clean: After completion of installation and completion of other major work in food service areas, remove protective coverings and clean food service equipment internally and externally.

C. Restore Damaged Finishes: Restore exposed and semi-exposed finishes to remove abrasions and other damages; polish exposed-metal surfaces and touch-up painted surfaces. Replace work which cannot be successfully restored.

D. Final Cleaning: After testing and start-up, and before the time of Substantial Completion, clean and sanitize Foodservice equipment, and leave in condition ready for use in Foodservice. The F.E.C. shall contact the Owner to visually inspect the cleaned Foodservice equipment, and shall have the Owner sign a statement prepared by the F.E.C. A copy of the signed statement will be sent to The BAKER Group, Inc.. If the F.E.C. fails to provide a copy with the Owners signature, the equipment will be cleaned again, until an Owners signed copy is received.

3.06 DEMONSTRATION AND TRAINING

A. Demonstration: In the presence of Owner, demonstrate that each item functions as specified.

B. Instruction: Provide comprehensive on-site instruction in the proper operation and typical use of each piece of equipment. Instruction shall be provided to the Owner or designated person(s) at or near a date set by owner at the completion of this project. Instruction shall be to the satisfaction of

the Owner. Repeat visits to the site may be required and should be anticipated.

3.07 WARRANTIES AND GUARANTEES

A. Period of Guarantee and Remedies: The Foodservice Equipment Contractor shall guarantee materials and workmanship for a period of 18 months from the date of acceptance by the Owner and shall leave the work in perfect order at completion. Should defects develop within the guarantee period, the Foodservice Equipment Contractor shall, upon written notice of same, remedy the defects and reimburse the Owner for all damage to the other work, whether caused by the defects or by the work of correcting the defects. Guarantee shall cover all labor, parts travel and incidental expense.

1. All equipment for a period of 18 months.

2. All refrigerator compressors shall be for 4 years.

B. Performance Bond and the Guarantee: Performance Bond will be furnished if required by the Owner and shall be a part of this contract shall remain in effect until the expiration of the guarantee period as assurance of the Foodservice Equipment Contractor's obligation to fulfill this stipulation.

C. Guarantees Extending Beyond Eighteen Months: Guarantees, if any, extending beyond said one year period shall be specifically indicated in the Specifications, and may be fulfilled by the assignment of the bond or written warranty of the manufacturer.

3.08 PUNCH LIST

A. Pre-Punch List: The Foodservice Equipment Contractor shall prepare an internal punch list and complete said list prior to completion of the project. This shall be done to minimize the final punch list and the time to complete the final punch list. Should defects arise F.E.C. shall repair, replace, or notify proper authorities. Under no circumstances shall the F.E.C. not inform or repair any defects found in there internal punch list.

B. Punch List: The BAKER Group, Inc. shall visit the project to prepare a punch list of the Foodservice Equipment Contractor's installation. The BAKER Group must prepare a punch list prior to the Health Department site inspection. The F.E.C. is responsible for notifying the BAKER Group.

C. Final Punch List: The Food service Equipment Contractor shall complete all punch lists in a timely manner acceptable to the Owner. When complete F.E.C. shall contact The BAKER Group, Inc. in writing, to inspect that all work is completed. If The BAKER Group, Inc. is required to make additional trips to the site after final inspection the F.E.C. will pay all costs incurred for each additional visit.

3.09 FINAL SUBMITTAL

A. Final Submittal: The Food Service Equipment Contractor shall submit to the Owner in a timely manner prior to opening the facility, all final submittal listed below. These shall be submitted in one (1) package at one time.

1. Three (3) operation and maintenance manuals, per section 1.07.

2. All keys, three (3) for each lock and each key labeled.

3. Three (3) copies of every drawing (as built), this includes all shop drawings, and rough-in drawings.

4. Three (3) additional copies of the buy-out brochure (as built).

3.10 CLARIFICATION

A. Questions: Questions concerning the Foodservice equipment and these specifications, either before bidding or after the award of the Foodservice equipment contract should be addressed to:

The BAKER Group, Inc.
2220 East Paris Ave SE
Grand Rapids, Michigan 49546
Telephone (616) 942-4011
Facsimile (616) 940-1415

B. Discrepancies: It is intended that the F.E.C. will provide the work described in the Foodservice documents for this project, and shown on Foodservice drawings. Where there is a discrepancy between the drawings and the written documents, the F.E.C. will provide, item for item, those items that are indicated on one, but not the other. For example, a table will be provided if shown on plan but not indicated in written specifications. The F.E.C. shall provide the greater of the two, unless noted on the bid form. No additional monies will be granted to the F.E.C. if they fail to note the discrepancies on the bid form.

C. Interpretations: Final binding interpretations regarding Foodservice work contained in the Foodservice bid documents and subsequent contract will be the responsibility of The BAKER Group, Inc.

END OF FOOD SERVICE SECTION

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 11610
LABORATORY FUME HOODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Bench-top laboratory fume hoods.
2. Fume hood base cabinets with countertops.
3. Laboratory sinks and cup sinks in fume hoods.
4. Water, laboratory gas, and electrical service fittings in fume hoods.
5. Piping and wiring within fume hoods for service fittings, light fixtures, blower switches, and other electrical devices.

B. Related Sections include the following:

1. Division 6 Section "Miscellaneous Carpentry" for wood blocking for anchoring fume hoods.
2. Division 9 Section "Gypsum Board Assemblies" for reinforcements in metal-framed gypsum board partitions for anchoring fume hoods.
3. Division 9 Section "Resilient Wall Base and Accessories" for resilient base applied to fume hood base cabinets.
4. Division 15 Section "Testing, Adjusting, and Balancing" for field quality-control testing of fume hoods.
5. Division 15 Sections for fume hood duct connections, including ducts.
6. Division 15 and 16 Sections for installing service fittings in fume hoods, including piping and wiring within fume hoods, and for other wiring in fume hoods, including connecting light fixtures, blower switches, and other electrical devices.
7. Division 15 and 16 Sections for connecting service utilities at back of fume hoods. Piping and wiring within fume hoods are specified in this Section.

1.3 PERFORMANCE REQUIREMENTS

A. Containment: Provide fume hoods that comply with the following when tested according to ASHRAE 110 at a release rate of 4.0 L/min.:

1. Average Face Velocity: 100 fpm plus or minus 10 percent with sashes fully open.
2. Face Velocity Variation: Not more than 10 percent of average face velocity.
3. Sash Position: Fully open.

    a. Test hoods with horizontal sashes with maximum opening on one side, with maximum opening in the center, and with one opening at each side equal to half of maximum opening.
    b. Test hoods with combination sashes fully raised, with maximum opening on one side, with maximum opening in the center, and with one opening at each side equal to half of maximum opening.

4. Test Setup Modifications: Conduct tests with a minimum of 3 and a maximum of 5 people in the test room and with two 1-gal. round paint cans, one 12-by-12-by-12-inch cardboard box, and three 6-by-6-by-12-inch cardboard boxes in the fume hood during the test. Position items from 6 to 10 inches behind the sash, randomly distributed, and supported off the work surface by 2-by-2-inch blocks.
5. Walk-by Test: At the conclusion of containment test, execute 3 rapid walk-bys at 30-second intervals, 12 inches behind the manikin. Test-gas concentration during each walk-by shall not exceed 0.1 ppm and shall return to specified containment value within 15 seconds.

B. Static-Pressure Loss: Not more than 1/4-inch wg at 100-fpm) face velocity when tested according to Paragraph 6.4.2.4 in SEFA 1.2, "Laboratory Fume Hoods--Recommended Practices."

C. Structural Performance: Provide fume hood components capable of withstanding the following loads without permanent deformation, excessive deflection, or binding of cabinet drawers and doors:

1. Fume Hood Base Stands: 50-lb/ft. countertop, 75 lb/ft. on countertop, plus weight of hood.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For laboratory fume hoods. Include plans, elevations, sections, details, and attachments to other work.

1. Indicate details for anchoring fume hoods to permanent building construction including locations of blocking and other supports.
2. Indicate locations and types of service fittings together with associated service supply connection required.
3. Indicate duct connections, electrical connections, and locations of access panels.
4. Include roughing-in information for mechanical, plumbing, and electrical connections.
5. Show adjacent walls, doors, windows, other building components, laboratory casework, and other laboratory equipment. Indicate clearances from above items.
6. Include layout of fume hoods in relation to lighting fixtures and air-conditioning registers and grilles.
7. Include coordinated dimensions for laboratory equipment specified in other Sections.

C. Samples for Initial Selection: For factory-applied finishes epoxy sinks and epoxy countertops.

D. Product Test Reports: Based on evaluation of comprehensive tests according to SEFA 1.2, "Laboratory Fume Hoods--Recommended Practices" and ASHRAE 110 performed by manufacturer and witnessed by a qualified independent testing agency, for fume hoods.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain laboratory fume hoods through one source from a single manufacturer.

B. Product Designations: Drawings indicate sizes, types, and configurations of fume hoods by referencing designated manufacturer's catalog numbers. Other manufacturers' hoods of similar sizes, types, and configurations, and complying with the Specifications may be considered. Refer to Division 1 Section "Product Requirements."

C. Product Standard: Comply with SEFA 1.2, "Laboratory Fume Hoods--Recommended Practices."

D. Safety Glass: Products complying with testing requirements in 16 CFR 1201 for Category II materials.

1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install fume hoods until building is enclosed, wet work and utility roughing-in are complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.8 COORDINATION

A. Coordinate installation of fume hoods with laboratory casework, fume hood exhaust ducts, and plumbing and electrical work.

1.9 EXTRA MATERIALS

A. Furnish complete touchup kit for each type and color of fume hood finish provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to damaged fume hood finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fisher Hamilton L.L.C.
2. Kewaunee Scientific Corporation; Laboratory Division.
3. Sheldon.

2.2 MATERIALS

A. Steel Sheet: Cold-rolled commercial steel sheet, complying with ASTM A 1008/A 1008M; matte finish; suitable for exposed applications.

B. Stainless-Steel Sheet: ASTM A 666, Type 304; stretcher-leveled standard of flatness.

C. Glass-Fiber-Reinforced Polyester: Polyester laminate complying with ASTM D 4357, with a chemical-resistant gel coat on the exposed face, and having a flame-spread index of 25 or less per ASTM E 84.

D. Epoxy: Factory molded of modified epoxy-resin formulation with smooth, nonspecular finish.

1. Physical Properties:

a. Flexural Strength: Not less than 10,000 psi.
b. Modulus of Elasticity: Not less than 2,000,000 psi.
c. Hardness (Rockwell M): Not less than 100.
d. Water Absorption (24 Hours): Not more than 0.02 percent.
e. Heat Distortion Point: Not less than 260 deg F.

2. Flame-Spread Index: 25 or less per ASTM E 84.
3. Chemical Resistance: Epoxy-resin material has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:

a. No Effect: Acetic acid (98 percent), acetone, ammonium hydroxide (28 percent), benzene, carbon tetrachloride, dimethyl formamide, ethyl acetate, ethyl alcohol, ethyl ether, methyl alcohol, nitric acid (70 percent), phenol, sulfuric acid (60 percent), and toluene.
b. Slight Effect: Chromic acid (60 percent) and sodium hydroxide (50 percent).

E. Ceiling Closure Panels: Minimum 18 gauge; finish to match hood exterior.

F. Glass-Fiber Cement Board: ASTM C 1186.

G. Laminated Safety Glass: ASTM C 1172, Kind LT, Condition A, Type I, Class I, Quality q3 with clear, polyvinyl butyral interlayer.

H. Downdraft Bypass: Low resistant type, 18 gauge steel chamber, directional louvers – not acceptable. All bypass air shall enter top of bypass chamber and enter hood in a downflow direction. Chamber shall protect user from expelled particulate in the event of an adverse internal reaction.

I. Fasteners: Provide stainless-steel fasteners where exposed to fumes.

1. Interior fasteners concealed.

J. Sash Chain: ANSI #35 steel, single strand. Average tensile strength of 2,400 pounds, maximum working load of 480 pounds.

K. Sash Guides: Extruded PVC.

L. Pulley assembly for sash chain: Finish bored steel drive sprocket stand keyed drive, ½" diameter, front connector shaft. Rear idler sprockets; double sealed ball bearing type lubricated. All sprockets steel with zine dichromate finish.

M. Sash Pull: Full width corrosion resistant steel with chemical resistant powder coating. Maximum 1.5" thick.

N. Gaskets: White 70 duormeter PVC for interior access panels. Gasket interior access panels to eliminate air leakage and to retain liquids inside hood.

O. Instruction Plate: Corrosion resistant plate attached to the fume hood exterior with condensed information covering recommended locations for apparatus and accessories, baffle settings and use of sash.

P. Sash cables (at pass-thru hood): Stainless steel, uncoated 1/8" diameter military spec. quality (MIL-W-834Z0b-3).

Q. Sash guides (at pass-thru hood): Corrosion resistant poly-vinyl chloride.

R. Bypass Grilles: Low resistant type, 18 gauge steel, upward directional louvers.

S. Sash counter balance system (at pass thru): single weight, pulley, cable, counterbalance system which prevents – sash tilting and permits one finger operation at any point along full width pull maximum 7 pounds pull required to raise or lower sash throughout its full length of travel.

Design system to hold sash at any position without creep and to prevent sash drop in the event of cable failure. Life cycle test 100 pound sash and weight to 100,000 cycles without sign of failure.

2.3 RESTRICTED BYPASS FUME HOODS

A. Provide fume hoods with partial compensating bypass above sash, which opens after sash is closed to less than 40 percent open. Design partial bypass to maintain sufficient exhaust air volume through hood to adequately dilute hazardous fumes regardless of sash position.

2.4 FABRICATION

A. General: Preassemble fume hoods in factory to greatest extent possible. Disassemble fume hoods only as necessary for shipping and handling limitations. Fume hoods shall be capable of being partly disassembled as necessary to permit movement through a 35-by-79-inch door opening.

B. Steel Exterior: Fabricate from steel sheet, not less than 0.0478 inch thick, with component parts screwed together to allow removal of end panels, front fascia, and airfoil and to allow access to plumbing lines and service fittings. Apply chemical-resistant finish to interior and exterior surfaces of component parts before assembly.

C. Ends: Fabricate with double-wall end panels without projecting corner posts or other obstructions to interfere with smooth, even airflow. Close area between double walls at front of fume hood and as needed to house sash counterbalance weights, utility lines, and remote-control valves.

D. Splay top and sides of face opening to provide an aerodynamic shape to ensure smooth, even flow of air into fume hood.

E. Interior Lining: Poly-resin

1. Reinforced polyester panel; smooth finish and white color in final appearance. Flexural strength: 14,000 psi.
2. Flamespread: 15 or less per U.L. 723 and ASTM E84-80.
3. Battle must be same material as liner.
4. Metallic baffles, brackets or supports on hood interior – not acceptable.
5. Liner and baffle material must meet 1.03 performance test.

F. Interior Lining (at pass-thru hood): Resistoroc with white enamel finish.

G. Baffles: Baffles providing controlled air vectors into and through the fume hood must be fabricated of the same material as the liner.

1. Provide minimal exhaust slots full height on vertical sides of the baffle.
2. High performance 2-piece baffle must be used.
3. Baffle shall incorporate exhaust slots located to purge the upper and lower area of the hood.
4. Baffle to be non-adjustable.

5. Minimum depth of 19" for interior work space is required at the extreme upper portion of the fume hood to provide maximum interior work area.
6. All baffle, supports, and brackets to be non-metallic.

H. Baffle (at pass-thru-hood): Resisto Roc with white enamel.

I. Lining Assembly: Unless otherwise indicated, assemble with stainless-steel fasteners or epoxy adhesive, concealed where possible. Seal joints by filling with chemical-resistant sealant during assembly.

J. Exhaust Plenum: Full width of fume hood and with adequate volume to provide uniform airflow from hood, of same material as hood lining, and with duct stub for exhaust connection.

K. Bypass Grilles: Provide grilles at bypass openings of bypass and restricted bypass fume hoods.

L. Auto Sash:

1. Sash shall be designed to promote usage as an upper body and face shield. Face velocities and volumes shall be based on an 18" operating opening.
2. Sash shall have the capability to be raised to full 28.5" vertical opening for loading or unloading of large apparatus.
3. A lock-open shall be provided.
4. Sash shall lower automatically to the operating position when released from any position above 18".
5. Auto-sash function shall be life cycle tested and not incorporate the need for motor drives.

M. Provide airfoil at bottom of sash opening to direct airflow across countertop from 1-inch space between airfoil and countertop.

1. Fabricate airfoil from stainless steel coated with PTFE or PVDF.
2. Spill-guard airfoil at ADA compliant fume hoods.

N. Light Fixtures: Provide vaporproof, two-tube, rapid-start, fluorescent light fixtures, of longest practicable length; complete with tubes at each fume hood. Shield tubes from hood interior with 1/4-inch- thick laminated glass or 3-mm-thick tempered glass, sealed into hood with chemical-resistant rubber gaskets. Provide units with fluorescent tubes easily replaceable from outside of fume hood.

1. Provide fluorescent tubes with color temperature of 3500 K and minimum color-rendering index of 85.
2. Access to light thru lintel panels, no tools required.
3. Light switch at pass-thru fume hood, located (1) at both sides.

O. Base Cabinets: Wood laboratory casework provided by fume hood manufacturer.

1. Where fumehood noted as ADA compliant, provide clear floor space not less than 36 inches wide by 25 inches deep by 27 inches high within fume hood base cabinets.

P. Countertops and Cup Sinks:

1. Resin Countertops 1-1/4" thick surface, dished a nominal 3/8" to contain spills.

    a. Molded resin work surfaces for hoods with poly resin liners.

2. Epoxy Sinks: Molded in 1 piece with smooth surfaces, coved corners, and bottom sloped to outlet; 1/2-inch minimum thickness.

    a. Provide with polypropylene strainers and tailpieces.
    b. Provide integral sinks in epoxy countertops, bonded to countertops with invisible joint line.
    c. Sink Size: 16" x 8" x 7" U.N.O.
    d. Sink Size: ADA depth where ADA Compliant fume hood is indicated.

Q. Filler Strips: Provide as needed to close spaces between fume hoods or fume hood base cabinets and adjacent building construction. Fabricate from same material and with same finish as fume hoods or fume hood base cabinets, as applicable.

1. Provide enclosure panel to match fume hood at pass-thru fume hood locations.

R. Comply with requirements in Divisions 15 and 16 Sections for installing water and laboratory gas service fittings, piping, electrical devices, and wiring. Install according to Shop Drawings. Securely anchor fittings, piping, and conduit to fume hoods, unless otherwise indicated.

2.5 CHEMICAL-RESISTANT FINISH

A. Preparation: Clean steel surfaces, other than stainless steel, of mill scale, rust, oil, and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.

B. Chemical-Resistant Finish: Immediately after cleaning and pretreating, apply fume hood manufacturer's standard two-coat, chemical-resistant, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8. Acceptance level for chemical spot test shall be no more than four Level 3 conditions.
2. Colors for Fume Hood Finish: As selected by Architect from manufacturer's full range.

2.6 ACCESSORIES

A. Service Fixtures and Fittings:

1. Service Treatment: Fittings are to be coated with a chemically resistant polyester power Lacquer electrostatically applied and baked on for a uniform finish.
2. Handle and outlet nozzle will be color coated to the media with the same polyester power lacquer finish. Outlet nozzles shall be made of the same high quality brass as the valve bodies.

3. Provide piping for all service fixtures from valve to outlet: Galvanized iron or copper for water, air and vacuum and black iron for gas services.
4. Fixture fittings shall be incorporate quick connect compression fittings on the valve body as well as the fume hood outlet nozzle. No soldering or brazing should be required.
5. Fixtures exposed to fume hood interior shall be brass with chemically resistant polyester power lacquer color coded to the media.
6. Fixtures are to be provided with easy to mount attachment device for secure mounting in deck or wall. System to be installed with simple hand tools.
7. Fittings are to be constructed to operate with the following maximum working pressure without leak or failure.
   a. Water Fittings: 145 psi.
   b. Non-burning gas: 145 psi.
   c. Burning gas: 100 psi.
   d. Special water fitting: 145 psi.
8. Outlets shall have detachable serrated nozzles.
9. All valves shall be front-loaded for ease of access and maintenance at point of use.

B. Airflow Indicator: Provide fume hoods with airflow indicator of the following type:

1. Thermally compensated glass-beaded thermistor, factory connected to a single wall port on the interior of the fume hood.

C. Airflow Alarm: Provide fume hoods with audible and visual alarm that activates when airflow sensor reading is outside of preset range.

1. Provide with either thermal-anemometer or aneroid (Magnehelic-type) gage airflow sensor.
2. Provide with reset and test switches.
3. Provide with switch that silences audible alarm and automatically resets when airflow returns to within preset range.
4. Silence push button, which disables the audible alarm shall be accessible on the front of the safety monitor.

D. Sash Alarm: Provide fume hoods with audible and visual alarm that activates when sash is opened beyond preset position.

1. Provide with silence and test switches.

E. Sash Stops: See auto sash in Part 2.7.

F. Electrical Rating: Maximum 12VDC, and maximum current rating of 200MA.

G. Bypass Grille Blank-off Panel: Provide fume hoods with blank-off panel on bypass grille designed for use with sash stops to reduce exhaust air volume and provide design face velocity with sash at 50 percent open position.

2.7 SOURCE QUALITY CONTROL

A. Demonstrate fume hood performance before shipment by testing one fume hood for each type required according to ASHRAE 110. Provide testing facility, instruments, equipment, and materials needed for tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fume hoods.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fume hoods according to Shop Drawings and manufacturer's written instructions. Install level, plumb, and true; shim as required, using concealed shims, and securely anchor to building and adjacent laboratory casework. Securely attach access panels, but provide for easy removal and secure reattachment. Where fume hoods abut other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

B. Comply with requirements in Divisions 15 and 16 Sections for installing water and laboratory gas service fittings, piping, electrical devices, and wiring. Install according to Shop Drawings and manufacturer's written instructions. Securely anchor fittings, piping, and conduit to fume hoods, unless otherwise indicated.

C. Secure work surfaces to casework and equipment components with material and procedures recommended by the manufacturers.

3.3 FIELD QUALITY CONTROL

A. Field test installed fume hoods according to SEFA 1.2, "Laboratory Fume Hoods--Recommended Practices" to demonstrate proper operation.

B. Field test installed fume hoods according to ASHRAE 110 as modified in Part 1 "Performance Requirements" Article to verify compliance with performance requirements.

1. Adjust fume hoods, hood exhaust fans, and building's HVAC system, or replace hoods and make other corrections until tested hoods perform as specified.
2. After making corrections, retest fume hoods that failed to perform as specified.

3.4 ADJUSTING AND CLEANING

A. Adjust moving parts for smooth, near silent, accurate sash operation with one hand. Adjust sashes for uniform contact of rubber bumpers. Verify that counterbalances operate without interference.

B. Clean finished surfaces, including both sides of glass; touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

3.5 FUME HOOD SCHEDULE

A. Fume Hood (**FH-1**): Where indicated provide equipment complying with the following:

1. Type: Restricted Bypass Fume Hood, Single Sided
    a. Bypass shall be sufficient in size to allow 25% flow with sash closed.
    b. Bypass must be achieved through low resistance opening at top of front lintel panel.
    c. Bypass shall be designed to provide a smooth down flow effect.
2. Sash: Standard Vertical Rising.
3. Size: 60"W x 31.5"D x 53"H
4. Work surface: Epoxy Resin
5. Cup Sink: Epoxy Resin 16" x 8" x 7"
6. Base: (2) Wood door base cabinets, 30"W x 31.5"D x 34"H (verify worksurface height with base & fume hood to be 36 inches high).
7. Exhaust Volume: 484
8. Fixtures:
    a. One Cold Goose neck faucet
    b. Two Single Gas fixtures
    c. Two AC outlets
9. Manufacturer: Equal To Fisher Hamilton
10. Product: Concept Fume Hood
11. Model: 54L751PO with base cabinets and enclosure to ceiling.

END OF SECTION 11610

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 12355
INSTITUTIONAL CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced wood cabinets of stock design.
2. Plastic-laminate countertops.

B. Related Sections:

1. Division 9 Section "Resilient Wall Base and Accessories" for resilient base applied to manufactured wood casework.

1.3 DEFINITIONS

A. MDF: Medium-density fiberboard.

B. Exposed Portions of Cabinets: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches above floor, and surfaces visible in open cabinets.

C. Semiexposed Portions of Cabinets: Surfaces behind opaque doors, such as interiors of cabinets, shelves, dividers, interiors and sides of drawers, and interior faces of doors. Tops of cases 78 inches or more above floor are defined as semiexposed.

D. Concealed Portions of Cabinets: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, and ends and backs that are placed directly against walls or other cabinets.

E. Hardwood Plywood: A panel product composed of layers or plies of veneer, or of veneers in combination with lumber core, hardboard core, MDF core, or particleboard core, joined with adhesive, and faced both front and back with hardwood veneers.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show fabrication details, including types and locations of hardware. Show installation details, including field joints and filler panels. Indicate manufacturer's catalog numbers for casework.

C. Qualification Data: For qualified Installer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

C. Source Limitations: Obtain manufactured wood casework from single source from single manufacturer.

D. Quality Standard: Unless otherwise indicated, comply with requirements for modular cabinets in AWI's "Architectural Woodwork Quality Standards."

E. Product Designations: Drawings indicate sizes, configurations, and finish material of manufactured wood casework by referencing designated manufacturer's catalog numbers. Other manufacturers' casework of similar sizes and door and drawer configurations, of same finish material, and complying with the Specifications may be considered. Refer to Division 1 Section "Product Requirements."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver manufactured wood casework only after painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas where environmental conditions meet requirements specified in "Project Conditions" Article.

B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install manufactured wood casework until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install manufactured wood casework until building is enclosed, wet work is complete, and HVAC system is operating and maintaining

temperature between 60 and 90 deg F and relative humidity at occupancy levels during the remainder of the construction period.

C. Field Measurements: Verify actual dimensions of construction contiguous with manufactured wood casework by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate layout and installation of framing and reinforcements in walls and partitions for support of manufactured wood casework.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of manufactured wood casework that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Delamination of components or other failures of glue bond.
b. Warping of components.
c. Failure of operating hardware.
d. Deterioration of finishes.

2. Warranty Period: Ten years from date of Substantial Completion.

1.10 EXTRA MATERIALS

A. Furnish complete touchup kit for each type and finish of manufactured wood casework provided. Include scratch fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged casework finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Plastic-Laminate-Faced Manufactured Casework:

a. Case Systems Inc.
b. Stevens Industries, Inc.
c. TMI Systems Design Corporation.
d. Strata.

2.2 MATERIALS, GENERAL

A. Low-Emitting Materials: Provide manufactured wood casework, including countertops, made with adhesives and composite wood products containing no urea formaldehyde.

B. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.

C. Hardwood Plywood: HPVA HP-1, either veneer core or particleboard core unless otherwise indicated.

D. Softwood Plywood: DOC PS 1.

E. Particleboard: ANSI A208.1, Grade M-2.

F. Hardboard: AHA A135.4, Class 1 Tempered.

G. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Formica Corporation.
    b. Nevamar Company, LLC; Decorative Products Div.
    c. Wilsonart International; Div. of Premark International, Inc.

H. Edgebanding for Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 3 mm thick at doors and drawer fronts, 1 mm thick elsewhere.

2.3 CABINET MATERIALS

A. Exposed Cabinet Materials:

1. Plastic Laminate: Grade VGS.
2. Unless otherwise indicated, provide specified edgebanding on all exposed edges.

B. Semiexposed Cabinet Materials:

1. Plastic Laminate: Grade VGS.

    a. Provide plastic laminate for semiexposed surfaces unless otherwise indicated.
    b. Provide plastic laminate for interior faces of doors and drawer fronts and where indicated.

C. Concealed Cabinet Materials:

1. Plastic Laminate: Grade BKL.

2.4 DESIGN, COLOR, AND FINISH

A. Design: Provide manufactured wood casework of the following design:

1. Flush overlay with wire pulls.
2. For wood casework, match existing style.

B. Plastic-Laminate Colors, Patterns, and Finishes: As indicated in Schedule.

C. PVC Edgebanding Color: As indicated in Schedule.

2.5 CABINET FABRICATION

A. Plastic-Laminate-Faced Cabinet Construction:

1. Bottoms and Ends of Cabinets, and Tops of Wall Cabinets and Tall Cabinets: 3/4-inch particleboard, plastic-laminate faced on exposed surfaces, melamine faced on semiexposed surfaces.
2. Shelves: 3/4-inch particleboard, plastic-laminate faced on exposed surfaces, melamine faced.
3. Backs of Cabinets: 1/2-inch particleboard, plastic-laminate faced on exposed surfaces, melamine faced on semiexposed surfaces.
4. Drawer Fronts: 3/4-inch particleboard, plastic-laminate faced.
5. Drawer Sides and Backs: 1/2-inch melamine faced particleboard, with glued dovetail or multiple-dowel joints.
6. Drawer Bottoms: 1/4-inch melamine faced particleboard glued and dadoed into front, back, and sides of drawers. Use 1/2-inch material for drawers more than 24 inches wide.
7. Doors: 3/4-inch particleboard or MDF, plastic-laminate faced.

B. Filler Strips: Provide as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets.

2.6 CASEWORK HARDWARE AND ACCESSORIES

A. Hardware, General: Unless otherwise indicated, provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware.

1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard except where hardware is through-bolted from back side.

B. Butt Hinges: Powder-coated, semiconcealed, 5-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide 2 hinges for doors less than 48 inches high and 3 hinges for doors more than 48 inches high.

C. Pulls: Solid aluminum wire pulls, fastened from back with two screws. Provide 2 pulls for drawers more than 24 inches wide. Provide satin finish.

D. Pulls: Semirecessed plastic pulls. For sliding doors, provide recessed plastic flush-pulls. Provide 2 pulls for drawers more than 24 inches wide.

E. Door Catches: Powder-coated, nylon-roller spring catch or dual, self-aligning, permanent magnet catch. Provide 2 catches on doors more than 48 inches high.

F. Drawer Slides: BHMA A156.9, Type B05091.

1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated, steel ball-bearing slides.
2. Box Drawer Slides: 150 lbf.
3. File Drawer Slides: 200 lbf.

G. Drawer and Hinged Door Locks: Cylindrical (cam) type, 5-pin tumbler, brass with chrome-plated finish, and complying with BHMA A156.11, Grade 1.

1. Provide a minimum of two keys per lock and six master keys.
2. Provide locks on all doors and drawers.

H. Adjustable Shelf Supports: 2-pin locking plastic shelf rests complying with BHMA A156.9, Type B04013.

I. Grommets for Cable Passage through Countertops: 1-1/2-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.

J. At Smith Middle School Home Skills Room all existing hardware and accessories are to be checked. Damaged or faulty hardware, including, but not limited to drawer slides, door hinges, and pulls are to be replaced. Verify in field.

2.7 COUNTERTOPS

A. Countertops, General: Provide smooth, clean exposed tops and edges in uniform plane free of defects. Provide front and end overhang of 1 inch over base cabinets.

B. Plastic-Laminate Tops: Plastic-laminate sheet, shop bonded to both sides of 1-1/8-inch plywood or particleboard. Sand surfaces to which plastic laminate is to be bonded.

1. Plastic Laminate for Flat Tops: Grade HGS.
2. Plastic Laminate for Backing: Grade BKL.
3. Provide 3-mm PVC edging on front edge of top, on top edges of backsplashes and end splashes, and on ends of tops and splashes.
4. Construct top and backsplash from one piece of plastic laminate with rolled edges and coved intersection. Where indicated, provide separate end splashes fitted to top.
5. Use exterior plywood or exterior glue particleboard for countertops containing sinks.

2.8 WALL SHELVING

A. Plastic-Laminate Shelving: Plastic-laminate sheet, Grade HGL or HGP, shop bonded to both sides of particleboard. Sand surfaces to which plastic laminate is to be bonded.

1. Shelf Thickness: 1 inch.
2. Edge Treatment: Finish both edges with rigid PVC extrusion, through color with satin finish, 3 mm thick.

B. Adjustable Shelf Supports: Zinc-plated steel standards and shelf brackets, complying with BHMA A156.9, Types B04102 and B04112, surface mounted.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of manufactured wood casework.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CASEWORK INSTALLATION

A. Install level, plumb, and true; shim as required, using concealed shims. Where manufactured wood casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

B. Base Cabinets: Set cabinets straight, level, and plumb. Adjust subtops within 1/16 inch of a single plane. Fasten cabinets to masonry or framing, wood blocking, or reinforcements in walls and partitions with fasteners spaced 24 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch.

1. Where base cabinets are not installed adjacent to walls, fasten to floor at toe space with fasteners spaced 16 inches o.c. Secure sides of cabinets to floor, where they do not adjoin other cabinets, with not less than two fasteners.

C. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten to hanging strips, masonry, or framing, blocking, or reinforcements in walls or partitions. Align similar adjoining doors to a tolerance of 1/16 inch.

1. Fasten through back, near top and bottom, at ends, and not more than 16 inches o.c.
2. Use expansion anchors at solid masonry.
3. Use No. 10 wafer-head screws sized for 1-inch penetration at wood hanging strips.
4. Use No. 10 wafer-head screws sized for 1-inch penetration into wood framing or blocking at wood-framed partitions.

D. Install hardware uniformly and precisely. Set hinges snug and flat in mortises unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.

E. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF TOPS

A. Field Jointing: Where possible make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

B. Secure tops to cabinets with Z- or L-type fasteners or equivalent, using two or more fasteners at each front, end, and back.

C. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.

D. Secure backsplashes and end splashes to tops with concealed metal brackets at 16 inches o.c. and walls with adhesive.

E. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.4 CLEANING AND PROTECTING

A. Repair or remove and replace defective work as directed on completion of installation.

B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

C. Protection: Provide 6-mil plastic or other suitable water-resistant covering over countertop surfaces. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

3.5 PLASTIC LAMINATE SCHEDULE

A. Vertical Surfaces: Pionite, Hardrock Maple WM791. Provide Woodtape 3mm edgebanding to match.

B. Horizontal Surfaces: Pionite, Thyme Fiber AV721. Provide Woodtape 3mm edgebanding to match.

TAG SCHEDULE FOLLOWS

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 12360
LABORATORY CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wood laboratory casework.
2. Filler and closure panels.
3. Laboratory countertops.
4. Shelves.
5. Laboratory sinks and troughs.

B. Related Sections:

1. Division 6 Section "Rough Carpentry and Miscellaneous Carpentry" for wood blocking for anchoring laboratory casework.
2. Division 9 Section "Non-Load-Bearing Steel Framing" for reinforcements in metal-framed partitions for anchoring laboratory casework.
3. Division 9 Section "Resilient Wall Base and Accessories" for resilient base applied to metal laboratory casework.
4. Divisions 15 and 16 Sections for installing service fittings specified in this Section, including connecting service utilities.

1.3 DEFINITIONS

A. MDF: Medium-density fiberboard.

B. Exposed Surfaces of Casework: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches above floor, and visible surfaces in open cabinets or behind glass doors.

1. Ends of cabinets, including those installed directly against walls or other cabinets, are defined as "exposed."

2. Ends of cabinets indicated to be installed directly against and completely concealed by walls or other cabinets are defined as "concealed."

C. Semiexposed Surfaces of Casework: Surfaces behind opaque doors, such as cabinet interiors, shelves, and dividers; interiors and sides of drawers; and interior faces of doors. Tops of cabinets 78 inches or more above floor are defined as "semiexposed."

D. Concealed Surfaces of Casework: Include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

E. Hardwood Plywood: A panel product composed of layers or plies of veneer, or of veneers in combination with lumber core, hardboard core, MDF core, or particleboard core, joined with adhesive and faced both front and back with hardwood veneers.

1.4 PERFORMANCE REQUIREMENTS

A. System Structural Performance: Laboratory casework and support framing system shall withstand the effects of the following gravity loads and stresses without permanent deformation, excessive deflection, or binding of drawers and doors:

1. Support Framing System: 600 lb/ft.
2. Suspended Base Cabinets (Internal Load): 160 lb/ft.
3. Work Surfaces (Including Tops of Suspended Base Cabinets): 160 lb/ft.
4. Wall Cabinets (Upper Cabinets): 160 lb/ft.
5. Shelves: 40 lb/sq. ft.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For laboratory casework. Include plans, elevations, sections, details, and attachments to other work.

1. Indicate locations of hardware and keying of locks.
2. Indicate locations and types of service fittings.
3. Indicate locations of blocking and reinforcements required for installing laboratory casework.
4. Include details of utility spaces showing supports for conduits and piping.
5. Include details of support framing system.
6. Include details of exposed conduits, if required, for service fittings.
7. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and other laboratory equipment.
8. Include coordinated dimensions for laboratory equipment specified in other Sections.

C. Samples for Initial Selection: For factory-applied finishes and other materials requiring color selection.

D. Samples for Verification: For each type of cabinet finish and each type of countertop material indicated, in manufacturer's standard sizes.

E. Qualification Data: For qualified manufacturer.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain laboratory casework from single source from single manufacturer unless otherwise indicated.

1. Obtain countertops, sinks and accessories from casework manufacturer.

B. Product Designations: Drawings indicate sizes and configurations of laboratory casework by referencing designated manufacturer's catalog numbers. Other manufacturers' laboratory casework of similar sizes and similar door and drawer configurations and complying with the Specifications may be considered. Refer to Division 1 Section "Product Requirements."

C. Casework Product Standard: Comply with SEFA 8, "Laboratory Furniture - Casework, Shelving and Tables - Recommended Practices."

D. Flammable Liquid Storage: Where cabinets are indicated for solvent or flammable liquid storage, provide units that are listed and labeled as complying with requirements in NFPA 30 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install laboratory casework until building is enclosed, utility roughing-in and wet work are complete and dry, and temporary HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.9 COORDINATION

A. Coordinate layout and installation of framing and reinforcements for support of laboratory casework.

B. Coordinate installation of laboratory casework with installation of fume hoods and other laboratory equipment.

1.10 EXTRA MATERIALS

A. Furnish complete touchup kit for each type and color of wood laboratory casework provided. Include scratch fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged laboratory casework finish.

B. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Cabinet Mounting Clips and Related Hardware: Quantity equal to 5 percent of amount installed, but no fewer than 20 of each type.
2. Modular Countertop Units: Two extra units of each length and material installed.

PART 2 - PRODUCTS

2.1 WOOD CABINET AND TABLE MATERIALS

A. General:

1. Certified Wood Materials: Provide cabinets with all wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
2. Adhesives: Do not use adhesives that contain urea formaldehyde.
3. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.
4. Hardwood Plywood: HPVA HP-1, either veneer core or particleboard core, unless otherwise indicated, made without urea formaldehyde.
5. MDF: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
6. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
7. Hardboard: AHA A135.4, Class 1 Tempered.
8. Edgebanding for Wood-Veneered Construction: Minimum 1/8-inch- thick, solid wood of same species as face veneer.

    a. Colors: As selected by Architect from manufacturer's full range.

B. Exposed Materials:

1. General: Provide materials that are selected and arranged for compatible grain and color. Do not use materials adjacent to one another that are noticeably dissimilar in color, grain, figure, or natural character markings.
2. Wood Species: Red oak.
3. Plywood: Hardwood plywood with face veneer of species indicated, selected for compatible color and grain. Grade A exposed faces at least 1/50 inch thick, and Grade J crossbands. Provide backs of same species as faces.

    a. Face Veneer Cut: Plain sliced.

4. Solid Wood: Clear hardwood lumber of species indicated.

C. Semiexposed Materials:

1. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects, of same species as exposed solid wood.

2. Plywood: Hardwood plywood of any species similar in color and grain to exposed plywood. Grade B faces and Grade J crossbands. Provide backs of same species as faces.
3. Provide solid wood or hardwood plywood for semiexposed surfaces unless otherwise indicated.
4. Metal for Steel Drawer Pans: Cold-rolled, carbon-steel sheet complying with ASTM A 1008/A 1008M; matte finish; suitable for exposed applications.

D. Concealed Materials:

1. Solid Wood: Any species, with no defects affecting strength or utility.
2. Plywood: Hardwood plywood. Provide backs of same species as faces.
3. Particleboard.
4. MDF.
5. Hardboard.

2.2 AUXILIARY CABINET MATERIALS

A. Acid Storage-Cabinet Lining: 1/4-inch- thick, glass-fiber cement board complying with ASTM C 1186 polyethylene, polypropylene, epoxy, or phenolic-composite lining material.

B. Glass for Glazed Doors: Clear laminated tempered glass complying with ASTM C 1172, Kind LT, Condition A, Type I, Class I, Quality-Q3; with 2 lites not less than 3.0 mm thick and with clear, polyvinyl butyral interlayer.

2.3 COUNTERTOP, TABLE TOP AND SINK MATERIALS

A. Epoxy: Factory-molded, modified epoxy-resin formulation with smooth, nonspecular finish.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Durcon Company (The).
b. Epoxyn Products.
c. Laboratory Tops, Inc.
d. Prime industries, Inc.

2. Physical Properties:

a. Flexural Strength: Not less than 10,000 psi.
b. Modulus of Elasticity: Not less than 2,000,000 psi.
c. Hardness (Rockwell M): Not less than 100.
d. Water Absorption (24 Hours): Not more than 0.02 percent.
e. Heat Distortion Point: Not less than 260 deg F.

3. Chemical Resistance: Epoxy-resin material has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:

a. No Effect: Acetic acid (98 percent), acetone, ammonium hydroxide (28 percent), benzene, carbon tetrachloride, dimethyl formamide, ethyl acetate, ethyl alcohol, ethyl ether, methyl alcohol, nitric acid (70 percent), phenol, sulfuric acid (60 percent), and toluene.
b. Slight Effect: Chromic acid (60 percent) and sodium hydroxide (50 percent).

4. Color: Black.

2.4 WOOD CABINETS AND TABLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Advanced Lab Concepts, Inc.
2. CampbellRhea.
3. Collegedale Casework, LLC.
4. Leonard Peterson & Company, Inc.
5. Sheldon Laboratory Systems.

B. Design: Full overlay with radiused edges.

C. Grain Direction:

1. Vertical on both doors and drawer fronts.

D. Construction: Provide wood-faced laboratory casework of the following minimum construction:

1. Bottoms of Base Cabinets and Tall Cabinets: 3/4-inch- thick hardwood plywood.
2. Tops and Bottoms of Wall Cabinets and Tops of Tall Cabinets: 1-inch- thick veneer-core hardwood plywood.
3. Ends of Cabinets: 3/4-inch- thick hardwood plywood.
4. Shelves: 1-inch- thick veneer-core hardwood plywood.
5. Base Cabinet Top Frames: 3/4-by-2-inch solid wood with mortise and tenon or doweled connections, glued and pinned or screwed.
6. Base Cabinet Stretchers: 3/4-by-4-1/2-inch panel product strips or solid wood boards at front and back of cabinet, glued and pinned or screwed.
7. Base Cabinet Subtops: 3/4-inch- thick panel product glued and pinned or screwed.
8. Backs of Cabinets: 3/4-inch- thick, hardwood plywood where exposed, 1/4-inch- thick, hardwood plywood dadoed into sides, bottoms, and tops where not exposed.
9. Drawer Fronts: 3/4-inch- thick, hardwood plywood or solid hardwood.
10. Drawer Sides and Backs: 1/2-inch- thick, solid hardwood or hardwood plywood, with glued dovetail or multiple-dowel joints.
11. Drawer Bottoms: 1/4-inch- thick, veneer-core hardwood plywood glued and dadoed into front, back, and sides of drawers. Use 1/2-inch- thick material for drawers more than 24 inches wide.
12. Drawer Bodies: Steel drawer pans formed from 0.036-inch- thick metal, metallic phosphate treated, and finished with manufacturer's standard 2-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat with a minimum dry film thickness of 1 mil for topcoat and 2 mils for system.

13. Doors 48 Inches High or Less: 3/4 inch thick, with particleboard or MDF cores, solid hardwood stiles and rails, and hardwood face veneers and crossbands.
14. Doors More Than 48 Inches High: 1-1/16 inches thick, with honeycomb cores, solid hardwood stiles and rails, and hardwood face veneers and crossbands.
15. Doors More Than 48 Inches High: 1-1/8 inches thick, with particleboard cores and hardwood face veneers and crossbands.
16. Stiles and Rails of Glazed Doors: 3/4-inch- thick, solid hardwood.

E. Tables: Solid hardwood legs, not less than 2 inches square with solid hardwood stretchers as needed to comply with product standard. Bolt stretchers to legs and cross-stretchers, and bolt legs to table aprons. Provide leveling device at bottom of each leg.

1. Leg Shoes: Black vinyl or rubber, open-bottom, slip-on type.

F. Filler and Closure Panels: Provide where indicated and as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as adjacent exposed cabinet surfaces unless otherwise indicated.

1. Provide utility-space closure panels at spaces between base cabinets where utility space would otherwise be exposed, including spaces below countertops.
2. Provide closure panels at ends of utility spaces where utility space would otherwise be exposed.

2.5 WOOD FINISH

A. Preparation: Sand lumber and plywood before assembling. Sand edges of doors, drawer fronts, and molded shapes with profile-edge sander. Sand after assembling for uniform smoothness at least equivalent to that produced by 220-grit sanding and without machine marks, cross sanding, or other surface blemishes.

B. Staining: Remove fibers and dust and apply stain to exposed and semiexposed surfaces as necessary to match approved Samples. Apply stain in a manner that will produce a consistent appearance. Apply wash-coat sealer before applying stain to closed-grain wood species.

1. Stain Color: As selected by Architect from manufacturer's full range.

C. Chemical-Resistant Finish: Apply laboratory casework manufacturer's standard three-coat, chemical-resistant, transparent finish. Sand and wipe clean between coats. Topcoat(s) may be omitted on concealed surfaces.

1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8. Acceptance level for chemical spot test shall be no more than four Level 3 conditions.

2.6 HARDWARE

A. General: Provide laboratory casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.

B. Hinges: Stainless-steel, 5-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide 2 for doors 48 inches high or less and 3 for doors more than 48 inches high.

C. Hinged Door and Drawer Pulls: Solid aluminum, stainless steel, or chrome-plated brass back-mounted pulls. Provide 2 pulls for drawers more than 24 inches wide. Chrome in finish.

1. Design: Wire pulls.

D. Pulls for Wood Cabinets: Full-width, recessed solid hardwood channels; matching exposed wood of cabinets.

E. Door Catches: Nylon-roller spring, Dual, self-aligning, permanent magnet catches. Provide 2 catches on doors more than 48 inches high.

F. Drawer Slides: Side mounted, epoxy-coated steel, self-closing; designed to prevent rebound when drawers are closed; complying with BHMA A156.9, Type B05091.

1. Provide Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.
2. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Full-extension, ball-bearing type.

G. Drawer Slides for Wood Cabinets: Hardwood runners under centers of drawers with polymer guides fastened to backs of drawers.

H. Locks for Wood Cabinets: Cam type with 5-pin tumbler, brass with chrome-plated finish; complying with BHMA A156.11, Type E07281.

1. Provide a minimum of two keys per lock and two master keys.
2. Provide on all drawers and doors.
3. Keying: Key locks within each room alike, key each room separately.
4. Master Key System: Key all locks to be operable by master key.

I. Adjustable Shelf Supports for Wood Cabinets: Powder-coated steel shelf rests complying with BHMA A156.9, Type B04013.

J. Adjustable Shelf Supports for Wood Cabinets: Mortise-type, powder-coated steel standards and shelf rests complying with BHMA A156.9, Types B04071 and B04091.

K. Adjustable Wall Shelf Supports: Surface-type steel standards and steel shelf brackets, with epoxy powder-coated finish, complying with BHMA A156.9, Types B04102 and B04112.

2.7 COUNTERTOPS, TABLE TOPS AND SINKS

A. Countertops, General: Provide units with smooth surfaces in uniform plane free of defects. Make exposed edges and corners straight and uniformly beveled. Provide front and end overhang of 1 inch, with continuous drip groove on underside 1/2 inch from edge.

B. Sinks, General: Provide sizes indicated or laboratory casework manufacturer's closest standard size of equal or greater volume, as approved by Architect.

1. Outlets: Provide with strainers and tailpieces, NPS 1-1/2, unless otherwise indicated.

2. Overflows: For each sink except cup sinks provide overflow of standard beehive or open-top design with separate strainer. Height 2 inches less than sink depth. Provide in same material as strainer.

C. Epoxy Countertops, Table Tops and Sinks:

1. Countertop Fabrication: Fabricate with factory cutouts for sinks, holes for service fittings and accessories, and with butt joints assembled with epoxy adhesive and concealed metal splines.

a. Countertop Configuration: Flat, 1 inch thick, with rounded edge and corners, and with drip groove and integral coved backsplash.
b. Countertop Construction: Uniform throughout full thickness.

2. Table-Top Fabrication:

a. Table-Top Configuration: Flat, 1 inch thick, with rounded edge and corners, and with drip groove at perimeter.

3. Sink Fabrication: Molded in 1 piece with smooth surfaces, coved corners, and bottom sloped to outlet; 1/2-inch minimum thickness.

a. Provide with polypropylene strainers and tailpieces.
b. Provide integral sinks in epoxy countertops, bonded to countertops with invisible joint line.
c. Provide manufacturer's recommended adjustable support system for table- and cabinet-type installations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of laboratory casework.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF CABINETS

A. Comply with installation requirements in SEFA 2.3. Install level, plumb, and true; shim as required, using concealed shims. Where laboratory casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:

1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet.
3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.

5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.

B. Utility-Space Framing: Secure to floor with two fasteners at each frame. Fasten to partition framing, wood blocking, or metal reinforcements in partitions and to base cabinets.

C. Base Cabinets: Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions with fasteners spaced not more than 24 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.

1. Where base cabinets are installed away from walls, fasten to floor at toe space at not more than 24 inches o.c. and at sides of cabinets with not less than 2 fasteners per side.

D. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 24 inches o.c.

E. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.

F. Adjust laboratory casework and hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF COUNTERTOPS

A. Comply with installation requirements in SEFA 2.3. Abut top and edge surfaces in one true plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints only where shown on Shop Drawings.

B. Field Jointing: Where possible, make in same manner as shop-made joints using dowels, splines, fasteners, adhesives, and sealants recommended by manufacturer. Prepare edges in shop for field-made joints.

1. Use concealed clamping devices for field-made joints in plastic-laminate countertops. Locate clamping devices within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a uniform heavy pressure at joints.

C. Fastening:

1. Secure countertops, except for epoxy countertops, to cabinets with Z-type fasteners or equivalent, using two or more fasteners at each cabinet front, end, and back.
2. Secure epoxy countertops to cabinets with epoxy cement, applied at each corner and along perimeter edges at not more than 48 inches o.c.
3. Where necessary to penetrate countertops with fasteners, countersink heads approximately 1/8 inch and plug hole flush with material equal to countertop in chemical resistance, hardness, and appearance.

D. Provide required holes and cutouts for service fittings.

E. Seal unfinished edges and cutouts in plastic-laminate countertops with heavy coat of polyurethane varnish.

F. Provide scribe moldings for closures at junctures of countertop, curb, and splash with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.

G. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

3.4 INSTALLATION OF SINKS

A. Comply with installation requirements in SEFA 2.3.

B. Underside Installation of Epoxy Sinks: Use laboratory casework manufacturer's recommended adjustable support system for table- and cabinet-type installations. Set top edge of sink unit in sink and countertop manufacturers' recommended chemical-resistant sealing compound or adhesive and firmly secure to produce a tight and fully leakproof joint. Adjust sink and securely support to prevent movement. Remove excess sealant or adhesive while still wet and finish joint for neat appearance.

3.5 CLEANING AND PROTECTING

A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

B. Protect countertop surfaces during construction with 6-mil plastic or other suitable water-resistant covering. Tape to underside of countertop at a minimum of 48 inches o.c.

SCHEDULE FOLLOWS

COLLEGEDALE ACTUAL DEPTHS: 16", 22 3/8" & 28 1/2"
FISHER HAMILTON ACTUAL DEPTHS: 21 1/2" & 31"
CAMPBELL RHEA ACTUAL DEPTHS: 22 1/2" (UNO)

***PROVIDE EPOXY TOPS ON ALL CASEWORK AND COUNTERTOPS, TYP., U.N.O.**

***NOTE: COLLEGEDALE, FISHER HAMILTON & CAMPBELL RHEA ARE LISTED HERE FOR REFERENCE ONLY AND ARE NOT NECESSARILY APPROVED BIDDERS. REFER TO SPECIFICATIONS FOR LIST OF APPROVED BIDDERS.**

	COL. DALE	CAMPBELL	FISHER H.		SIZE			
TAG #	**STYLE #**	**STYLE#**	**STYLE#**	**WIDTH**	**DEPTH**	**HEIGHT**	**DESCRIPTION**	**Notes**
							36" DRAWER - DOOR BASE CABINETS	Locking of cabinets is typical unless noted otherwise (UNO)
WB-1	BHBB-2F48	3687F	148C832	48"	24"	36"	Drawer, door base cabinet. 2 hinged doors, 2 drawers, fixed vertical divider, 1 adjustable shelf.	Locking
WB-3	BHBB-2F36	3687D	148C632	36"	24"	36"	Drawer, door base cabinet. 2 hinged doors, 2 drawers, fixed vertical divider, 1 adjustable shelf.	Locking
WB-5	BHBB-2C24 MOD	3685A	146C532 MOD	24"	24"	36"	Drawer, door base cabinet. 2 hinged doors, 2 drawers, fixed vertical divider, 1 adjustable shelf.	Locking
							36" DRAWER BASE CABINETS	

WB-63	BHBB-4A24	3723A	145C432	24"	24"	36"	Drawer base. 4 drawers equal size OR 4" top drawer , 3 bottom drawers equal.	Locking
							36" SINK BASE CABINETS	
WB-93	BHBB-1D36	3681D	115C632	36"	24"	36"	Sink base. 2 hinged doors	Locking
BF-23				36"	24"	34"	Barrier free Sink base, Wall hung with access panel and recessing doors. Provide Accuride Pro-Pocketing door hardware. Must meet ADA requirements.	
							24" DOOR WALL CABINETS	
WW-1	WMBB-1D48	4698 Mod	706C831 Mod	48"	14"	24"	Wall cabinet. 2 hinged doors, 2 adjustable shelves. Clear inside depth of 12", vertical divider.	Locking
WW-3	WMBB-1D36	4694	706C621 Mod	36"	14"	24"	Wall cabinet. 2 hinged doors, 1 adjustable shelf. Clear inside depth of 12".	Locking
WW-4	WMBB-1D30	4692	706C521 Mod	30"	14"	24"	Wall cabinet. 2 hinged doors, 1 adjustable shelf. Clear inside depth of 12".	Locking

WW-5	WMBB-1D24	4688	706C521 MOD	24"	14"	24"	Wall cabinet. 2 hinged doors, 1 adjustable shelf. Clear inside depth of 12".	Locking
							24" GLASS DOOR CABINETS	
WW-33	WMBB-2D36	4766 Mod	712C631 Mod	36"	14"	24"	Wall Cabinet, Glass Doors, 2 hinged doors, 2 adjustable shelves, clear inside depth of 12"	Locking
							84" TALL DOOR CABINETS	
WT-13	JTBB-1D36	5688	806C692	36"	24"	84"	Tall storage. 2 doors, 1 fixed shelf, 4 adjustable shelves.	Locking
							84" TOTE CABINET	
WT-73	JTBB-5E36	6358	N/A	36"	24"	84"	Tote cabinet. 2 doors, include 48 tote trays - 10"x 4"x 19"	Locking
							KNEE SPACES	
KS-1				24"	24"	36"	Knee space for under-counter dishwasher.	
							SCIENCE MISC.	

CSS-1			16'-0"	42"	36" and 42"; refer to drawings	Chemistry Student Stations. Each station to include: (2) sink bases on each end with epoxy sinks (S-2), (2) 24" drawer bases, (2) 24" drawer bases, (2) open spaces for CPU's, raised computer stations with (2) pull-out keyboard trays/shelves. Refer to equipment drawings for elevations and dimensions. See sheet A1.12.	Coordinate with electrical for computers. Provide grommets as necessary.
EWC-1	Match Fisher Hamilton #95OC1740		36"	31" overall	84"	ADA compliant safety shower/eyewash center. Stainless steel shroud/eyewash fountain with push handle, upper emergency shower with pull chain. Two fixed shelves.	
GC-3		Campbell Rhea #6782 (35) #6786	25"	10"	32"	Goggle Cabinet. Reinforced steel cabinet, Chem. Lab rack for 35 pairs of goggle, built in germicidal lamp, fully shielded, auto timer, 7ft elect cord. Provide 35 goggles for each cabinet.	

DEMONSTRATION UNITS

WDMO-2	108"	30"	36"	Demo unit. (Chemistry rooms) Wood unit with black epoxy tops. To include: 30" sink base with blank panel and epoxy sink. 48" drawer/door base, 30" drawer/door base. Provide (2) 1/2" grommets at back panel of unit. See sheet A1.12 for elevation and description.
				EPOXY SINKS See Mechanical specifications for fittings.
S-1	21"	18"	Must meet ADA requirements for depth.	Epoxy sink @ ADA sink bases. Meet ADA requirements.
S-2	13"	16"	10" D.	Epoxy sink @ student stations.
S-3	22"	22"	12" D.	Epoxy sink @ demo unit.

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 13845
LIGHTING CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes manually operated lighting controls with relays and control module.

B. Related Sections include the following:

1. Division 16 Section "Lighting Control Devices" for time switches, photoelectric switches, occupancy sensors, and multipole contactors.
2. Division 16 Section "Dimming Controls" for dimming control components.

1.3 DEFINITIONS

A. BACnet: A networking communication protocol that complies with ASHRAE 135.

B. BAS: Building automation system.

C. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling and power-limited circuits.

D. Monitoring: Acquisition, processing, communication, and display of equipment status data, metered electrical parameter values, power quality evaluation data, event and alarm signals, tabulated reports, and event logs.

E. PC: Personal computer; sometimes plural as "PCs."

F. RS-485: A serial network protocol, similar to RS-232, complying with TIA/EIA-485-A.

1.4 SUBMITTALS

A. Product Data: For control modules, power distribution components, manual switches and plates, and conductors and cables.

B. Shop Drawings: Detail assemblies of standard components, custom assembled for specific application on this Project.

1. Outline Drawings: Indicate dimensions, weights, arrangement of components, and clearance and access requirements.
2. Block Diagram: Show interconnections between components specified in this Section and devices furnished with power distribution system components. Indicate data communication paths and identify networks, data buses, data gateways, concentrators, and other devices to be used. Describe characteristics of network and other data communication lines.
3. Wiring Diagrams: Power, signal, and control wiring. Coordinate nomenclature and presentation with a block diagram.

C. Coordination Drawings: Submit evidence that lighting controls are compatible with connected monitoring and control devices and systems specified in other Sections.

1. Show interconnecting signal and control wiring and interfacing devices that prove compatibility of inputs and outputs.

D. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
3. Device address list.

E. Field quality-control test reports.

F. Software licenses and upgrades required by and installed for operation and programming of digital and analog devices.

G. Operation and Maintenance Data: For lighting controls to include in emergency, operation, and maintenance manuals.

H. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain lighting control module and power distribution components through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with 47 CFR, Subparts A and B, for Class A digital devices.

D. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate lighting control components to form an integrated interconnection of compatible components.

1. Match components and interconnections for optimum performance of lighting control functions.
2. Coordinate lighting controls with Building Automation System (BAS). Design display graphics showing building areas controlled; include the status of lighting controls in each area.
3. Coordinate lighting controls with that in Sections specifying distribution components that are monitored or controlled by power monitoring and control equipment.

B. Coordinate lighting control components specified in this Section with components specified in Division 16 Section "Panelboards."

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of lighting controls that fail within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of software input/output to execute switching or dimming commands.
b. Failure of modular relays to operate under manual or software commands.
c. Damage of electronic components due to transient voltage surges.

2. Warranty Period: Two years from date of Substantial Completion.
3. Extended Warranty Period Failure Due to Transient Voltage Surges: Eight years.

a. Extended Warranty Period for Relays: 10 years from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Mechanically Held Electrical Relays: Equal to the amount indicated on the lighting control schedules.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Andover Controls (MCMI) – Area Lighting Control Panels, LCX890 Series

2.2 SYSTEM REQUIREMENTS

A. Expandability: System shall be capable of increasing the number of control functions in the future by 25 percent of current capacity; to include equipment ratings, housing capacities, spare relays, terminals, number of conductors in control cables, and control software.

B. Performance Requirements: Manual switches, an internal timing and control unit, and external sensors or other control signal sources send a signal to a PC-based programmable-system control module that processes the signal according to its programming and routes an open or close command to one or more lighting control relays in the power-supply circuits, or routes variable commands to one or more dimmers, for groups of lighting fixtures or other loads.

2.3 AREA LIGHTING CONTROL PANEL

A. Control Module Description: Comply with UL 916 (LCX890 Series: 8, 16 and 24 channel models only); microprocessor-based, solid-state, 365-day timing and control unit. Output circuits shall be switched on or off by internally programmed time signals or by program-controlled analog or digital signals from external sources. Output circuits shall be pilot-duty relays compatible with power switching devices.Sixteen digital inputs for occupancy sensors or manual signaling that can be programmed to control multi-channel outputs.

2. Eight universal inputs, daylight sensors, and dimming systems with associated daylight sensors.
3. Software: Lighting control software shall be capable of linking switch inputs to relay outputs, retrieving links, viewing relay output status, controlling relay outputs, simulating switch inputs, setting device addresses, and assigning switch input and relay output modes.
4. Automatic Time Adjustment: System shall automatically adjust for leap year and daylight saving time and shall provide weekly routine and annual holiday scheduling.
5. Astronomic Control: Automatic adjustment of dawn and dusk switching.
6. Demand Control: Demand shall be monitored through pulses from a remote meter and shall be controlled by programmed switching of loads. System capability shall include sliding window averaging and programming of load priorities and characteristics. Minimum of two different time-of-day demand schedules shall execute load-management control actions by switching output circuits or by transmitting other types of load-control signals.
7. Confirmation: Each relay or contactor device operated by system shall have auxiliary contacts that provide a confirmation signal to the system of on or off status of device. Retain one of first two subparagraphs below.

    a. Software shall interpret status signals, provide for their display, and initiate failure signals.
    b. Lamp or LED at control module or display panel shall identify status of each controlled circuit.

8. Remote Communication Capability: Allow programming, data-gathering interrogation, status display, and controlled command override from a PC at a remote location over the TSD Wide Area Network.

9. Local Override Capability: Manual, low-voltage control devices shall override programmed shutdown of lighting and shall override other programmed control for intervals that may be duration programmed.
10. Automatic Control of Local Override: Automatic control shall switch lighting off if lighting has been switched on by local override.
11. Automatic battery backup shall provide power to maintain program and system clock operation for 24 hour minimum duration when power is off.
12. Daylight Compensating Switch Control: Control module shall interpret a preset threshold illumination-level signal from a photoelectric relay and shall activate relays controlling power to selected groups of lighting fixtures to turn them on and off to maintain adjustable minimum illumination level as daylight contribution varies.
13. Energy Conservation: Bilevel control of special ballasts to comply with local energy codes.
14. Flick Warning: Programmable momentary turnoff of lights shall warn that programmed shutoff will occur after a preset interval. Warning shall be repeated after a second preset interval before end of programmed override period.
15. Additional Programming: In addition to system programming by the PC, individual control modules shall be programmable using data-entry and -retrieval (such as PCs, or personal digital assistants (PDAs).

B. Modular Relay Panel: Comply with UL 916 (CSA C22.2, No. 205); factory assembled with modular single-pole relays, power supplies, and accessory components required for specified performance.

1. Cabinet: Steel with hinged, locking door.

    a. Barriers separate low-voltage and line-voltage components.
    b. Directory: Mounted on back of door. Identifies each relay as to load groups controlled and each programmed pilot device if any.
    c. Control Power Supply: Transformer and full-wave rectifier with filtered dc output.

2. Single or double-Pole Relays: Mechanically held unless otherwise indicated; split-coil, momentary-pulsed type.

    a. Low-Voltage Leads: Plug connector to the connector strip in cabinet and pilot light power where indicated.
    b. Rated Capacity (Mounted in Relay Panel): 20 A, 125-V ac for tungsten filaments; 20 A, 277-V ac for ballasts.
    c. Endurance: 50,000 cycles at rated capacity.
    d. Mounting: Provision for easy removal and installation in relay cabinet.

C. Line-Voltage Surge Suppression: Field-mounting surge suppressors that comply with Division 16 Section "Transient Voltage Suppression" for Category A locations.

2.4 MANUAL SWITCHES AND PLATES

A. Push-Button Switches: Modular, momentary-contact, low-voltage type.

1. Match color specified in Division 16 Section "Wiring Devices."

B. Manual, Maintained Contact, Full- or Low-Voltage Switch: Comply with Division 16 Section "Wiring Devices."

C. Wall-Box Dimmers: Comply with Division 16 Section "Wiring Devices."

D. Wall Plates: Single and multigang plates as specified in Division 16 Section "Wiring Devices."

E. Legend: Engraved or permanently silk-screened on wall plate where indicated. Use designations indicated on Drawings.

2.5 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Class 2 Power Source: Not smaller than No. 12 AWG, complying with Division 16 Section "Conductors and Cables."

B. Classes 2 and 3 Control Cables: Multiconductor cable with copper conductors not smaller than No. 18 AWG, complying with Division 16 Section "Conductors and Cables."

C. Class 1 Control Cables: Multiconductor cable with copper conductors not smaller than No. 14 AWG, complying with Division 16 Section "Conductors and Cables."

D. Digital and Multiplexed Signal Cables: Unshielded, twisted-pair cable with copper conductors, complying with TIA/EIA-568-B.2, Category 6 for horizontal copper cable and with Division 16 Section "Voice and Data Communication Cabling."

PART 3 - EXECUTION

3.1 WIRING INSTALLATION

A. Comply with NECA 1.

B. Wiring Method: Install wiring in raceways except in accessible ceiling areas and gypsum board partitions. Comply with Division 16 Section "Conductors and Cables." Minimum conduit size shall be 1/2 inch.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and non-power-limited conductors according to conductor manufacturer's written instructions.

D. Install field-mounting transient voltage suppressors for lighting control devices in Category A locations that do not have integral line-voltage surge protection.

E. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

F. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in terminal cabinets, equipment enclosures, and in junction, pull, and outlet boxes.

G. Identify components and power and control wiring according to Division 16 Section "Electrical Identification."

3.2 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test and program and adjust field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Test for circuit continuity.
2. Verify that the control module features are operational.
3. Check operation of local override controls.
4. Test system diagnostics by simulating improper operation of several components selected by Architect.

3.3 SOFTWARE INSTALLATION

A. Install and program software with initial settings of adjustable values. Make backup copies of software and user-supplied values. Provide current licenses for software.

3.4 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors and to assist Owner's personnel in making program changes to suit actual occupied conditions. Provide up to four visits to Project during other than normal occupancy hours for this purpose.

3.5 TRAINING

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting controls. Provide one (4) hour on-site training session and one (4) hour operator workstation training session.

END OF SECTION 13845

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 13851
FIRE ALARM
(Performance Specifications)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes fire alarm systems. Drawings indicate location of devices for reference purposes. Provide complete functional system as required to meet applicable codes and ADA requirements. Additional required devices not indicated on drawings shall be provided at no additional cost. Provide 120V power circuits as required.

B. Related Sections include the following:

1. Division 8 Section "Door Hardware" for door closers and holders with associated smoke detectors, electric door locks, and release devices that interface with the fire alarm system.

1.3 DEFINITIONS

A. FACP: Fire alarm control panel.

B. LED: Light-emitting diode.

C. NICET: National Institute for Certification in Engineering Technologies.

D. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

1.4 SYSTEM DESCRIPTION

A. Noncoded, didital-addressable system; automatic sensitivity control of certain smoke detectors; and multiplexed signal transmission dedicated to fire alarm service only.

1. Interface with existing fire alarm system.

1.5 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 72.

B. Premises protection includes school.

C. Fire alarm signal initiation shall be by one or more of the following devices:

1. Manual stations.
2. Smoke detectors.
3. Automatic sprinkler system water flow.
4. Fire extinguishing system operation.
5. Fire standpipe system.

D. Fire alarm signal shall initiate the following actions:

1. Alarm notification appliances shall operate continuously.
2. Identify alarm at the FACP and remote annunciators.
3. De-energize electromagnetic door holders.
4. Transmit an alarm signal to the remote alarm receiving station.
5. Unlock electric door locks in designated egress paths.
6. Release fire and smoke doors held open by magnetic door holders.
7. Activate voice/alarm communication system.
8. Switch heating, ventilating, and air-conditioning equipment controls to fire alarm mode.
9. Close smoke dampers in air ducts of system serving zone where alarm was initiated.
10. Record events in the system memory.

E. Supervisory signal initiation shall be by one or more of the following devices or actions:
1. Operation of a fire-protection system valve tamper.

F. System trouble signal initiation shall be by one or more of the following devices or actions:

1. Open circuits, shorts and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.
2. Opening, tampering, or removal of alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at the FACP.
4. Ground or a single break in FACP internal circuits.
5. Abnormal ac voltage at the FACP.
6. A break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at the FACP or annunciator.
9. Fire-pump power failure, including a dead-phase or phase-reversal condition.
10. Low-air-pressure switch operation on a dry-pipe or preaction sprinkler system.

G. System Trouble and Supervisory Signal Actions: Ring trouble bell and annunciate at the FACP and remote annunciators. Record the event on system printer.

1.6 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Shop Drawings shall be prepared by persons with the following qualifications:
   a. Trained and certified by manufacturer in fire alarm system design.

2. System layout: Provide floor plan with layout of devices and system components.
3. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
4. Device Address List: Coordinate with final system programming.
5. System riser diagram with device addresses, conduit sizes, and cable and wire types and sizes.
6. Wiring Diagrams: Power, signal, and control wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Show wiring color code.
7. Batteries: Size calculations.
8. Duct Smoke Detectors: Performance parameters and installation details for each detector, verifying that each detector is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
9. Ductwork Coordination Drawings: Plans, sections, and elevations of ducts, drawn to scale and coordinating the installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, the detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
10. Voice/Alarm Signaling Service: Equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.

C. Qualification Data: For Installer.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For fire alarm system to include in emergency, operation, and maintenance manuals. Comply with NFPA 72, Appendix A, recommendations for Owner's manual. Include abbreviated operating instructions for mounting at the FACP.

F. Submittals to Authorities Having Jurisdiction: In addition to distribution requirements for submittals specified in Division 1 Section "Submittals," make an identical submittal to authorities having jurisdiction. To facilitate review, include copies of annotated Contract Drawings as needed to depict component locations. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Architect for review.

G. Documentation:

1. Approval and Acceptance: Provide the "Record of Completion" form according to NFPA 72 to Owner, Architect, and authorities having jurisdiction.
2. Record of Completion Documents: Provide the "Permanent Records" according to NFPA 72 to Owner, Architect, and authorities having jurisdiction. Format of the written sequence of operation shall be the optional input/output matrix.
   a. Hard copies on paper to Owner, Architect, and authorities having jurisdiction.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Fire Alarm Service: Do not interrupt fire alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:

1. Notify Architect, Construction Manager and Owner no fewer than seven days in advance of proposed interruption of fire alarm service.
2. Do not proceed with interruption of fire alarm service without Construction Manager's and Owner's written permission.

1.9 SEQUENCING AND SCHEDULING

A. Existing Fire Alarm Equipment: Maintain fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service and label existing fire alarm equipment "NOT IN SERVICE" until removed from the building.

1. Equipment Removal: After acceptance of the new fire alarm system, remove existing disconnected fire alarm equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. FACP and Equipment:

a. National Time and Signal.

2. Wire and Cable:

a. Comtran Corporation.
b. Helix/HiTemp Cables, Inc.; a Draka USA Company.
c. Rockbestos-Suprenant Cable Corporation; a Marmon Group Company.
d. West Penn Wire/CDT; a division of Cable Design Technologies.

3. Audible and Visual Signals shall be system manufacturer or by one of the following:

a. Gentex Corporation.
b. System Sensor; a GE-Honeywell Company

2.2 EXISTING FIRE ALARM SYSTEM

A. Compatibility with Existing Equipment: Fire alarm system and components shall operate as an extension of existing system.

2.3 FACP

A. General Description:

1. Modular, power-limited design with electronic modules, UL 864 listed.
2. Addressable initiation devices that communicate device identity and status.

a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at the FACP.

3. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at the FACP and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, three line(s) of 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands; and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Circuits:

1. Signaling Line Circuits: NFPA 72, Class A, Style 6.

a. System Layout: Install no more than 30 addressable devices on each signaling line circuit.

2. Notification-Appliance Circuits: NFPA 72, Class A, Style Z.

3. Actuation of alarm notification appliances, emergency voice communications, annunciation, smoke control, elevator recall, and actuation of suppression systems shall occur within 10 seconds after the activation of an initiating device.
4. Electrical monitoring for the integrity of wiring external to the FACP for mechanical equipment shutdown and magnetic door-holding circuits is not required, provided a break in the circuit will cause doors to close and mechanical equipment to shut down.

D. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm verification" signal at the FACP.
2. Activate a listed and approved "alarm verification" sequence at the FACP and the detector.
3. Record events by the system printer.
4. Sound general alarm if the alarm is verified.
5. Cancel FACP indication and system reset if the alarm is not verified.

E. Notification-Appliance Circuit: Operation shall sound in a temporal pattern, complying with ANSI S3.41.

F. Power Supply for Supervision Equipment: Supply for audible and visual equipment for supervision of the ac power shall be from a dedicated dc power supply, and power for the dc component shall be from the ac supply.

G. Alarm Silencing, Trouble, and Supervisory Alarm Reset: Manual reset at the FACP and remote annunciators, after initiating devices are restored to normal.

1. Silencing-switch operation halts alarm operation of notification appliances and activates an "alarm silence" light. Display of identity of the alarm zone or device is retained.
2. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
3. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.

H. Walk Test: A test mode to allow one person to test alarm and supervisory features of initiating devices. Enabling of this mode shall require the entry of a password. The FACP and annunciators shall display a test indication while the test is underway. If testing ceases while in walk-test mode, after a preset delay, the system shall automatically return to normal.

I. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and control of changes in those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory.

1. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, trouble, and supervisory signals to a remote alarm station through a digital alarm communicator transmitter and telephone lines.
2. Notification-Appliance Circuits: NFPA 72, Class [A] [B].

J. Service Modem: Ports shall be RS-232 for system printer and for connection to a dial-in terminal unit.

1. The dial-in port shall allow remote access to the FACP for programming changes and system diagnostic routines. Access by a remote terminal shall be by encrypted password algorithm.

K. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signal, supervisory signal, supervisory and digital alarm communicator transmitter shall be powered by the 24-V dc source.

1. The alarm current draw of the entire fire alarm system shall not exceed 80 percent of the power-supply module rating.
2. Power supply shall have a dedicated fused safety switch for this connection at the service entrance equipment. Paint the switch box red and identify it with "FIRE ALARM SYSTEM POWER."

L. Secondary Power: 24-V dc supply system with batteries and automatic battery charger and an automatic transfer switch.

1. Batteries: Vented, wet-cell pocket, plate nickel cadmium.
2. Battery and Charger Capacity: Comply with NFPA 72.

M. Surge Protection:

1. Install surge protection on normal ac power for the FACP and its accessories. Comply with Division 16 Section "Transient Voltage Suppression" for auxiliary panel suppressors.
2. Install surge protectors recommended by FACP manufacturer. Install on all system wiring external to the building housing the FACP.

2.4 MANUAL FIRE ALARM BOXES

A. Description: UL 38 listed; finished in red with molded, raised-letter operating instructions in contrasting color. Station shall show visible indication of operation. Mounted on recessed outlet box; if indicated as surface mounted, provide manufacturer's surface back box.

1. Double-action mechanism requiring two actions to initiate an alarm, breaking-glass or plastic-rod type. With integral addressable module, arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.
2. Station Reset: Key- or wrench-operated switch.

2.5 SYSTEM SMOKE DETECTORS

A. General Description:

1. UL 268 listed, operating at 24-V dc, nominal.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

3. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection of building wiring.
4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
5. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status.
6. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
    a. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at the FACP to operate at 135 or 155 deg F.
    b. Provide multiple levels of detection sensitivity for each sensor.

B. Photoelectric Smoke Detectors:

1. Sensor: LED or infrared light source with matching silicon-cell receiver.
2. Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.

C. Ionization Smoke Detector:

1. Sensor: Responsive to both visible and invisible products of combustion. Self-compensating for changes in environmental conditions.
2. Detector Sensitivity: Between 0.5 and 1.7 percent/foot smoke obscuration when tested according to UL 268A.

D. Remote Air-Sampling Detector System: Includes air-sampling pipe network, a laser-based photoelectric detector, a sample transport fan, and a control unit.

1. UL 268 listed, operating at 24-V dc, nominal.
2. Pipe Network: Electrical metallic tubing connects control unit with designated sampling holes.
3. Smoke Detector: Particle-counting type with continuous laser beam. Sensitivity adjustable to a minimum of three preset values.
4. Sample Transport Fan: Centrifugal type, creating a minimum static pressure of 0.05-inch wg (12.5 Pa) at all sampling ports.
5. Control Unit: Single or multizone unit as indicated. Provides same system power supply, supervision, and alarm features as specified for the central FACP plus separate trouble indication for airflow and detector problems.
6. Signals to the Central FACP: Any type of local system trouble is reported to the central FACP as a composite "trouble" signal. Alarms on each system zone are individually reported to the central FACP as separately identified zones.

E. Duct Smoke Detectors:

1. Photoelectric Smoke Detectors:

    a. Sensor: LED or infrared light source with matching silicon-cell receiver.
    b. Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.

2. UL 268A listed, operating at 24-V dc, nominal.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
4. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. The fixed base shall be designed for mounting directly to the air duct. Provide terminals in the fixed base for connection to building wiring.

    a. Weatherproof Duct Housing Enclosure: UL listed for use with the supplied detector. The enclosure shall comply with NEMA 250 requirements for Type 4X.

5. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status. Provide remote status and alarm indicator and test station where indicated.
7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
8. Each sensor shall have multiple levels of detection sensitivity.
9. Sampling Tubes: Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.
10. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.6 HEAT DETECTORS

A. General: UL 521 listed.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or rate-of-rise of temperature that exceeds 15 deg F per minute, unless otherwise indicated.

1. Mounting: Plug-in base, interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

2.7 NOTIFICATION APPLIANCES

A. Description: Equipped for mounting as indicated and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.

B. Chimes, High-Level Output: Vibrating type, 81-dBA minimum rated output. Housing color shall be off-white.

C. Visible Alarm Devices: Xenon strobe lights listed under UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens. Housing color shall be off-white.

1. Adjustable Rated Light Output: 30, 75 or 110 candela or as required to meet minimum ADA requirements.
2. Strobe Leads: Factory connected to screw terminals.
3. Housing color shall be off-white.

2.8 SPRINKLER SYSTEM REMOTE INDICATORS

A. Remote status and alarm indicator and test stations, with LED indicating lights. Light is connected to flash when the associated device is in an alarm or trouble mode. Lamp is flush mounted in a single-gang wall plate. A red, laminated, phenolic-resin identification plate at the indicating light identifies, in engraved white letters, device initiating the signal and room where the smoke detector or valve is located. For water-flow switches, the identification plate also designates protected spaces downstream from the water-flow switch.

2.9 MAGNETIC DOOR HOLDERS (by others)

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching door plate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
2. Wall-Mounted Units: Flush mounted, unless otherwise indicated.
3. Rating: 24-V ac or dc.
4. Rating: 120-V ac.

B. Material and Finish: Match door hardware.

2.10 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module listed for use in providing a system address for listed alarm-initiating devices for wired applications with normally open contacts.

2.11 WIRE AND CABLE

A. Wire and cable for fire alarm systems shall be UL listed and labeled as complying with NFPA 70, Article 760.

B. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG and as recommended by system manufacturer.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70 Article 760, Classification CI, for power-limited fire alarm signal service. UL listed as Type FPL, and complying with requirements in UL 1424 and in UL 2196 for a 2-hour rating.

C. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Low-Voltage Circuits: No. 18 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.

3. Multiconductor Armored Cable: NFPA 70 Type MC, copper conductors, TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, UL listed for fire alarm and cable tray installation, plenum rated, and complying with requirements in UL 2196 for a 2-hour rating.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Connecting to Existing Equipment: Verify that existing fire alarm system is operational before making changes or connections.

1. Connect new equipment to the existing control panel in the existing part of the building.
2. Connect new equipment to the existing monitoring equipment at the Supervising Station.
3. Expand, modify, and supplement the existing control/monitoring equipment as necessary to extend the existing control/monitoring functions to the new points. New components shall be capable of merging with the existing configuration without degrading the performance of either system.

B. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.

C. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of the duct.

D. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

E. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling or 96 inches above finished; whichever is lower. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

F. Visible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling or 96 inches above finished; whichever is lower.

G. Audible/Visible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling or 96 inches above finished; whichever is lower.

H. Device Location-Indicating Lights: Locate in public space near the device they monitor.

I. FACP: Mount with tops of cabinets not more than 72 inches above the finished floor.

J. Annunciator: Install with top of panel not more than 72 inches above the finished floor.

K. Fire Shutters: Provide with smoke detectors and interface with fire alarm system.

L. Fire/Smoke dampers: Provide with duct detectors to control operation of dampers. Connect dampers to 120V circuit of closest duplex receptacles.

3.2 WIRING INSTALLATION

A. Install wiring according to the following:

1. NECA 1.
2. TIA/EIA 568-A.

B. Wiring Method:

1. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
2. Fire-Rated Cables: Use of 2-hour fire-rated fire alarm cables, NFPA 70 Types MI and CI, is not permitted.
3. Signaling Line Circuits: Power-limited fire alarm cables shall not be installed in the same cable or raceway as signaling line circuits.
4. Cables shall be plenum rated concealed in accessible areas and shall be in metal raceways in non-accessible areas.

C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

E. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

F. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum 1-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Division 16 Section "Basic Electrical Materials and Methods."

B. Install instructions frame in a location visible from the FACP.

C. Paint power-supply disconnect switch red and label "FIRE ALARM."

3.4 GROUNDING

A. Ground the FACP and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to the FACP.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

C. Perform the following field tests and inspections and prepare test reports:

1. Before requesting final approval of the installation, submit a written statement using the form for Record of Completion shown in NFPA 72.
2. Perform each electrical test and visual and mechanical inspection listed in NFPA 72. Certify compliance with test parameters. All tests shall be conducted under the direct supervision of a NICET technician certified under the Fire Alarm Systems program at Level III.

    a. Include the existing system in tests and inspections.

3. Visual Inspection: Conduct a visual inspection before any testing. Use as-built drawings and system documentation for the inspection. Identify improperly located, damaged, or nonfunctional equipment, and correct before beginning tests.
4. Testing: Follow procedure and record results complying with requirements in NFPA 72.

    a. Detectors that are outside their marked sensitivity range shall be replaced.

5. Test and Inspection Records: Prepare according to NFPA 72, including demonstration of sequences of operation by using the matrix-style form in Appendix A in NFPA 70.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.

B. Follow-Up Tests and Inspections: After date of Substantial Completion, test the fire alarm system complying with testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for three monthly, and one quarterly, periods.

C. Annual Test and Inspection: One year after date of Substantial Completion, test the fire alarm system complying with the testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for monthly, quarterly, semiannual, and annual periods. Use forms developed for initial tests and inspections.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the fire alarm system, appliances, and devices. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 13851

SECTION 14420
WHEELCHAIR LIFTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vertical portable platform lifts.

B. Related Sections:

1. Division 16 Sections for electrical service to lifts.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, dimensions, electrical characteristics, safety features, controls, and finishes.

B. Shop Drawings: For each lift. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly and components.
2. Wiring Diagrams: For power wiring.

C. Samples for Initial Selection: For surfaces and components with factory-applied color finishes.

1. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Metal Finish: Manufacturer's standard-size unit, not less than square.
2. Tubular Products and Running Trim: Manufacturer's standard-size unit, 6 inches long.
3. Hardware: Manufacturer's standard, exposed, door-operating device.

E. Qualification Data: For qualified Installer.

F. Manufacturer Certificates: Signed by lift manufacturer certifying that conditions and dimensions as shown on Drawings and that electrical service as shown and specified are adequate for lift being provided.

G. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted use of lifts.

H. Operation and Maintenance Data: For each type of lift to include in operation and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. Parts list with sources indicated.
2. Recommended parts inventory list.

I. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

B. Regulatory Requirements: Lift must meet all required codes for use indicated. In addition to requirements of authorities having jurisdiction, comply with ASME A18.1, "Safety Standard for Platform Lifts and Stairway Chairlifts."

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of lifts that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

1.6 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of lift Installer. Include quarterly preventive maintenance and repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper lift operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Tubing: ASTM A 500.

B. Steel Pipe: ASTM A 53/A 53M; standard weight (Schedule 40) unless otherwise indicated or required by structural loads.

C. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel (CS), Type B, exposed, matte finish.

D. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, commercial steel (CS), Type B, pickled.

E. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 zinc coating,

F. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

G. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required:

1. Extruded Aluminum: ASTM B 221, Alloy 6063-T6.
2. Aluminum Sheet: ASTM B 209, Alloy 5005-H15.

H. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.

I. Stainless-Steel Floor Plate: ASTM A 793.

2.2 VERTICAL PLATFORM LIFTS

A. Portable Vertical Platform Lifts: Manufacturer's standard preengineered lift systems as indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Handi-Ramp
b. Ameriglide Atlas
c. Trus-T-Lift
d. Garaventa Accessibility – Genesis Stage 44
e. Liftavator, Inc.Portable.
f. National Wheel-O-Vator Co., Inc. (The). BC Portable (Enclosed)
g. ThyssenKrupp Access; a ThyssenKrupp company. PL-P

B. Platform Size: Minimum 34 x 48 clear.

C. Rated Speed: Minimum 8 fpm.

D. Power Supply: 120 V, 60 Hz, 1 phase. Electrical connection shall be by standard outlet for maximum ½ HP motor. Any lift with electrical requirements that exceed what has been provided must include all additional costs for electrical upgrades.

E. Emergency Operation: Provide emergency manual operation and emergency battery power system to lower units in case of malfunction or power loss.

F. Self-Supporting Units: Support vertical loads of units only at base, with lateral support only at landing levels.

G. Partial Runway Enclosure: Manufacturer's standard enclosure assembly.

1. Runway Enclosure: Rectangular steel-tube frame with flush steel-sheet panels.
2. Runway Enclosure: Rectangular hot-dip-galvanized steel-tube frame with flush galvanized-steel-sheet panels.
3. Runway Enclosure: Extruded-aluminum frame with flush galvanized-steel-sheet panels.
4. Runway Enclosure: Extruded-aluminum frame with flush aluminum-sheet panels; with hot-dip-galvanized steel-tube frame for structural framing that cannot be aluminum.

H. Platform: Galvanized-steel sheet with black rubber flooring.

I. Platform: Stainless-steel floor plate with checkered texture.

J. Platform: Aluminum floor plate with nonskid surface texture.

K. Retractable Ramp: Provide ramp matching platform to provide transition from lower floor to lift platform. Ramp lowers to floor automatically when lifts reach lower landing and door opens. Ramp rises automatically when lift control is activated for lift to leave lower landing.

1. Ramp Size: End ramps a minimum of 32 inches wide; length as required for slope.
2. Ramp Slope: Maximum 1:12.
3. Ramp Finish: Finish ramps to match lift platform.

2.3 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.4 FINISHES

A. Steel and Galvanized-Steel Factory Finish:

1. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard, thermosetting polyester or acrylic urethane powder coating with a cured film thickness not less than 1.5 mils.
2. Color and Gloss: As selected by Architect from manufacturer's full range.

B. Aluminum Finishes:

1. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
2. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

    a. Color: As selected by Architect from full range of industry colors and color densities.

3. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard, thermosetting polyester or acrylic urethane powder coating with a cured film thickness not less than 1.5 mils.

    a. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, critical dimensions, and other conditions affecting performance.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Wiring Method: Conceal conductors and cables within housings of units and connect unit to power source by standard plug in twist lock caped end.

B. Coordinate platform doors with platform travel and positioning.

C. Adjust stops for accurate stopping and leveling at each landing, within required tolerances.

1. Leveling Tolerance: 1/4 inch up or down, regardless of load and direction of travel.

D. Adjust retractable ramps to meet maximum allowable slope and change-in-elevation requirements, and to lie fully against landing surfaces.

E. Lubricate operating parts of lift, including drive mechanism, guide rails, hinges, safety devices, and hardware.

F. Test safety devices and verify smoothness of required protective enclosures and fascias

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of lift installation and before permitting use of lifts, perform acceptance tests as required and recommended by ASME A18.1 and authorities having jurisdiction.

B. Operating Test: In addition to above testing, load lifts to rated capacity and operate continuously for 30 minutes between lowest and highest landings served. Readjust stops, signal equipment, and other devices for accurate stopping and operation of system.

C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on lifts.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lifts. Include a review of emergency systems and emergency procedures to be followed at time of operational failure and other building emergencies.

B. Check operation of lifts with Owner's personnel present and before date of Substantial Completion. Determine that operating systems and devices are functioning properly.

C. Check operation of lifts with Owner's personnel present not more than one month before end of warranty period. Determine that operating systems and devices are functioning properly.

END OF SECTION 14420

SECTION 15050
BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Mechanical demolition.
9. Equipment installation requirements common to equipment sections.
10. Painting and finishing.
11. Concrete bases.
12. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Dielectric fittings.
2. Mechanical sleeve seals.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers listed.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 15 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 15 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

    a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements for Joining Plastic Piping:

1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.4 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

1. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
2. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
3. Aboveground Pressure Piping: Pipe fitting.

B. Plastic-to-Metal Transition Fittings: PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

D. Plastic-to-Metal Transition Unions: MSS SP-107, PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.5 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Manufacturers:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Central Plastics Company.
    d. Pipeline Seal and Insulator, Inc.

2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

D. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:

    a. Perfection Corp.
    b. Precision Plumbing Products, Inc.
    c. Sioux Chief Manufacturing Co., Inc.
    d. Victaulic Co. of America.

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Metraflex Co.
    d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel or Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating or Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.7 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

2.8 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated.

E. One-Piece, Stamped-Steel Type: With spring clips and chrome-plated finish.

F. One-Piece, Floor-Plate Type: Cast-iron floor plate.

2.9 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 MECHANICAL DEMOLITION

A. Refer to Division 1 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

2. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
3. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
4. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

    a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.

c. Insulated Piping: One-piece, stamped-steel type with spring clips.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
g. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

2. Existing Piping: Use the following:

a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.
b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge and spring clips.
c. Bare Piping in Unfinished Service Spaces: Split-casting, cast-brass type with polished chrome-plated finish.
d. Bare Piping in Equipment Rooms: Split-casting, cast-brass type.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves are not required for holes formed by removable PE sleeves.

O. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
b. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.

1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

P. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

Q. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

R. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Through-Penetration Firestop Systems" for materials.

S. Verify final equipment locations for roughing-in.

T. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Nonpressure Piping: Join according to ASTM D 2855.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.6 PAINTING

A. Painting of mechanical systems, equipment, and components is specified in Division 9 Section "Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.9 GROUTING

A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 15050

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 15055
MOTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes basic requirements for factory- and field-installed motors.

1.3 DEFINITIONS

A. Factory-Installed Motor: A motor installed by motorized-equipment manufacturer as a component of equipment.

B. Field-Installed Motor: A motor installed at Project site and not factory installed as an integral component of motorized equipment.

1.4 SUBMITTALS

A. Product Data for Field-Installed Motors: For each type and size of motor, provide nameplate data and ratings; shipping, installed, and operating weights; enclosure type and mounting arrangements; size, type, and location of winding terminations; conduit entry and ground lug locations; and information on coatings or finishes.

B. Operation and Maintenance Data: For field-installed motors to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

C. Manufacturer's Qualifications: Firms regularly engaged in manufacture of variable frequency drives with characteristic, sizes and capacities required whose products have been in satisfactory use in similar service for not less than 5 years.

D. UL and NEMA Compliance: Provide electric cabinets and components which are listed and labeled by Underwriters Laboratories and mounted in a NEMA1 enclosure for variable frequency drives.

1.6 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices and features that comply with the following:

1. Compatible with the following:

a. Magnetic controllers.
b. Multispeed controllers.
c. Reduced-voltage controllers.

2. Designed and labeled for use with variable frequency controllers, and suitable for use throughout speed range without overheating.
3. Matched to torque and horsepower requirements of the load.
4. Matched to ratings and characteristics of supply circuit and required control sequence.

B. Coordinate motor support with requirements for driven load; access for maintenance and motor replacement; installation of accessories, belts, belt guards; and adjustment of sliding rails for belt tensioning.

C. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

1.7 PRODUCT DELIVERY, STORAGE AND BUILDING

A. Store Panels and Components in clean dry place. Protect from weather, dirt, fumes, water, construction debris and physical damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturer specified.

1. Variable Frequency Drives

a. ABB Drives, Inc. 500 Series.

2.2 MOTOR REQUIREMENTS

A. Motor requirements apply to factory- and field-installed motors except as follows:

1. Different ratings, performance, or characteristics for motor are specified in another Section.
2. Motorized-equipment manufacturer requires ratings, performance, or characteristics, other than those specified in this Section, to meet performance specified.

2.3 MOTOR REQUIREMENTS

A. Motor requirements apply to factory- and field-installed motors except as follows:

1. Different ratings, performance, or characteristics for motor are specified in another Section.
2. Motorized-equipment manufacturer requires ratings, performance, or characteristics, other than those specified in this Section, to meet performance specified.

2.4 MOTOR CHARACTERISTICS

A. Motors 1/2 HP and Larger: Three phase.

B. Motors Smaller Than 1/2 HP: Single phase.

C. Frequency Rating: 60 Hz.

D. Voltage Rating: NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.

E. Service Factor: 1.15 for open dripproof motors; 1.0 for totally enclosed motors.

F. Duty: Continuous duty at ambient temperature of 105 deg F and at altitude of 3300 feet above sea level.

G. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

H. Enclosure: Open dripproof.

2.5 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium, as defined in NEMA MG 1.

C. Stator: Copper windings, unless otherwise indicated.

1. Multispeed motors shall have separate winding for each speed.

D. Rotor: Squirrel cage, unless otherwise indicated.

E. Bearings: Double-shielded, prelubricated ball bearings suitable for radial and thrust loading.

F. Temperature Rise: Match insulation rating, unless otherwise indicated.

G. Insulation: Class F, unless otherwise indicated.

H. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.

I. Enclosure: Cast iron for motors 7.5 hp and larger; rolled steel for motors smaller than 7.5 hp.

1. Finish: Gray enamel.

2.6 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Inrush Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Designed with critical vibration frequencies outside operating range of controller output.
2. Temperature Rise: Matched to rating for Class B insulation.
3. Insulation: Class H.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

C. Rugged-Duty Motors: Totally enclosed, with 1.25 minimum service factor, greased bearings, integral condensate drains, and capped relief vents. Windings insulated with non-hygroscopic material.

1. Finish: Chemical-resistant paint over corrosion-resistant primer.

D. Source Quality Control for Field-Installed Motors: Perform the following tests on each motor according to NEMA MG 1:

1. Measure winding resistance.
2. Read no-load current and speed at rated voltage and frequency.
3. Measure locked rotor current at rated frequency.
4. Perform high-potential test.

2.7 SINGLE-PHASE MOTORS

A. Type: One of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split-phase start, capacitor run.
3. Capacitor start, capacitor run.

B. Shaded-Pole Motors: For motors 1/20 hp and smaller only.

C. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

D. Bearings: Ball type for belt-connected motors and other motors with high radial forces on motor shaft; sealed, prelubricated-sleeve type for other single-phase motors.

E. Source Quality Control for Field-Installed Motors: Perform the following tests on each motor according to NEMA MG 1:

1. Measure winding resistance.
2. Read no-load current and speed at rated voltage and frequency.
3. Measure locked rotor current at rated frequency.
4. Perform high-potential test.

2.8 VARIABLE FREQUENCY DRIVES, GENERAL

A. The Standard Variable Frequency Controller (VFC) and all of the optional modifications shall mount with a common NEMA 1 Enclosure.

B. Description:

1. The Variable Frequency Controller (VFC) shall be a fully digital PWM using very large scale integration techniques as well as surface mount technology for increased reliability. The VFC shall use a 16 bit microprocessor with a 12 bit resolution to allow stepless motor control from 0.1% to 110% of motor base speed.
2. All programmable settings shall be held in a non-volatile memory and shall not be affected by power outages, brownouts, power drips, etc. The VFC shall have initial programmable settings intact from the factory without the need of battery backup, etc. The VFC shall not need to be programmed at the job site prior to being able to run a motor, but shall be ready to run a motor as soon as power connections are made.
3. Programmable at the job site to accommodate specific load application requirements, such as frequency avoidance and preset speeds shall be available to the user.
4. Complete efficiency versus load and speed for all VFC ratings shall be readily available from the manufacturer. VFC shall be capable of multiple motor operation at the same frequency and speed.
5. All high voltage components within the enclosure shall be isolated with steel or polycarbonate covers.

C. Basic Features:

1. Operator controls shall be mounted on the door of the cabinet and consist of a membrane command center which allows manual stop/start and speed control, local/remote

indication and manual/or automatic speed control selection. In addition, the command center will serve as a means to configure controller parameters such a minimum speed, maximum speed acceleration and deceleration times, volts/Hz ration, torque boost, etc. Potentionmeters will not be allowed for these settings.

2. The controller will be able to follow an external speed signal and respond to remote start/stop contacts wired to the terminal strip while in the automatic/remote mode.
3. The main input disconnect shall provide a positive disconnect between the controller and all phases of the incoming A-C line. This disconnect shall be mounted inside the controller enclosure and have through the door interlocking toggle with provisions for padlocking.
4. The controller shall contain an electronic overload circuit designed to protect two A-C motors, operated on the Variable Frequency Controller.
5. Frequency Controller output from extended overload operation on an inverse time basis. A motor thermostat back up may also be provided.
6. Automatic restarts will be attempted three times after a power outage, drive faultor external fault, if the drives in automatic mode. The circuit shall allow the user to select 0, 1, 2, or 3 restart attempts. The reset time between fault occurrences shall also be selectable. All settings shall be via the membrane command center.
7. An LED display will be mounted on the door of the cabinet and will digitally indicate:
   a. Frequency output.
   b. Voltage output.
   c. Current output.
   d. First fault indication.
8. The Adjustable Frequency Controller shall be capable of starting into a rotating load without the need of a time delay upon a start command.
9. Relay contacts for remote indication of drive fault and motor running shall be provided for interwiring to other devices.
10. There shall be three critical frequency avoidance bands which can be programmed in the field via the membrane command center to enable the controller to avoid certain frequencies which the pump or fan system may resonate at due to reduced speed operation. Each critical frequency avoidance band shall have a band width adjustable via keypad entry of up to 10 Hz.
11. There shall be three programmable preset speeds which will force the AFC to preset speed upon the user contact closure. This feature shall be set digitally by entering via the door mounted membrane command center.
12. The AFC shall have the capability to ride through power dips up to 400 msec without a controller trip depending on load and operating condition.
13. Isolated electrical follower shall enable the Adjustable Frequency Controller to follow a 0-20ma, 4-20ma, or 0-4, 0-8, 0-10, volt D-C grounded or ungrounded signal.
14. Line inductance in the form of line reactors or isolation transformers shall be provided regardless of the KVA connected to the line. Backfeed of total harmonic distortion into the electrical system shall not exceed 5%. This is to minimize line surges, line notching, and voltage distortions from causing nuisance trips and type Variable Frequency Controller.

D. Protective Circuits and Features:

1. The AFC shall include the following protective circuits and features:

   a. DV-DT and DI/DT protection for semiconductors.
   b. Instantaneous Electronic Trip for the following faults.

c. Motor current exceeds 110% for longer than one minute of controller maximum site since wave current rating.
d. Output phase to phase short circuit condition.
e. Total ground fault under any operating condition.
f. High input line voltage.
g. Low input line voltage.
h. Loss of input phase.
i. External fault. (This protective circuit shall permit, by means of the terminal strip, wiring of remote N.C. safety contact such as high static, firestat, etc. to shut down the drive).

2. All live power equipment shall be converted by protective shields to ensure the safety of operating personnel.
3. Metal oxide varistors.

E. Adjustments:

1. The following adjustments shall be provided:
   a. Maximum frequency (15 to 400 Hz) with factory setting at 60 Hz.
   b. Minimum frequency (5 to 60 Hz) with factory setting at 6 Hz.
   c. Acceleration (0.1 to 360 seconds) factory set at 20 seconds.
   d. Deceleration (0.1 to 360 seconds) factory set at 20 seconds.
   e. Volts/Hertz ratio factory set for 460 volts at 60 Hz.
   f. Voltage offset or boost with factory setting at 100% torque.
   g. Current limit (50 to 100%) sine wave current rating factory set at 100%.

F. Service Conditions:

1. The VFC shall be designed and constructed to operate within the following service conditions:
   a. Suitable for continuous operation at an ambient temperature of 32 deg. F. to 104 deg. F. Elevation up to 1100 ft. altitude with a relative humidity to 95% non-condensing.
   b. A-C line variation of –10% to +10% voltage and +/- 2% frequency.

G. Modifications:

1. The following options shall be included as specified in the cover document.
2. Bypass circuitry to transfer the motor from the Variable Frequency Controller to the utility supplied input power or from the line to the controller while the motor is at any speed. Two motor contactors, electrically interlocked shall be utilized. One contactor is to be between the controller output and the motor, controlled by the controller regulator; and the other one is to be between the bypass power line and the motor, providing across-the-line starting. Motor protection per National Electrical Code shall be provided in both the "controller" mode and the "bypass" mode by a motor overload relay. The 115 volt A-C relay control logic, allowing common start/stop commands in the "Controller" mode and the "bypass" mode shall also be included within the enclosure which is UL listed as a single unit.
3. The bypass shall include a door interlocked, main power input disconnect or circuit breaker option providing positive shutdown of all power to both the bypass circuitry and the Adjustable Frequency Controller. A separate motor starter shall not be needed for

safe operation. The bypass circuit shall also include a second input disconnect installed in the Adjustable Frequency Controller. This disconnect shall provide a bypass mode. The bypass shall mount within the controller enclosure and be accessible only upon opening the controller door. The bypass shall include terminal connectors for over pressurization switches to protect the duct work in the bypass mode.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive field-installed motors for compliance with requirements, installation tolerances and other conditions affecting performance.

B. Examine roughing-in for conduit systems to verify actual locations of conduit connections before motor installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install panel where indicated, in accordance with manufacturer's published installation instructions, complying with recognized industry practices to ensure that control panels comply with requirements and serve intended purposes.

B. Access: Provide access space around V-F panel for service as indicated, but in no case less than that recommended by manufacturer.

C. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

D. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 16 sections. Do not proceed with equipment start up until wiring installation is acceptable to equipment installer.

3.3 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain field-installed motors. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 15055

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 15060
HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following hangers and supports for mechanical system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.

B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 15 Section "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:

1. AAA Technology & Specialties Co., Inc.
2. B-Line Systems, Inc.; a division of Cooper Industries.
3. Carpenter & Paterson, Inc.
4. Empire Industries, Inc.
5. Globe Pipe Hanger Products, Inc.
6. Grinnell Corp.
7. GS Metals Corp.
8. National Pipe Hanger Corporation.
9. PHD Manufacturing, Inc.
10. PHS Industries, Inc.
11. Piping Technology & Products, Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers:

1. Carpenter & Paterson, Inc.
2. PHS Industries, Inc.
3. Pipe Shields, Inc.
4. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.
4. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
5. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
6. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
7. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
8. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
9. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
10. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.
11. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
12. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24, if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
13. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
2. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
3. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
4. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
5. C-Clamps (MSS Type 23): For structural shapes.
6. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
7. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
8. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
9. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
10. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
11. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

12. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
13. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
14. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
4. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.

5. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
6. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

E. Install lateral bracing with pipe hangers and supports to prevent swaying.

F. Install building attachments to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping.

G. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

H. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

I. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

5. Insert Material: Length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.5 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 15060

SECTION 15074
VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Restrained spring isolators.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Include rated load, rated deflection, for each vibration isolation device.
2. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. Isolation Technology, Inc.
4. Kinetics Noise Control.
5. Mason Industries.
6. Vibration Eliminator Co., Inc.
7. Vibration Isolation.
8. Vibration Mountings & Controls, Inc.

B. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch- thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.2 RESTRAINED VIBRATION ISOLATION ROOF-CURB RAILS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amber/Booth Company, Inc.
2. Isolation Technology, Inc.
3. Kinetics Noise Control.
4. Mason Industries.
5. Thybar Corporation.
6. Vibration Eliminator Co., Inc.
7. Vibration Isolation.
8. Vibration Mountings & Controls, Inc.

B. Spring Isolators: Adjustable, restrained spring isolators shall be mounted on 1/4-inch- thick, elastomeric vibration isolation pads and shall have access ports, for level adjustment, with removable waterproof covers at all isolator locations. Isolators shall be located so they are accessible for adjustment at any time during the life of the installation without interfering with the integrity of the roof.

1. Restrained Spring Isolators: Freestanding, steel, open-spring isolators.

    a. Housing: Steel with resilient vertical-limit stops and adjustable equipment mounting and leveling bolt.
    b. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
    c. Minimum Additional Travel: 50 percent of the required deflection at rated load.
    d. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
    e. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and wind-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 VIBRATION-CONTROL DEVICE INSTALLATION

A. Comply with requirements in Division 7 Section "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

B. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

3.3 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

END OF SECTION 15074

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 15075
MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following mechanical identification materials and their installation:

1. Equipment nameplates.
2. Access panel and door markers.
3. Pipe markers.
4. Duct markers.
5. Stencils.
6. Valve tags.
7. Valve schedules.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Valve numbering scheme.

D. Valve Schedules: For each piping system. Furnish extra copies (in addition to mounted copies) to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.5 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION DEVICES

A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.

1. Data:

a. Manufacturer, product name, model number, and serial number.
b. Capacity, operating and power characteristics, and essential data.
c. Labels of tested compliances.

2. Location: Accessible and visible.
3. Fasteners: As required to mount on equipment.

B. Access Panel and Door Markers: 1/16-inch- thick, engraved laminated plastic, with abbreviated terms and numbers corresponding to identification. Provide 1/8-inch center hole for attachment.

1. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

2.2 PIPING IDENTIFICATION DEVICES

A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.

1. Colors: Comply with ASME A13.1, unless otherwise indicated.
2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
3. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.
4. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.

B. Pretensioned Pipe Markers: Precoiled semirigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.

C. Shaped Pipe Markers: Preformed semirigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.

2.3 DUCT IDENTIFICATION DEVICES

A. Duct Markers: Engraved, color-coded laminated plastic. Include direction and quantity of airflow and duct service (such as supply, return, and exhaust). Include contact-type, permanent adhesive.

2.4 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches for ducts; and minimum letter height of 3/4 inch for access panel and door markers, equipment markers, equipment signs, and similar operational instructions.

1. Stencil Material: Metal or fiberboard.
2. Stencil Paint: Exterior, gloss, alkyd enamel black, unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, alkyd enamel in colors according to ASME A13.1, unless otherwise indicated.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme approved by Architect. Provide 5/32-inch hole for fastener.

1. Material: 0.032-inch- thick brass.
2. Valve-Tag Fasteners: Brass S-hook.

2.6 VALVE SCHEDULES

A. Valve Schedules: For each piping system, on standard-size bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include mounting screws.
2. Frame: Extruded aluminum.
3. Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

A. Products specified are for applications referenced in other Division 15 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 EQUIPMENT IDENTIFICATION

A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:

1. Pumps, compressors and similar motor-driven units.
2. Coils, evaporators and similar equipment.
3. Fans, blowers, primary balancing dampers, and mixing boxes.
4. Packaged HVAC central-station.

B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.

1. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:

    a. Meters, gages, thermometers, and similar units.
    b. Pumps, compressors and similar motor-driven units.
    c. Coils, evaporators and similar equipment.
    d. Fans, blowers, primary balancing dampers, and mixing boxes.
    e. Packaged HVAC central-station.
    f. Strainers, filters and similar equipment.

3.3 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.

1. Pipes with OD, Including Insulation, Less Than 6 Inches: Pretensioned pipe markers. Use size to ensure a tight fit.

2. Pipes with OD, Including Insulation, 6 Inches and Larger: Shaped pipe markers. Use size to match pipe and secure with fasteners.

B. Stenciled Pipe Marker Option: Stenciled markers may be provided instead of manufactured pipe markers, at Installer's option. Install stenciled pipe markers with painted, color-coded bands or rectangles on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

C. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

3.4 DUCT IDENTIFICATION

A. Install duct markers with permanent adhesive on air ducts in the following color codes:

1. Green: For cold-air supply ducts.
2. Blue: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
3. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

B. Stenciled Duct Marker Option: Stenciled markers, showing service and direction of flow, may be provided instead of laminated-plastic duct markers, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.

C. Locate markers near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets;

convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:

1. Valve-Tag Size and Shape:

   a. Cold Water: 1-1/2 inches, round.
   b. Hot Water: 1-1/2 inches, round.

2. Valve-Tag Color:

   a. Cold Water: Black.
   b. Hot Water: White.

3. Letter Color:

   a. Cold Water: White.
   b. Hot Water: Black.

3.6 VALVE-SCHEDULE INSTALLATION

A. Mount valve schedule on wall in accessible location in each major equipment room.

3.7 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.8 CLEANING

A. Clean faces of mechanical identification devices and glass frames of valve schedules.

END OF SECTION 15075

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 15080
MECHANICAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes mechanical insulation for boiler breeching, duct, equipment, and pipe, including the following:

1. Insulation Materials:

    a. Flexible elastomeric.
    b. Mineral fiber.
    c. Polyolefin.

2. Insulating cements.
3. Adhesives.
4. Mastics.
5. Sealants.
6. Factory-applied jackets.
7. Tapes.
8. Securements.
9. Corner angles.

B. Related Sections include the following:

1. Division 15 Section "Metal Ducts" for duct liners.

1.3 DEFINITIONS

A. ASJ: All-service jacket.

B. FSK: Foil, scrim, kraft paper.

C. FSP: Foil, scrim, polyethylene.

D. SSL: Self-sealing lap.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, identify thermal conductivity, thickness, and jackets (both factory and field applied, if any).

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 15 Section "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 INSULATION MATERIALS

A. Refer to Part 3 schedule articles for requirements about where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products:

   a. Aeroflex USA Inc.; Aerocel.
   b. Armacell LLC; AP Armaflex.
   c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Products:

   a. CertainTeed Corp.; Duct Wrap.
   b. Johns Manville; Microlite.
   c. Knauf Insulation; Duct Wrap.
   d. Manson Insulation Inc.; Alley Wrap.
   e. Owens Corning; All-Service Duct Wrap.

H. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied ASJ. For equipment applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Products:

   a. CertainTeed Corp.; Commercial Board.
   b. Fibrex Insulations Inc.; FBX.
   c. Johns Manville; 800 Series Spin-Glas.
   d. Knauf Insulation; Insulation Board.
   e. Manson Insulation Inc.; AK Board.
   f. Owens Corning; Fiberglas 700 Series.

I. Mineral-Fiber, Preformed Pipe Insulation:

1. Products:

   a. Fibrex Insulations Inc.; Coreplus 1200.
   b. Johns Manville; Micro-Lok.
   c. Knauf Insulation; 1000(Pipe Insulation.
   d. Manson Insulation Inc.; Alley-K.
   e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

J. Mineral-Fiber, Pipe Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Products:

   a. CertainTeed Corp.; CrimpWrap.
   b. Johns Manville; MicroFlex.
   c. Knauf Insulation; Pipe and Tank Insulation.
   d. Manson Insulation Inc.; AK Flex.
   e. Owens Corning; Fiberglas Pipe and Tank Insulation.

K. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.

1. Products:

   a. Armacell LLC; Tubolit.
   b. Nomaco Inc.; IMCOLOCK, IMCOSHEET, NOMALOCK, and NOMAPLY.

c. RBX Corporation; Therma-cell.

2.3 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products:

a. Insulco, Division of MFS, Inc.; Triple I.
b. P. K. Insulation Mfg. Co., Inc.; Super-Stik.

2.4 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products:

a. Aeroflex USA Inc.; Aeroseal.
b. Armacell LCC; 520 Adhesive.
c. Foster Products Corporation, H. B. Fuller Company; 85-75.
d. RBX Corporation; Rubatex Contact Adhesive.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products:

a. Dow Chemical Company (The); 739, Dow Silicone.
b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Red Devil, Inc.; Celulon Ultra Clear.
e. Speedline Corporation; Speedline Vinyl Adhesive.

2.5 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

1. Products:

a. Childers Products, Division of ITW; CP-30.
b. Foster Products Corporation, H. B. Fuller Company; 30-35.
c. ITW TACC, Division of Illinois Tool Works; CB-25.
d. Marathon Industries, Inc.; 501.
e. Mon-Eco Industries, Inc.; 55-10.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
3. Service Temperature Range: 0 to 180 deg F.
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

2.6 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products:

a. Childers Products, Division of ITW; CP-76-8.
b. Foster Products Corporation, H. B. Fuller Company; 95-44.
c. Marathon Industries, Inc.; 405.
d. Mon-Eco Industries, Inc.; 44-05.
e. Vimasco Corporation; 750.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products:

a. Childers Products, Division of ITW; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. Vinyl Jacket: UL-rated white vinyl with a permeance of 1.3 perms when tested according to ASTM E 96, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products:

a. Johns Manville; Zeston.
b. P.I.C. Plastics, Inc.; FG Series.
c. Proto PVC Corporation; LoSmoke.
d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

5. Factory-fabricated tank heads and tank side panels.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136 and UL listed.

1. Products:

   a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
   b. Compac Corp.; 104 and 105.
   c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
   d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136 and UL listed.

1. Products:

   a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
   b. Compac Corp.; 110 and 111.
   c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
   d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Products:

   a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
   b. Compac Corp.; 130.
   c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
   d. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.

4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive and UL listed.

1. Products:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
b. Compac Corp.; 120.
c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
d. Venture Tape; 3520 CW.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.10 SECUREMENTS

A. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated.

a. Products:

1) AGM Industries, Inc.; CWP-1.
2) GEMCO; CD.
3) Midwest Fasteners, Inc.; CD.
4) Nelson Stud Welding; TPA, TPC, and TPS.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

a. Products:

1) AGM Industries, Inc.; CWP-1.
2) GEMCO; Cupped Head Weld Pin.
3) Midwest Fasteners, Inc.; Cupped Head.
4) Nelson Stud Welding; CHP.

3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products:

1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
2) GEMCO; Perforated Base.
3) Midwest Fasteners, Inc.; Spindle.

b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Copper- or zinc-coated, low carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products:

1) GEMCO; Nylon Hangers.
2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.

b. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
c. Spindle: Nylon, 0.106-inch- diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

5. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products:

1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series TSA.
2) GEMCO; Press and Peel.
3) Midwest Fasteners, Inc.; Self Stick.

b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Copper- or zinc-coated, low carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
d. Adhesive-backed base with a peel-off protective cover.

6. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Products:

1) AGM Industries, Inc.; RC-150.
2) GEMCO; R-150.
3) Midwest Fasteners, Inc.; WA-150.
4) Nelson Stud Welding; Speed Clips.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

7. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Manufacturers:

1) GEMCO.
2) Midwest Fasteners, Inc.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

C. Wire: 0.080-inch nickel-copper alloy.

1. Manufacturers:

a. ACS Industries, Inc.
b. C & F Wire.
c. Childers Products.
d. PABCO Metals Corporation.
e. RPR Products, Inc.

2.11 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 COMMON INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Below-Grade Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Firestopping and fire-resistive joint sealers are specified in Division 7 Section "Through-Penetration Firestop Systems."

F. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies according to Division 7 Section "Through-Penetration Firestop Systems."

3.5 DUCT AND PLENUM INSULATION INSTALLATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.

3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.

3.6 EQUIPMENT INSULATION INSTALLATION

A. Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of tank and vessel surfaces.
2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
3. Protect exposed corners with secured corner angles.
4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:

    a. Do not weld anchor pins to ASME-labeled pressure vessels.
    b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
    c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
    d. Do not overcompress insulation during installation.
    e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
    f. Impale insulation over anchor pins and attach speed washers.
    g. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
7. Stagger joints between insulation layers at least 3 inches.

8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

3.7 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this Article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.8 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.

2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.9 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

E. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches (75 mm).

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.

6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

F. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches (75 mm).

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.10 POLYOLEFIN INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of polyolefin pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.11 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.12 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.13 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, round supply-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

B. Concealed, rectangular, supply-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

C. Concealed, rectangular, return-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

D. Exposed, rectangular, supply-air duct insulation shall be the following:

1. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.

E. Exposed, rectangular, return-air duct insulation shall be any of the following:

1. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.

F. Exposed, rectangular, outdoor-air duct insulation shall be the following:

1. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.

3.14 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Fire-suppression piping.
2. Drainage piping located in crawl spaces.
3. Below-grade piping.
4. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.15 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. NPS 3/4 and Larger: Insulation shall be any of the following:

a. Flexible Elastomeric: 1/2 inch thick.
b. Mineral-Fiber Pipe Insulation, Type I: 1/2 inch thick.
c. Polyolefin: 1/2 inch thick.

B. Domestic Hot and Recirculated Hot Water:

1. NPS 1/2 and Larger: Insulation shall be any of the following:

a. Flexible Elastomeric: 1/2 inches thick.
b. Mineral-Fiber Pipe Insulation, Type I: 1/2 inches thick.
c. Polyolefin: 1 inch thick.

C. Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be any of the following:

a. Flexible Elastomeric: 1/2 inches thick.
b. Mineral-Fiber Pipe Insulation, Type I: 1/2 inch thick.
c. Polyolefin: 1/2 inches thick.

D. Heating-Hot-Water Supply and Return, 200 Deg F and below:

1. NPS ½" and Larger: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe, Type I: 1 inch thick.

END OF SECTION 15080

SECTION 15110
VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following general-duty valves:

1. Copper-alloy ball valves.
2. Ferrous-alloy ball valves.
3. Ferrous-alloy butterfly valves.
4. Bronze check valves.
5. Gray-iron swing check valves.
6. Ferrous-alloy wafer check valves.
7. Spring-loaded, lift-disc check valves.

B. Related Sections include the following:

1. Division 15 Section "Mechanical Identification" for valve tags and charts.
2. Division 15 Section "HVAC Instrumentation and Controls" for control valves and actuators.
3. Division 15 piping Sections for specialty valves applicable to those Sections only.

1.3 DEFINITIONS

A. The following are standard abbreviations for valves:

1. CWP: Cold working pressure.
2. EPDM: Ethylene-propylene-diene terpolymer rubber.
3. PTFE: Polytetrafluoroethylene plastic.
4. SWP: Steam working pressure.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

1.5 QUALITY ASSURANCE

A. ASME Compliance: ASME B31.1 for power piping valves and ASME B31.9 for building services piping valves.

1. Exceptions: Domestic hot- and cold-water, sanitary waste, and storm drainage piping valves unless referenced.

B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 VALVES, GENERAL

A. Refer to Part 3 "Valve Applications" Article for applications of valves.

B. Bronze Valves: NPS 2 and smaller with threaded ends, unless otherwise indicated.

C. Ferrous Valves: NPS 2-1/2 and larger with flanged ends, unless otherwise indicated.

D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Valve Sizes: Same as upstream pipe, unless otherwise indicated.

F. Valve Actuators:

1. Chainwheel: For attachment to valves, of size and mounting height, as indicated in the "Valve Installation" Article in Part 3.
2. Gear Drive: For quarter-turn valves NPS 8 and larger.
3. Handwheel: For valves other than quarter-turn types.
4. Lever Handle: For quarter-turn valves NPS 6 and smaller, except plug valves.
5. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug head.

G. Extended Valve Stems: On insulated valves.

H. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.

I. Valve Grooved Ends: AWWA C606.

1. Solder Joint: With sockets according to ASME B16.18.

a. Caution: Use solder with melting point below 840 deg F for angle, check, gate, and globe valves; below 421 deg F for ball valves.

2. Threaded: With threads according to ASME B1.20.1.

J. Valve Bypass and Drain Connections: MSS SP-45.

2.3 COPPER-ALLOY BALL VALVES

A. Manufacturers:

1. Two-Piece, Copper-Alloy Ball Valves:

a. Conbraco Industries, Inc.; Apollo Div.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Div.
e. Grinnell Corporation.
f. Hammond Valve.

g. Jamesbury, Inc.
h. Kitz Corporation of America.
i. Legend Valve & Fitting, Inc.
j. Milwaukee Valve Company.
k. NIBCO INC.
l. Red-White Valve Corp.
m. Watts Industries, Inc.; Water Products Div.

B. Copper-Alloy Ball Valves, General: MSS SP-110.

C. Two-Piece, Copper-Alloy Ball Valves: Brass or bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig minimum CWP rating and blowout-proof stem.

2.4 FERROUS-ALLOY BUTTERFLY VALVES

A. Manufacturers:

1. Flangeless, Ferrous-Alloy Butterfly Valves:

a. Crane Co.; Crane Valve Group; Center Line.
b. Crane Co.; Crane Valve Group; Stockham Div.
c. Grinnell Corporation.
d. Hammond Valve.
e. Kitz Corporation of America.
f. Legend Valve & Fitting, Inc.
g. Metraflex Co.
h. Milwaukee Valve Company.
i. Mueller Steam Specialty.
j. NIBCO INC.
k. Red-White Valve Corp.
l. Watts Industries, Inc.; Water Products Div.

2. Grooved-End, Ductile-Iron Butterfly Valves:

a. Central Sprinkler Co.; Central Grooved Piping Products.
b. Grinnell Corporation.
c. Hammond Valve.
d. McWane, Inc.; Kennedy Valve Div.
e. Milwaukee Valve Company.
f. Mueller Steam Specialty.
g. NIBCO INC.
h. Victaulic Co. of America.

B. Ferrous-Alloy Butterfly Valves, General: MSS SP-67, Type I, for tight shutoff, with disc and lining suitable for potable water, unless otherwise indicated.

C. Flangeless, 150-psig CWP Rating, Ferrous-Alloy Butterfly Valves: Wafer type with one- or two-piece stem.

D. Single-Flange, 150-psig CWP Rating, Ferrous-Alloy Butterfly Valves: Wafer-lug type with one- or two-piece stem.

E. Grooved-End, 175-psig CWP Rating, Ferrous-Alloy Butterfly Valves: Ductile-iron or steel body with grooved or shouldered ends.

2.5 BRONZE CHECK VALVES

A. Manufacturers:

1. Type 4, Bronze, Swing Check Valves with Nonmetallic Disc:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Div.
d. Grinnell Corporation.
e. Hammond Valve.
f. McWane, Inc.; Kennedy Valve Div.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Red-White Valve Corp.
j. Walworth Co.
k. Watts Industries, Inc.; Water Products Div.

B. Bronze Check Valves, General: MSS SP-80.

C. Type 1, Class 125, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.

D. Type 4, Class 125, Bronze, Swing Check Valves: Bronze body with nonmetallic disc and bronze seat.

2.6 GRAY-IRON SWING CHECK VALVES

A. Manufacturers:

1. Grooved-End, Ductile-Iron Swing Check Valves:

a. Grinnell Corporation.
b. Mueller Co.
c. Victaulic Co. of America.

B. 175-psig CWP Rating, Grooved-End, Swing Check Valves: Ductile-iron body with grooved or shouldered ends.

2.7 FERROUS-ALLOY WAFER CHECK VALVES

A. Ferrous-Alloy Wafer Check Valves, General: API 594, spring loaded.

B. Dual-Plate, Class 125 or 150, Ferrous-Alloy, Wafer Check Valves: Flangeless body.

2.8 SPRING-LOADED, LIFT-DISC CHECK VALVES

A. Manufacturers:

1. Type I, Wafer Lift-Disc Check Valves:

    a. Mueller Steam Specialty.

2. Type II, Compact-Wafer, Lift-Disc Check Valves:

    a. Grinnell Corporation.
    b. Hammond Valve.
    c. Metraflex Co.
    d. Milwaukee Valve Company.
    e. Mueller Steam Specialty.
    f. NIBCO INC.
    g. Val-Matic Valve & Mfg. Corp.

3. Type IV, Threaded Lift-Disc Check Valves:

    a. Grinnell Corporation.
    b. Legend Valve & Fitting, Inc.
    c. Metraflex Co.
    d. Milwaukee Valve Company.
    e. Mueller Steam Specialty.
    f. NIBCO INC.
    g. Watts Industries, Inc.; Water Products Div.

B. Lift-Disc Check Valves, General: FCI 74-1, with spring-loaded bronze or alloy disc and bronze or alloy seat.

C. Type I, Class 125, Wafer Lift-Disc Check Valves: Wafer style with cast-iron shell with diameter matching companion flanges.

D. Type II, Class 125, Compact-Wafer, Lift-Disc Check Valves: Compact-wafer style with cast-iron shell with diameter made to fit within bolt circle.

E. Type IV, Class 125, Threaded Lift-Disc Check Valves: Threaded style with bronze shell and threaded ends.

F. Type IV, Class 150, Threaded Lift-Disc Check Valves: Threaded style with bronze shell and threaded ends.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

F. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE APPLICATIONS

A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball or butterfly valves.
2. Throttling Service: Ball or butterfly valves.
3. Pump Discharge: Spring-loaded, lift-disc check valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Domestic Water Piping: Use the following types of valves:

1. Ball Valves, NPS 2 and Smaller: Two-piece, 600-psig CWP rating, copper alloy.
2. Butterfly Valves, NPS 2-1/2 and Larger: Flangeless or Single-flange, 150-psig CWP rating, ferrous alloy, with EPDM liner.
3. Grooved-End, Ductile-Iron Butterfly Valves, NPS 2-1/2 and Larger: 175-psig CWP rating.
4. Swing Check Valves, NPS 2 and Smaller: Type 4, Class 125, bronze.
5. Grooved-End, Ductile-Iron, Swing Check Valves, NPS 2-1/2 and Larger: 175-psig CWP rating.
6. Wafer Check Valves, NPS 2-1/2 and Larger: Dual-plate, wafer double-flanged, Class 125 or 150, ferrous alloy.

7. Spring-Loaded, Lift-Disc Check Valves, NPS 2 and Smaller: Type IV, Class 125 minimum.

D. Heating Water Piping: Use the following types of valves:

1. Ball Valves, NPS 2 and Smaller: Two-piece, 600-psig CWP rating, copper alloy.
2. Butterfly Valves, NPS 2-1/2 and Larger: Flangeless or Single-flange, 150-psig CWP rating, ferrous alloy, with EPDM liner.
3. Grooved-End, Ductile-Iron Butterfly Valves, NPS 2-1/2 and Larger: 175-psig CWP rating.
4. Spring-Loaded, Lift-Disc Check Valves, NPS 2 and Smaller: Type IV, Class 125 minimum.

E. Select valves, except wafer and flangeless types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Solder-joint or threaded ends, except provide valves with threaded ends for condenser water, heating hot water, steam, and steam condensate services.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged or threaded ends.
3. For Steel Piping, NPS 2 and Smaller: Threaded ends.
4. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged or threaded ends.
5. For Steel Piping, NPS 5 and Larger: Flanged ends.
6. For Grooved-End, Copper Tubing and Steel Piping: Valve ends may be grooved.

3.3 VALVE INSTALLATION

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

C. Locate valves for easy access and provide separate support where necessary.

D. Install valves in horizontal piping with stem at or above center of pipe.

E. Install valves in position to allow full stem movement.

F. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Dual-Plate Check Valves: In horizontal or vertical position, between flanges.
3. Lift Check Valves: With stem upright and plumb.

3.4 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 15110

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 15127
METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Thermometers.
2. Gages.
3. Test plugs.

1.3 DEFINITIONS

A. CR: Chlorosulfonated polyethylene synthetic rubber.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated; include performance curves.

B. Product Certificates: For each type of thermometer and gage, signed by product manufacturer.

PART 2 - PRODUCTS

2.1 METAL-CASE, LIQUID-IN-GLASS THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Palmer - Wahl Instruments Inc.

2. Trerice, H. O. Co.
3. Weiss Instruments, Inc.
4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Case: Die-cast aluminum or brass, 7 inches long.

C. Tube: Red or blue reading, organic-liquid filled, with magnifying lens.

D. Tube Background: Satin-faced, nonreflective aluminum with permanently etched scale markings.

E. Window: Glass.

F. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.

G. Stem: Copper-plated steel, aluminum, or brass for thermowell installation and of length to suit installation.

H. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.2 THERMOWELLS

A. Manufacturers: Same as manufacturer of thermometer being used.

B. Description: Pressure-tight, socket-type metal fitting made for insertion into piping and of type, diameter, and length required to hold thermometer.

2.3 PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
2. Ernst Gage Co.
3. Eugene Ernst Products Co.
4. Marsh Bellofram.
5. Miljoco Corp.
6. Palmer - Wahl Instruments Inc.
7. Trerice, H. O. Co.
8. Weiss Instruments, Inc.
9. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Direct-Mounting, Dial-Type Pressure Gages: Indicating-dial type complying with ASME B40.100.

1. Case: Liquid-filled type, drawn steel or cast aluminum, 4-1/2-inch diameter.
2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.

3. Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is indicated.
4. Movement: Mechanical, with link to pressure element and connection to pointer.
5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
6. Pointer: Red or other dark-color metal.
7. Window: Glass.
8. Ring: Metal.
9. Accuracy: Grade A, plus or minus 1 percent of middle half scale.
10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure.
11. Range for Fluids under Pressure: Two times operating pressure.

C. Pressure-Gage Fittings:

1. Valves: NPS 1/4 brass or stainless-steel needle type.
2. Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

2.4 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flow Design, Inc.
2. MG Piping Products Co.
3. National Meter, Inc.
4. Peterson Equipment Co., Inc.
5. Sisco Manufacturing Co.
6. Trerice, H. O. Co.
7. Watts Industries, Inc.; Water Products Div.

B. Description: Corrosion-resistant brass or stainless-steel body with core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping.

C. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

D. Core Inserts: One or two self-sealing rubber valves.

1. Insert material for air, water, oil, or gas service at 20 to 200 deg F shall be CR.
2. Insert material for air or water service at minus 30 to plus 275 deg F shall be EPDM.

PART 3 - EXECUTION

3.1 THERMOMETER APPLICATIONS

A. Install liquid-in-glass thermometers in the following locations:

1. Inlet and outlet of each hydronic zone.
2. Inlet and outlet of each hydronic boiler.
3. Inlet and outlet of each hydronic coil in air-handling units and built-up central systems.

4. Inlet and outlet of each hydronic heat exchanger.
5. Inlet and outlet of each hydronic heat-recovery unit.

B. Provide the following temperature ranges for thermometers:

1. Heating Hot Water: 30 to 240 deg F, with 2-degree scale divisions.
2. Condenser Water: 0 to 160 deg F, with 2-degree scale divisions.
3. Chilled Water: 0 to 100 deg F, with 2-degree scale divisions.

3.2 GAGE APPLICATIONS

A. Install dry-case-type pressure gages for discharge of each pressure-reducing valve.

B. Install liquid-filled-case-type pressure gages at suction and discharge of each pump.

3.3 INSTALLATIONS

A. Install direct-mounting thermometers and adjust vertical and tilted positions.

B. Install thermowells with socket extending to center of pipe and in vertical position in piping tees where thermometers are indicated.

C. Install direct-mounting pressure gages in piping tees with pressure gage located on pipe at most readable position.

D. Install needle-valve and snubber fitting in piping for each pressure gage for fluids.

E. Install test plugs in tees in piping.

3.4 CONNECTIONS

A. Install gages adjacent to machines and equipment to allow service and maintenance for meters, gages, machines, and equipment.

3.5 ADJUSTING

A. Calibrate meters according to manufacturer's written instructions, after installation.

B. Adjust faces of meters and gages to proper angle for best visibility.

END OF SECTION 15127

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 15140
DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes domestic water piping inside the building.

B. Related Sections include the following:

1. Division 15 Section "Meters and Gages" for thermometers, pressure gages, and fittings.
2. Division 15 Section "Plumbing Specialties" for water distribution piping specialties.

1.3 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing domestic water piping systems with 125 psig, unless otherwise indicated.

1.4 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Pipe and Fitting Applications" Article for applications of pipe, tube, fitting, and joining materials.

B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.3 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.4 VALVES

A. Bronze and cast-iron, general-duty valves are specified in Division 15 Section "Valves."

B. Balancing and drain valves are specified in Division 15 Section "Plumbing Specialties."

PART 3 - EXECUTION

3.1 PIPE AND FITTING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground piping, unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-Building-Slab, Domestic Water Piping on House Side of Water Meter, NPS 4 and Smaller: Soft copper tube, Type L; copper pressure fittings; and soldered joints.

E. Aboveground Domestic Water Piping: Use any of the following piping materials for each size range:

1. NPS 1 and Smaller: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
2. NPS 1-1/4 and NPS 1-1/2: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
3. NPS 2: Hard copper tube, Type L; copper pressure fittings; and soldered joints.

3.2 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use bronze ball valves for piping NPS 2 and smaller. Use cast-iron butterfly valves with flanged ends for piping NPS 2-1/2 and larger.
2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 and smaller. Use cast-iron butterfly valves with flanged ends for piping NPS 2-1/2 and larger.
3. Hot-Water-Piping, Balancing Duty: Calibrated balancing valves.
4. Drain Duty: Hose-end drain valves.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball valves for piping NPS 2 and smaller. Use butterfly valves for piping NPS 2-1/2 and larger.

C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping.

1. Install hose-end drain valves at low points in water mains, risers, and branches.
2. Install stop-and-waste drain valves where indicated.

D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 and smaller and butterfly valves for piping NPS 2-1/2 and larger. Balancing valves are specified in Division 15 Section "Plumbing Specialties."

E. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Calibrated balancing valves are specified in Division 15 Section "Plumbing Specialties."

3.3 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

B. Install under-building-slab copper tubing according to CDA's "Copper Tube Handbook."

C. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Wall penetration systems are specified in Division 15 Section "Basic Mechanical Materials and Methods."

D. Install domestic water piping level and plumb.

3.4 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 HANGER AND SUPPORT INSTALLATION

A. Pipe hanger and support devices are specified in Division 15 Section "Hangers and Supports." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet: MSS Type 49, spring cushion rolls, if indicated.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 15 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

3.7 FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test domestic water piping as follows:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.8 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
    b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.9 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

    c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION 15140

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 15145
DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers.
2. Backflow preventers.
3. Balancing valves.
4. Temperature-actuated water mixing valves.
5. Strainers.
6. Outlet boxes.
7. Hose bibbs.
8. Drain valves.
9. Water hammer arresters.
10. Air vents.
11. Trap-seal primer valves.

B. Related Sections include the following:

1. Division 15 Section "Meters and Gages" for thermometers, pressure gages, and flow meters in domestic water piping.
2. Division 15 Section "Emergency Plumbing Fixtures" for water tempering equipment.

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. NSF Compliance:

1. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Ames Co.
   b. Conbraco Industries, Inc.
   c. FEBCO; SPX Valves & Controls.
   d. Watts Industries, Inc.; Water Products Div.
   e. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1001.
3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Chrome plated.

B. Hose-Connection Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Conbraco Industries, Inc.
   b. Legend Valve.
   c. MIFAB, Inc.
   d. Watts Industries, Inc.; Water Products Div.
   e. Woodford Manufacturing Company.
   f. Zurn Plumbing Products Group; Light Commercial Operation.
   g. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.

5. Finish: Chrome or nickel-plated.

C. Pressure Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Ames Co.
   b. Conbraco Industries, Inc.
   c. FEBCO; SPX Valves & Controls.
   d. Watts Industries, Inc.; Water Products Div.
   e. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1020.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
5. Size: Refer to drawing.
6. Accessories:

   a. Valves: Ball type, on inlet and outlet.

2.2 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Watts Industries, Inc.; Water Products Div.

2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
5. Body: Bronze.
6. End Connections: Threaded.
7. Configuration: Designed for horizontal, straight through flow.
8. Accessories:

   a. Valves: Ball type with threaded ends on inlet and outlet.
   b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Double-Check Backflow-Prevention Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Watts Industries, Inc.; Water Products Div.

2. Standard: ASSE 1015.
3. Operation: Continuous-pressure applications, unless otherwise indicated.

4. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
5. Body: Cast iron with interior lining complying with AWWA C550 or that is FDA approved.
6. End Connections: Flanged.
7. Configuration: Designed for horizontal, straight through flow.
8. Accessories:

    a. Valves: Outside screw and yoke gate-type with flanged ends on inlet and outlet.

2.3 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ITT Industries; Bell & Gossett Div.
    b. NIBCO, Inc.
    c. TAC Americas.
    d. Watts Industries, Inc.; Water Products Div.

2. Type: Ball or Y-pattern globe valve with two readout ports and memory setting indicator.
3. Body: Brass or bronze.
4. Size: Same as connected piping, but not larger than NPS 2.
5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

2.4 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Individual-Fixture, Water Tempering Valves (MV-1):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Cash Acme.
    b. Conbraco Industries, Inc.
    c. Honeywell Water Controls.
    d. Lawler Manufacturing Company, Inc.
    e. Leonard Valve Company.
    f. Powers; a Watts Industries Co.
    g. Watts Industries, Inc.; Water Products Div.
    h. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1016, thermostatically controlled water tempering valve.
3. Pressure Rating: 125 psig minimum, unless otherwise indicated.
4. Body: Bronze body with corrosion-resistant interior components.
5. Temperature Control: Adjustable.
6. Inlets and Outlet: Threaded.
7. Finish: Rough or chrome-plated bronze.

8. Tempered-Water Setting: 105 deg F.
9. Tempered-Water Design Flow Rate: 0.5 gpm.

2.5 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Perforation Size:

    a. Strainers NPS 2 and Smaller: 0.020 inch.
    b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.
    c. Strainers NPS 5 and Larger: 0.10 inch.

6. Drain: Factory-installed, hose-end drain valve.

2.6 OUTLET BOXES

A. Icemaker Outlet Boxes (OB-1):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Acorn Engineering Company.
    b. IPS Corporation.
    c. LSP Products Group, Inc.
    d. Oatey.
    e. Plastic Oddities; a division of Diverse Corporate Technologies.

2. Mounting: Recessed.
3. Material and Finish: Enameled-steel or epoxy-painted-steel box and faceplate.
4. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 or smaller copper tube outlet.
5. Supply Shutoff Fitting: NPS 1/2 ball valve and NPS 1/2 copper, water tubing.

2.7 HOSE BIBBS

A. Hose Bibbs (HB-1):

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.

7. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Chrome or nickel plated.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Operating key.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.8 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.9 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company.
    b. MIFAB, Inc.
    c. PPP Inc.
    d. Sioux Chief Manufacturing Company, Inc.
    e. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    f. Tyler Pipe; Wade Div.
    g. Watts Drainage Products Inc.
    h. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.10 AIR VENTS

A. Bolted-Construction Automatic Air Vents:

1. Body: Bronze.
2. Pressure Rating: 125-psig minimum pressure rating at 140 deg F.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

B. Welded-Construction Automatic Air Vents:

1. Body: Stainless steel.
2. Pressure Rating: 150-psig minimum pressure rating.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

2.11 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. MIFAB, Inc.
   b. PPP Inc.
   c. Sioux Chief Manufacturing Company, Inc.
   d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   e. Watts Industries, Inc.; Water Products Div.

2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Rough bronze.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.

B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
3. Do not install bypass piping around backflow preventers.

C. Install balancing valves in locations where they can easily be adjusted.

D. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install thermometers and water regulators if specified.

E. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, and pump.

F. Install outlet boxes recessed in wall. Install 2-by-4-inch fire-retardant-treated-wood blocking wall reinforcement between studs. Fire-retardant-treated-wood blocking is specified in Division 6 Section "Rough Carpentry."

G. Install water hammer arresters in water piping according to PDI-WH 201.

H. Install air vents at high points of water piping.

I. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping and specialties.

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Pressure vacuum breakers.
2. Calibrated balancing valves.
3. Thermostatic, water-mixing-valve assemblies.
4. Supply-type, trap-seal primer valves.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 15 Section "Mechanical Identification."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each pressure vacuum breaker, reduced-pressure-principle backflow preventer, double-check backflow-prevention assembly and double-check, backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.5 ADJUSTING

A. Set field-adjustable flow set points of balancing valves.

B. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 15145

SECTION 15150
SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following for soil, waste, and vent piping inside the building:

1. Pipe, tube, and fittings.

1.3 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.5 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.

C. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.

a. Manufacturers:

1) ANACO.
2) Fernco, Inc.
3) Ideal Div.; Stant Corp.
4) Mission Rubber Co.
5) Tyler Pipe; Soil Pipe Div.

2.4 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.

2.5 COPPER TUBE AND FITTINGS

A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Aboveground, soil and waste piping NPS 4 and smaller shall be the following:

1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
2. Copper DWV tube, copper drainage fittings and soldered joints.

B. Aboveground, vent piping NPS 4 and smaller shall be the following:

1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.

C. Underground, soil, waste, and vent piping NPS 4 and smaller shall be the following:

1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

3.3 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

B. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 15 Section "Basic Mechanical Materials and Methods."

C. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

D. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

E. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of

lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

F. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

G. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

H. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

I. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

B. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

D. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.5 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 15 Section "Hangers and Supports." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs according to the following:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 15 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.

F. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.8 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.9 PROTECTION

A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION 15150

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 15155
DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following drainage piping specialties:

1. Cleanouts.
2. Floor drains.
3. Miscellaneous drainage piping specialties.

1.3 DEFINITIONS

A. PE: Polyethylene plastic.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:

1. Cleanouts.
2. Floor drains.

B. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary and storm piping specialty components.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company; Josam Div.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Tyler Pipe; Wade Div.
   e. Watts Drainage Products Inc.
   f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, cast-iron plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Metal Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company; Josam Div.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Tyler Pipe; Wade Div.
   e. Watts Drainage Products Inc.
   f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M for adjustable housing cast-iron soil pipe with cast-iron ferrule heavy-duty, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Heavy-duty, adjustable housing.
5. Clamping Device: Not required.
6. Outlet Connection: Threaded.
7. Closure: Brass plug with tapered threads.
8. Adjustable Housing Material: Cast iron with threads.
9. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
10. Frame and Cover Shape: Round.
11. Top Loading Classification: Medium Duty.
12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company; Josam Div.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Tyler Pipe; Wade Div.
   e. Watts Drainage Products Inc.
   f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
5. Closure: Countersunk or raised-head, drilled-and-threaded cast-iron plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

2.2 FLOOR DRAINS

A. Floor Drains, (FD-1):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company; Josam Div.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Tyler Pipe; Wade Div.
   e. Watts Drainage Products Inc.
   f. Zurn Plumbing Products Group; Light Commercial Operation.
   g. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Anchor Flange: Not required.
7. Clamping Device: Not required.
8. Outlet: Bottom.
9. Coating on Interior and Exposed Exterior Surfaces: Not required.
10. Sediment Bucket: Not required.
11. Top or Strainer Material: Nickel bronze.
12. Top of Body and Strainer Finish: Nickel bronze.
13. Top Shape: Square.
14. Dimensions of Top or Strainer: 6" x 6" adjustable strainer with square openings and 3" outlet.
15. Top Loading Classification: Medium Duty.

16. Funnel: Not required.
17. Inlet Fitting: Not required.
18. Trap Material: Cast iron.
19. Trap Pattern: Deep-seal P-trap.
20. Trap Features: Trap-seal primer valve drain connection.

2.3 FLOOR SINKS

A. Floor Sinks (FS-1):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company; Josam Div.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Zurn Plumbing Products Group; Light Commercial Operation.
    g. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Anchor Flange: Not required.
7. Clamping Device: Not required.
8. Outlet: Bottom.
9. Coating on Interior and Exposed Exterior Surfaces: Required.
10. Sediment Bucket: Not required.
11. Top or Strainer Material: Nickel bronze.
12. Top of Body and Strainer Finish: Nickel bronze.
13. Top Shape: Square.
14. Dimensions of Top or Strainer: 12" x 12" x 8" deep body, 9-1/2" square opening with half grate, aluminum anti-splash interior dome strainer and 3" outlet.
15. Top Loading Classification: Medium Duty.
16. Funnel: Not required.
17. Inlet Fitting: Not required.
18. Trap Material: Cast iron.
19. Trap Pattern: Deep-seal P-trap.

2.4 MISCELLANEOUS DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.

    a. NPS 2: 4-inch- minimum water seal.
    b. NPS 2-1/2 and Larger: 5-inch- minimum water seal.

C. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
    c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Assemble open drain fittings and install with top of hub 2 inches above floor.

G. Install deep-seal traps on floor drains and other waste outlets, if indicated.

H. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

I. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

J. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 15155

SECTION 15160
STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following storm drainage piping inside the building:

1. Pipe, tube, and fittings.

1.3 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working-pressure, unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water.

1.5 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.

a. Manufacturers:

1) ANACO.
2) Fernco, Inc.
3) Ideal Div.; Stant Corp.
4) Mission Rubber Co.
5) Tyler Pipe; Soil Pipe Div.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Aboveground storm drainage piping NPS 6 and smaller shall be the following:

1. Hubless cast-iron soil pipe and fittings; standard shielded, stainless-steel couplings; and coupled joints.

C. Underground storm drainage piping NPS 6 and smaller shall be the following:

1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

3.3 PIPING INSTALLATION

A. Storm sewer and drainage piping outside the building are specified in Division 2 Section "Storm Drainage."

B. Basic piping installation requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 15 Section "Basic Mechanical Materials and Methods."

D. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

E. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

F. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:

1. Building Storm Drain: 1 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.

G. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

H. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

B. Hubless Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

3.5 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 15 Section "Hangers and Supports." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 15 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6: 60 inches with 3/4-inch rod.

F. Install supports for vertical cast-iron soil piping every 15 feet.

G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Test Procedure: Test storm drainage piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.8 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 15160

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 15165
STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following storm drainage piping specialties:

1. Cleanouts.

1.3 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

1.6 COORDINATION

A. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company; Josam Div.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Metal Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company; Josam Div.
    b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    c. Tyler Pipe; Wade Div.
    d. Watts Drainage Products Inc.
    e. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M for adjustable housing and cast-iron soil pipe with cast-iron ferrule cleanout.
3. Size: Same as connected branch.
4. Type: Adjustable housing and Cast-iron soil pipe with cast-iron ferrule.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Not required.
7. Outlet Connection: Spigot.
8. Closure: Brass plug with tapered threads.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Light Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company; Josam Div.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Tyler Pipe; Wade Div.
   e. Watts Drainage Products Inc.
   f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
8. Wall Access: Round, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 15 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 15165

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 15181
HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:

1. Hot-water heating piping.
2. Makeup-water piping.
3. Condensate-drain piping.
4. Air-vent piping.

B. Related Sections include the following:

1. Division 15 Section "Hydronic Pumps" for pumps, motors, and accessories for hydronic piping.

1.3 DEFINITIONS

A. PTFE: Polytetrafluoroethylene.

1.4 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:

1. Hot-Water Heating Piping: 30 psig at 200 deg F.
2. Makeup-Water Piping: 80 psig at 150 deg F.
3. Air-Vent Piping: 200 deg F.

1.5 SUBMITTALS

A. Product Data: For each type of the following:

1. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
2. Air control devices.
3. Hydronic specialties.

B. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.

B. Annealed-Temper Copper Tubing: ASTM B 88, Type K.

C. Wrought-Copper Fittings: ASME B16.22.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anvil International, Inc.
b. S. P. Fittings; a division of Star Pipe Products.
c. Victaulic Company of America.

2. Grooved-End Copper Fittings: ASTM B 75, copper tube or ASTM B 584, bronze casting.
3. Grooved-End-Tube Couplings: Rigid pattern, unless otherwise indicated; gasketed fitting. Ductile-iron housing with keys matching pipe and fitting grooves, prelubricated EPDM gasket rated for minimum 230 deg F for use with housing, and steel bolts and nuts.

D. Wrought-Copper Unions: ASME B16.22.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.

B. Grooved Mechanical-Joint Fittings and Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Anvil International, Inc.
   b. National Fittings, Inc.
   c. S. P. Fittings; a division of Star Pipe Products.
   d. Victaulic Company of America.

2. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
3. Couplings: Ductile- or malleable-iron housing and synthetic rubber gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.

C. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.3 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

B. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

C. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric-Flange Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Central Plastics Company.
   d. Pipeline Seal and Insulator, Inc.

2. Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
3. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

D. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Perfection Corporation; a subsidiary of American Meter Company.
   b. Precision Plumbing Products, Inc.
   c. Sioux Chief Manufacturing Company, Inc.
   d. Victaulic Company of America.

2. Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.5 VALVES

A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Division 15 Section "Valves."

B. Bronze, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Armstrong Pumps, Inc.
   b. Bell & Gossett Domestic Pump; a division of ITT Industries.
   c. Flow Design Inc.
   d. Griswold Controls.
   e. Taco.

2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.

7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig.
10. Maximum Operating Temperature: 250 deg F.

C. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Armstrong Pumps, Inc.
    b. Bell & Gossett Domestic Pump; a division of ITT Industries.
    c. Flow Design Inc.
    d. Griswold Controls.
    e. Tour & Andersson; available through Victaulic Company of America.

2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Stem Seals: EPDM O-rings.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: PTFE.
7. End Connections: Flanged or grooved.
8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
9. Handle Style: Lever, with memory stop to retain set position.
10. CWP Rating: Minimum 125 psig.
11. Maximum Operating Temperature: 250 deg F.

D. Diaphragm-Operated, Pressure-Reducing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Amtrol, Inc.
    b. Armstrong Pumps, Inc.
    c. Bell & Gossett Domestic Pump; a division of ITT Industries.
    d. Conbraco Industries, Inc.
    e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.
5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.
7. Low inlet-pressure check valve.
8. Inlet Strainer: Brass, removable without system shutdown.
9. Valve Seat and Stem: Noncorrosive.
10. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

2.6 AIR CONTROL DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amtrol, Inc.
2. Armstrong Pumps, Inc.
3. Bell & Gossett Domestic Pump; a division of ITT Industries.
4. Taco.

B. Manual Air Vents:

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2.
5. Discharge Connection: NPS 1/8.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 225 deg F.

C. Automatic Air Vents:

1. Body: Bronze or cast iron.
2. Internal Parts: Nonferrous.
3. Operator: Noncorrosive metal float.
4. Inlet Connection: NPS 1/2.
5. Discharge Connection: NPS 1/4.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 240 deg F.

D. Bladder-Type Expansion Tanks:

1. Tank: Welded steel, rated for 125-psig working pressure and 375 deg F maximum operating temperature. Factory test with taps fabricated and supports installed and labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Bladder: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.
3. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.

E. Tangential-Type Air Separators:

1. Tank: Welded steel; ASME constructed and labeled for 125-psig minimum working pressure and 375 deg F maximum operating temperature.
2. Air Collector Tube: Perforated stainless steel, constructed to direct released air into expansion tank.
3. Tangential Inlet and Outlet Connections: Threaded for NPS 2 and smaller; flanged connections for NPS 2-1/2 and larger.
4. Blowdown Connection: Threaded.
5. Size: Match system flow capacity.

2.7 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

B. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

B. Hot-water heating piping, aboveground, NPS 2-1/2 and larger, shall be the following:

1. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.

C. Hot-water heating piping installed belowground and within slabs shall be the following:

1. Type K, annealed-temper copper tubing, wrought-copper fittings, and soldered joints. Use the fewest possible joints.

D. Makeup-water piping installed aboveground shall be the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

E. Condensate-Drain Piping: Type M, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

F. Air-Vent Piping:

1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.
2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.

3.2 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.

B. Install calibrated-orifice, balancing valves at each branch connection to return main.

C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

D. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.3 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install valves according to Division 15 Section "Valves."

Q. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

R. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

S. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

T. Install expansion loops, expansion joints, anchors, and pipe alignment guides as specified in Division 15 Section "Pipe Expansion Fittings and Loops."

U. Identify piping as specified in Division 15 Section "Mechanical Identification."

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Division 15 Section "Hangers and Supports." Comply with the following requirements for maximum spacing of supports.

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

C. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 7 feet; minimum rod size, 1/4 inch.
2. NPS 1: Maximum span, 7 feet; minimum rod size, 1/4 inch.
3. NPS 1-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 3/8 inch.
6. NPS 3: Maximum span, 12 feet; minimum rod size, 3/8 inch.
7. NPS 4: Maximum span, 14 feet; minimum rod size, 1/2 inch.
8. NPS 6: Maximum span, 17 feet; minimum rod size, 1/2 inch.
9. NPS 8: Maximum span, 19 feet; minimum rod size, 5/8 inch.

10. NPS 10: Maximum span, 20 feet; minimum rod size, 3/4 inch.

D. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
4. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
6. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.

E. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.

3.6 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Manual vents at heat-transfer coils and elsewhere as required for air venting.

C. Install piping from boiler air outlet, air separator, or air purger to expansion tank with a 2 percent upward slope toward tank.

D. Install tangential air separator in pump suction. Install blowdown piping with gate or full-port ball valve; extend full size to nearest floor drain.

E. Install expansion tanks above the air separator. Install tank fitting in tank bottom and charge tank. Use manual vent for initial fill to establish proper water level in tank.

1. Install tank fittings that are shipped loose.

2. Support tank from floor or structure above with sufficient strength to carry weight of tank, piping connections, fittings, plus tank full of water. Do not overload building components and structural members.

F. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure tank is properly charged with air to suit system Project requirements.

3.7 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections according to Division 15 Section "Meters and Gages."

3.8 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."

5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION 15181

SECTION 15183
REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-22:

1. Suction Lines for Air-Conditioning Applications: 185 psig.
2. Hot-Gas and Liquid Lines: 325 psig.

1.4 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:

1. Thermostatic expansion valves.
2. Solenoid valves.
3. Hot-gas bypass valves.
4. Filter dryers.
5. Strainers.
6. Pressure-regulating valves.

B. Welding certificates.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

2.2 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

B. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

C. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

D. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 115-V ac coil.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.
8. Manual operator.

E. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat Disc: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig.
6. Maximum Operating Temperature: 240 deg F.

F. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: 40 deg F.
6. Superheat: Nonadjustable.
7. Reverse-flow option (for heat-pump applications).
8. End Connections: Socket, flare, or threaded union.
9. Working Pressure Rating: 450 psig.

G. Straight-Type Strainers:

1. Body: Welded steel with corrosion-resistant coating.
2. Screen: 100-mesh stainless steel.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig.
5. Maximum Operating Temperature: 275 deg F.

H. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.
2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig.
6. Maximum Operating Temperature: 275 deg F.

I. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 240 deg F.

J. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina.
4. End Connections: Socket.
5. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
6. Maximum Pressure Loss: 2 psig.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 240 deg F.

K. Permanent Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 240 deg F.

L. Mufflers:

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or flare.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F.

M. Receivers: Comply with ARI 495.

1. Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
2. Comply with UL 207; listed and labeled by an NRTL.
3. Body: Welded steel with corrosion-resistant coating.
4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
5. End Connections: Socket or threaded.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

N. Liquid Accumulators: Comply with ARI 495.

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F.

2.3 REFRIGERANTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

B. ASHRAE 34, R-22: Monochlorodifluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-22

A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

B. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless or packed-angle valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless or packed-angle valves on inlet and outlet side of filter dryers.

E. Install a full-sized, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

L. Install receivers sized to accommodate pump-down charge.

M. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss,

expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Division 15 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 8 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

R. Seal penetrations through fire and smoke barriers according to Division 7 Section "Through-Penetration Firestop Systems."

S. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

T. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

U. Seal pipe penetrations through exterior walls according to Division 7 Section "Joint Sealants" for materials and methods.

V. Identify refrigerant piping and valves according to Division 15 Section "Mechanical Identification."

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

F. Threaded Joints: Thread steel pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12/D10.12M.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Division 15 Section "Hangers and Supports."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.

2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 15183

SECTION 15185
HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Separately coupled, horizontal, in-line centrifugal pumps.
2. Separately coupled, base-mounted, end-suction centrifugal pumps.

1.3 SUBMITTALS

A. Product Data: Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.

B. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

B. Store pumps in dry location.

C. Retain protective covers for flanges and protective coatings during storage.

D. Protect bearings and couplings against damage from sand, grit, and other foreign matter.

E. Comply with pump manufacturer's written rigging instructions.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Mechanical Seals: One mechanical seal for each pump.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SEPARATELY COUPLED, HORIZONTAL, IN-LINE CENTRIFUGAL PUMPS

A. Manufacturers:

1. Bell & Gossett; Div. of ITT Industries.
2. Taco, Inc.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally. Rate pump for 125-psig minimum working pressure and a continuous water temperature of 225 deg F.

C. Pump Construction:

1. Casing: Radially split, cast iron, with threaded gage tappings at inlet and outlet, and threaded companion-flange connections.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, and keyed to shaft. Trim impeller to match specified performance.
3. Pump Shaft: Stainless steel.
4. Mechanical Seal: Carbon rotating ring against a ceramic seat held by a stainless-steel spring, and Buna-N bellows and gasket. Include water slinger on shaft between motor and seal.

5. Pump Bearings: Oil lubricated; bronze-journal or thrust type.

D. Shaft Coupling: Molded rubber insert with interlocking spider or Interlocking frame with interconnecting springs capable of absorbing vibration.

E. Motor: Single speed, with oil-lubricated sleeve bearings, unless otherwise indicated; and resiliently mounted to pump casing. Comply with requirements in Division 15 Section "Motors."

2.3 SEPARATELY COUPLED, BASE-MOUNTED, END-SUCTION CENTRIFUGAL PUMPS

A. Manufacturers:

1. Bell & Gossett; Div. of ITT Industries.
2. Taco, Inc.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, end-suction pump as defined in HI 1.1-1.2 and HI 1.3; designed for base mounting, with pump and motor shafts horizontal. Rate pump for 175-psig minimum working pressure and a continuous water temperature of 225 deg F.

C. Pump Construction:

1. Casing: Radially split, cast iron, with replaceable bronze wear rings, threaded gage tappings at inlet and outlet, drain plug at bottom and air vent at top of volute, and threaded companion-flange or flanged connections. Provide integral mount on volute to support the casing, and attached piping to allow removal and replacement of impeller without disconnecting piping or requiring the realignment of pump and motor shaft.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. Trim impeller to match specified performance.
3. Pump Shaft: Steel, with copper-alloy shaft sleeve.
4. Mechanical Seal: Carbon rotating ring against a ceramic seat held by a stainless-steel spring, and EPT bellows and gasket.
5. Packing Seal: Stuffing box, with a minimum of four rings of graphite-impregnated braided yarn with bronze lantern ring between center two graphite rings, and bronze packing gland.
6. Pump Bearings: Grease-lubricated ball bearings contained in cast-iron housing with grease fittings.

D. Shaft Coupling: Molded rubber insert and interlocking spider capable of absorbing vibration. Couplings shall be drop-out type to allow disassembly and removal without removing pump shaft or motor.

E. Coupling Guard: Dual rated; ANSI B15.1, Section 8; OSHA 1910.219 approved; steel; removable; attached to mounting frame.

F. Mounting Frame: Welded-steel frame and cross members, factory fabricated from ASTM A 36/A 36M channels and angles. Fabricate to mount pump casing, coupling guard, and motor.

2.4 PUMP SPECIALTY FITTINGS

A. Suction Diffuser: Angle pattern, 175-psig pressure rating, cast-iron body and end cap, pump-inlet fitting; with bronze startup and bronze or stainless-steel permanent strainers; bronze or stainless-steel straightening vanes; drain plug; and factory-fabricated support.

B. Triple-Duty Valve: Angle or straight pattern, 175-psig pressure rating, cast-iron body, pump-discharge fitting; with drain plug and bronze-fitted shutoff, balancing, and check valve features. Brass gage ports with integral check valve, and orifice for flow measurement.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.

C. Examine foundations and inertia bases for suitable conditions where pumps are to be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONCRETE BASES

A. Install concrete bases of dimensions indicated for pumps and controllers. Refer to Division 15 Section "Basic Mechanical Materials and Methods."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Cast-in-place concrete materials and placement requirements are specified in Division 3.

3.3 PUMP INSTALLATION

A. Comply with HI 1.4.

B. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.

C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

D. Install continuous-thread hanger rods and of sufficient size to support pump weight. Vibration isolation devices are specified in Division 15 Section "Mechanical Vibration and Seismic Controls." Fabricate brackets or supports as required. Hanger and support materials are specified in Division 15 Section "Hangers and Supports."

E. Set base-mounted pumps on concrete foundation. Disconnect coupling before setting. Do not reconnect couplings until alignment procedure is complete.

1. Support pump baseplate on rectangular metal blocks and shims, or on metal wedges with small taper, at points near foundation bolts to provide a gap of 3/4 to 1-1/2 inches between pump base and foundation for grouting.
2. Adjust metal supports or wedges until pump and driver shafts are level. Check coupling faces and suction and discharge flanges of pump to verify that they are level and plumb.

3.4 ALIGNMENT

A. Align pump and motor shafts and piping connections after setting on foundation, grout has been set and foundation bolts have been tightened, and piping connections have been made.

B. Comply with pump and coupling manufacturers' written instructions.

C. Adjust pump and motor shafts for angular and offset alignment by methods specified in HI 1.1-1.5, "Centrifugal Pumps for Nomenclature, Definitions, Application and Operation."

D. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with nonshrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

3.5 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect piping to pumps. Install valves that are same size as piping connected to pumps.

D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

E. Install check valve and throttling or triple-duty valve on discharge side of pumps.

F. Install Y-type strainer or suction diffuser and shutoff valve on suction side of pumps.

G. Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves.

H. Install pressure gages on pump suction and discharge, at integral pressure-gage tapping, or install single gage with multiple input selector valve.

I. Install check valve and gate or ball valve on each condensate pump unit discharge.

J. Install electrical connections for power, controls, and devices.

K. Ground equipment according to Division 16 Section "Grounding and Bonding."

L. Connect wiring according to Division 16 Section "Conductors and Cables."

3.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping.
4. Perform the following startup checks for each pump before starting:

    a. Verify bearing lubrication.
    b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
    c. Verify that pump is rotating in the correct direction.

5. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
6. Start motor.
7. Open discharge valve slowly.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 15185

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 15189
HVAC WATER TREATMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following HVAC water-treatment systems:

1. Bypass chemical-feed equipment and controls.
2. Chemical treatment test equipment.
3. HVAC water-treatment chemicals.

1.3 DEFINITIONS

A. TDS: Total dissolved solids.

1.4 PERFORMANCE REQUIREMENTS

A. Water quality for HVAC systems shall minimize corrosion, scale buildup, and biological growth for optimum efficiency of HVAC equipment without creating a hazard to operating personnel or the environment.

B. Base HVAC water treatment on quality of water available at Project site, HVAC system equipment material characteristics and functional performance characteristics, operating personnel capabilities, and requirements and guidelines of authorities having jurisdiction.

C. Closed hydronic systems, including hot-water heating and chilled water, shall have the following water qualities:

1. pH: Maintain a value within 9.0 to 10.5.
2. "P" Alkalinity: Maintain a value within 100 to 500 ppm.
3. Boron: Maintain a value within 100 to 200 ppm.
4. Chemical Oxygen Demand: Maintain a maximum value of 100 ppm.
5. Soluble Copper: Maintain a maximum value of 0.20 ppm.
6. TDS: Maintain a maximum value of 10 ppm.

7. Ammonia: Maintain a maximum value of 20 ppm.
8. Free Caustic Alkalinity: Maintain a maximum value of 20 ppm.
9. Microbiological Limits:

    a. Total Aerobic Plate Count: Maintain a maximum value of 1000 organisms/ml.
    b. Total Anaerobic Plate Count: Maintain a maximum value of 100 organisms/ml.
    c. Nitrate Reducers: Maintain a maximum value of 100 organisms/ml.
    d. Sulfate Reducers: Maintain a maximum value of 0 organisms/ml.
    e. Iron Bacteria: Maintain a maximum value of 0 organisms/ml.

1.5 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for the following products:

1. Bypass feeders.
2. Water meters.
3. Chemical test equipment.
4. Chemical material safety data sheets.

B. Field quality-control test reports.

C. Other Informational Submittals:

1. Water Analysis: Illustrate water quality available at Project site.

1.6 QUALITY ASSURANCE

A. HVAC Water-Treatment Service Provider Qualifications: An experienced HVAC water-treatment service provider capable of analyzing water qualities, installing water-treatment equipment, and applying water treatment as specified in this Section.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Enerco.

2.2 MANUAL CHEMICAL-FEED EQUIPMENT

A. Bypass Feeders: Steel, with corrosion-resistant exterior coating, minimum 3-1/2-inch fill opening in the top, and NPS 3/4 bottom inlet and top side outlet. Quarter turn or threaded fill cap with gasket seal and diaphragm to lock the top on the feeder when exposed to system pressure in the vessel.

1. Capacity: 5 gal..
2. Minimum Working Pressure: 125 psig.

2.3 AUTOMATIC CHEMICAL-FEED EQUIPMENT

A. Water Meter:

1. AWWA C700, oscillating-piston, magnetic-drive, totalization meter.
2. Body: Bronze.
3. Minimum Working-Pressure Rating: 150 psig.
4. Maximum Pressure Loss at Design Flow: 3 psig.
5. Registration: Gallons or cubic feet.
6. End Connections: Threaded.
7. Controls: Flow-control switch with normally open contacts; rated for maximum 10 A, 250-V ac; and that will close at adjustable increments of total flow.

2.4 CHEMICAL TREATMENT TEST EQUIPMENT

A. Test Kit: Manufacturer-recommended equipment and chemicals in a wall-mounting cabinet for testing pH, TDS, inhibitor, chloride, alkalinity, and hardness; sulfite and testable polymer tests for high-pressure boilers, and oxidizing biocide test for open cooling systems.

B. Sample Cooler:

1. Tube: Sample.

   a. Size: NPS 1/4 tubing.
   b. Material: ASTM A 666, Type 316 stainless steel.
   c. Pressure Rating: Minimum 2000 psig.
   d. Temperature Rating: Minimum 850 deg F.

2. Shell: Cooling water.

   a. Material: ASTM A 666, Type 304 stainless steel.
   b. Pressure Rating: Minimum 250 psig.
   c. Temperature Rating: Minimum 450 deg F.

3. Capacities and Characteristics:

   a. Tube: Sample.

      1) Flow Rate: 0.25 gpm.
      2) Entering Temperature: 400 deg F.

3) Leaving Temperature: 88 deg F.
4) Pressure Loss: 6.5 psig.

b. Shell: Cooling water.

1) Flow Rate: 3 gpm.
2) Entering Temperature: 70 deg F.
3) Pressure Loss: 1.0 psig.

C. Corrosion Test-Coupon Assembly: Constructed of corrosive-resistant material, complete with piping, valves, and mild steel and copper coupons. Locate copper coupon downstream from mild steel coupon in the test-coupon assembly.

1. Two-station rack for closed-loop systems.

2.5 CHEMICALS

A. Chemicals shall be as recommended by water-treatment system manufacturer that are compatible with piping system components and connected equipment, and that can attain water quality specified in Part 1 "Performance Requirements" Article.

PART 3 - EXECUTION

3.1 WATER ANALYSIS

A. Perform an analysis of supply water to determine quality of water available at Project site.

3.2 INSTALLATION

A. Install chemical application equipment on concrete bases, level and plumb. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible. Anchor chemical tanks and floor-mounting accessories to substrate.

B. Install water-testing equipment on wall near water chemical application equipment.

C. Install interconnecting control wiring for chemical treatment controls and sensors.

D. Mount sensors and injectors in piping circuits.

E. Bypass Feeders: Install in closed hydronic systems, including hot-water heating and chilled water, and equipped with the following:

1. Install bypass feeder in a bypass circuit around circulating pumps, unless otherwise indicated on Drawings.
2. Install water meter in makeup water supply.
3. Install test-coupon assembly in bypass circuit around circulating pumps, unless otherwise indicated on Drawings.

4. Install a gate or full-port ball isolation valves on inlet, outlet, and drain below feeder inlet.
5. Install a swing check on inlet after the isolation valve.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Make piping connections between HVAC water-treatment equipment and dissimilar-metal piping with dielectric fittings. Dielectric fittings are specified in Division 15 Section "Basic Mechanical Materials and Methods."

D. Install shutoff valves on HVAC water-treatment equipment inlet and outlet. Metal general-duty valves are specified in Division 15 Section "Valves."

E. Refer to Division 15 Section "Domestic Water Piping Specialties" for backflow preventers required in makeup water connections to potable-water systems.

F. Confirm applicable electrical requirements in Division 16 Sections for connecting electrical equipment.

G. Ground equipment according to Division 16 Section "Grounding and Bonding."

H. Connect wiring according to Division 16 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Tests and Inspections:

1. Inspect field-assembled components and equipment installation, including piping and electrical connections.
2. Inspect piping and equipment to determine that systems and equipment have been cleaned, flushed, and filled with water, and are fully operational before introducing chemicals for water-treatment system.
3. Place HVAC water-treatment system into operation and calibrate controls during the preliminary phase of HVAC systems' startup procedures.
4. Do not enclose, cover, or put piping into operation until it is tested and satisfactory test results are achieved.
5. Test for leaks and defects. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

6. Leave uncovered and unconcealed new, altered, extended, and replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
7. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow test pressure to stand for four hours. Leaks and loss in test pressure constitute defects.
8. Repair leaks and defects with new materials and retest piping until no leaks exist.

C. Remove and replace malfunctioning units and retest as specified above.

D. Comply with ASTM D 3370 and with the following standards:

1. Silica: ASTM D 859.
2. Steam System: ASTM D 1066.
3. Acidity and Alkalinity: ASTM D 1067.
4. Iron: ASTM D 1068.
5. Water Hardness: ASTM D 1126.

END OF SECTION 15189

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 15195
FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.
6. Mechanical sleeve seals.
7. Grout.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.

1.5 SUBMITTALS

A. Product Data: For each type of the following:

1. Piping specialties.
2. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
3. Pressure regulators. Indicate pressure ratings and capacities.
4. Dielectric fittings.
5. Mechanical sleeve seals.
6. Escutcheons.

B. Welding certificates.

C. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of natural-gas service.

2. Do not proceed with interruption of natural-gas service without Construction Manager's written permission.

1.9 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Division 8 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

    a. Material Group: 1.1.
    b. End Connections: Threaded or butt welding to match pipe.
    c. Lapped Face: Not permitted underground.
    d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
    e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.

5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.

    a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

B. Drawn-Temper Copper Tube: Comply with ASTM B 88, Type L.

1. Copper Fittings: ASME B16.22, wrought copper, and streamlined pattern.
2. Bronze Flanges and Flanged Fittings: ASME B16.24, Class 150.

    a. Gasket Material: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
    b. Bolts and Nuts: ASME B18.2.1, carbon steel or stainless steel.

3. Protective Coating for Underground Tubing: Factory-applied, extruded PE a minimum of 0.022 inch thick.

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig.
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches.

B. Quick-Disconnect Devices: Comply with ANSI Z21.41.

1. Copper-alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

C. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: **[40]** **[60]**-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

D. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

C. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. BrassCraft Manufacturing Company; a Masco company.
    b. Conbraco Industries, Inc.; Apollo Div.
    c. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Lee Brass Company.
   b. McDonald, A. Y. Mfg. Co.

2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Cast-Iron, Nonlubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. McDonald, A. Y. Mfg. Co.
   b. Mueller Co.; Gas Products Div.
   c. Xomox Corporation; a Crane company.

2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.5 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

B. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Canadian Meter Company Inc.
   b. Eaton Corporation; Controls Div.
   c. Harper Wyman Co.
   d. Maxitrol Company.
   e. SCP, Inc.

2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 1 psig.

2.6 SLEEVES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.7 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Advance Products & Systems, Inc.
   b. Calpico Inc.
   c. Metraflex Company (The).
   d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe and sleeve.
3. Pressure Plates: Stainless steel.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one nut and bolt for each sealing element.

2.8 ESCUTCHEONS

A. General Requirements for Escutcheons: Manufactured wall and ceiling escutcheons and floor plates, with ID to fit around pipe or tube, and OD that completely covers opening.

B. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Escutcheons: With set screw.

1. Finish: Polished chrome-plated.

D. Split-Casting, Cast-Brass Escutcheons: With concealed hinge and set screw.

1. Finish: Polished chrome-plated.

E. One-Piece, Stamped-Steel Escutcheons: With set screw and chrome-plated finish.

F. Split-Plate, Stamped-Steel Escutcheons: With concealed hinge, set screw, and chrome-plated finish.

G. One-Piece, Floor-Plate Escutcheons: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Escutcheons: Cast brass with concealed hinge and set screw.

2.9 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.10 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to the International Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with the International Fuel Gas Code requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Steel Piping with Protective Coating:

1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
3. Replace pipe having damaged PE coating with new pipe.

C. Copper Tubing with Protective Coating:

1. Apply joint cover kits over tubing to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.

D. Install fittings for changes in direction and branch connections.

E. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.

F. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 INDOOR PIPING INSTALLATION

A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Install escutcheons at penetrations of interior walls, ceilings, and floors.

1. New Piping:

    a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    b. Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
    c. Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type and set screw.
    d. Piping in Unfinished Service Spaces: One-piece, stamped-steel type with set screw.
    e. Piping in Equipment Rooms: One-piece, cast-brass type.
    f. Piping in Equipment Rooms: One-piece, stamped-steel type with set screw.
    g. Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."

M. Verify final equipment locations for roughing-in.

N. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

O. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

P. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

Q. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
2. In Floors: Install natural-gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1-1/2 inches of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
3. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.

    a. Exception: Tubing passing through partitions or walls does not require striker barriers.

4. Prohibited Locations:

    a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
    b. Do not install natural-gas piping in solid walls or partitions.

R. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

S. Connect branch piping from top or side of horizontal piping.

T. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

U. Do not use natural-gas piping as grounding electrode.

V. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

3.5 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.6 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hangers and supports specified in Division 15 Section "Hangers and Supports."

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

C. Install hangers for horizontal drawn-temper copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8: Maximum span, 48 inches; minimum rod size, 3/8 inch.
2. NPS 1/2 and NPS 5/8: Maximum span, 72 inches; minimum rod size, 3/8 inch.
3. NPS 3/4 and NPS 7/8: Maximum span, 84 inches; minimum rod size, 3/8 inch.
4. NPS 1: Maximum span, 96 inches; minimum rod size, 3/8 inch.

3.8 CONNECTIONS

A. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

B. Install piping adjacent to appliances to allow service and maintenance of appliances.

C. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 LABELING AND IDENTIFYING

A. Comply with requirements in Division 15 Section "Mechanical Identification" for piping and valve identification.

B. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under slabs.

3.10 PAINTING

A. Paint exposed, exterior metal piping, valves and piping specialties, except components, with factory-applied paint or protective coating.

1. Alkyd System: MPI EXT 5.1D.

    a. Prime Coat: Alkyd anticorrosive metal primer.
    b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
    c. Topcoat: Exterior alkyd enamel (semigloss).
    d. Color: Yellow.

B. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Test, inspect, and purge natural gas according to the International Fuel Gas Code and authorities having jurisdiction.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.12 OUTDOOR PIPING SCHEDULE

A. Aboveground natural-gas piping shall be one of the following:

1. Steel pipe with wrought-steel fittings and welded joints.
2. Drawn-temper copper tube with wrought-copper fittings and brazed joints.

3.13 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

A. Aboveground, branch piping NPS 2 and smaller shall be one of the following:

1. Annealed-temper, copper tube with wrought-copper fittings and brazed joints.
2. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

C. Underground, below building, piping shall be the following:

1. Steel pipe with wrought-steel fittings and welded joints.

D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

E. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.14 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 and smaller at service meter shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.

B. Valves for pipe sizes NPS 2-1/2 and larger at service meter shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.

2. Cast-iron, nonlubricated plug valve.

C. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.

D. Distribution piping valves for pipe sizes NPS 2-1/2 and larger shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Cast-iron, nonlubricated plug valve.

E. Valves in branch piping for single appliance shall be the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.

END OF SECTION 15195

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 15221
CHEMICAL-WASTE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following components for chemical-waste piping:

1. Single-wall piping.
2. Piping specialties.
3. Neutralization tanks.

1.3 DEFINITIONS

A. PE: Polyethylene plastic.

B. PP: Polypropylene plastic.

C. PVDF: Polyvinylidene fluoride plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Gravity-Flow Drainage Piping:

1. Single-Wall Piping Pressure Rating: 10 feet head of water.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Operation and Maintenance Data: For chemical-waste specialties to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain pipe, fittings, and joining materials for each piping system through one source from a single manufacturer.

1. Exception: Piping from different manufacturers may be used in same system if indicated and suitable transition fittings matching both piping materials are used.

B. Piping materials shall bear label, stamp, or other markings of specified testing laboratory.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties with sealing plugs in ends or with end protection.

B. Do not store plastic pipe or fittings in direct sunlight.

C. Protect pipe, fittings, and seals from dirt and damage.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Neutralization-Tank Limestone: Equal to 200 percent of amount required for each tank sump initial charge. Furnish limestone in 50-lb bags.

PART 2 - PRODUCTS

2.1 SINGLE-WALL PIPE AND FITTINGS

A. PVDF Drainage Pipe and Fittings: Pipe extruded and drainage-pattern fittings molded, with Schedule 40 dimensions, from PVDF resin complying with ASTM D 3222; with drainage-pattern fittings complying with ASTM D 3311 except with fusion- and mechanical-joint ends.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Orion Fittings, Inc.
b. Zurn Plumbing Products Group; Chemical Drainage Systems.

2.2 JOINING MATERIALS

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for commonly used joining materials.

B. Couplings: Assemblies with combination of clamps, gaskets, sleeves, and threaded or flanged parts; compatible with piping and system liquid; and made by piping manufacturer for joining system piping.

C. Adapters and Transition Fittings: Assemblies with combination of clamps, couplings, adapters, gaskets, and threaded or flanged parts; compatible with piping and system liquid; and made for joining different piping materials.

D. Flanges: Assemblies of companion flanges and gasket complying with ASME B16.21 and compatible with system liquid, and bolts and nuts.

2.3 PIPING SPECIALTIES

A. Corrosion-Resistant Traps:

1. Type: P-trap or drum trap.
2. Size: NPS 1-1/2 or NPS 2, as required to match connected piping.
3. PVDF: ASTM D 3222, with mechanical-joint pipe connections.

2.4 NEUTRALIZATION TANKS

A. Plastic Neutralization Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Orion Fittings, Inc.
    b. Schier Products Company.
    c. Sloane, George Fischer, Inc.
    d. Town & Country Plastics, Inc.
    e. Zurn Chemical Drainage Systems

2. Description: Corrosion-resistant plastic materials; with removable, gastight cover; interior, sidewall, dip-tube inlet; outlet; vent; and threaded or flanged, sidewall pipe connections.

    a. Material: ASTM D 4101, PP.
    b. Tank Capacity: 100 gal.
    c. Dip Tube: On outlet pipe instead of inlet pipe.
    d. Extension: HDPE, PE, or PP.
    e. Traffic Cover: Heavy-duty pedestrian or light-duty vehicular, steel plate over plastic, bolted.
    f. Limestone: Chips or lumps, with more than 90 percent calcium-carbonate content and 1- to 3-inch diameter.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 CONCRETE BASES

A. Anchor neutralization tanks to concrete bases.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 19-inch centers around full perimeter of base.
2. For installed equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be imbedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Concrete base construction requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

3.3 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground pressure piping, unless otherwise indicated.

C. Aboveground Chemical-Waste Piping: Use the following piping materials for each size range:

1. NPS 1-1/2 to NPS 6: PVDF drainage piping and electrofusion or mechanical joints.

D. Underground and/or Under Slab-on-Grade, Chemical-Waste Piping: Use the following piping materials for each size range:

1. NPS 1-1/2 to NPS 6: PP drainage piping and electrofusion joints.

3.4 PIPING INSTALLATION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.

B. Install piping next to equipment, accessories, and specialties to allow service and maintenance.

C. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

D. Flanges may be used on aboveground piping, unless otherwise indicated.

3.5 PIPING SPECIALTY INSTALLATION

A. Install piping specialties as components of connected chemical-waste piping system.

3.6 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction. Where specific joint construction is not indicated, follow piping manufacturer's written instructions.

B. Plastic-Piping Electrofusion Joints: Make polyolefin drainage-piping joints according to ASTM F 1290.

C. Plastic-Piping, Heat-Fusion Joints: Make polyolefin pressure-piping joints according to ASTM D 2657.

D. Dissimilar-Material Piping Joints: Make joints using adapters compatible with both system materials.

3.7 HANGER AND SUPPORT INSTALLATION

A. Pipe sizes in this Article refer to aboveground, single-wall piping.

B. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:

1. Vertical Piping: MSS Type 8 or MSS Type 42, riser clamps.
2. Individual, Straight, Horizontal Piping Runs:
    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet, if indicated: MSS Type 49, spring cushion rolls.
3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install supports according to Division 15 Section "Hangers and Supports."

D. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

E. Support vertical piping and tubing at base and at each floor.

F. Rod diameter may be reduced 1 size for double-rod hangers, to minimum of 3/8 inch.

G. Install vinyl-coated hangers for PVDF piping with the following maximum horizontal spacing and minimum rod diameters:

1. All Sizes: Install continuous support for piping with liquid above 140 deg F.
2. NPS 1/2 and Smaller: 30 inches with 3/8-inch rod.

3. NPS 3/4 to NPS 1-1/2: 36 inches with 3/8-inch rod.
4. NPS 2: 36 inches with 3/8-inch rod.
5. NPS 2-1/2 and NPS 3: 42 inches with 1/2-inch rod.
6. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
7. NPS 6: 48 inches with 3/4-inch rod.

H. Install supports for vertical PVDF piping NPS 1-1/2 every 48 inches and NPS 2 and larger every 72 inches.

I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.8 NEUTRALIZATION TANK INSTALLATION

A. Install neutralization tanks on smooth and level concrete base. Include full initial charge of limestone.

3.9 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.10 LABELING AND IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in Division 15 Section "Mechanical Identification."

B. Label pressure piping with system operating pressure.

3.11 CLEANING

A. Use procedures prescribed by authorities having jurisdiction or, if not prescribed, use procedures described below:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Clean piping by flushing with potable water.

END OF SECTION 15221

SECTION 15410
PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following conventional plumbing fixtures and related components:

1. Faucets for lavatories and sinks.
2. Laminar-flow faucet-spout outlets.
3. Flushometers.
4. Toilet seats.
5. Protective shielding guards.
6. Fixture supports.
7. Dishwasher air-gap fittings.
8. Water closets.
9. Lavatories.
10. Commercial sinks.

B. Related Sections include the following:

1. Division 10 Section "Toilet and Bath Accessories".
2. Division 15 Section "Plumbing Specialties" for backflow preventers, floor drains, and specialty fixtures not included in this Section.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

C. Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured-marble and solid-surface materials.

D. Cultured Marble: Cast-filled-polymer-plastic material with surface coating.

E. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

F. FRP: Fiberglass-reinforced plastic.

G. PVC: Polyvinyl chloride plastic.

H. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.4 SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

B. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.

C. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

F. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Stainless-Steel Commercial Sinks: NSF 2 construction.
2. Vitreous-China Fixtures: ASME A112.19.2M.

G. Comply with the following applicable standards and other requirements specified for sink faucets:

1. Faucets: ASME A112.18.1.
2. Hose-Connection Vacuum Breakers: ASSE 1011.
3. Hose-Coupling Threads: ASME B1.20.7.
4. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
5. NSF Potable-Water Materials: NSF 61.
6. Pipe Threads: ASME B1.20.1.
7. Supply Fittings: ASME A112.18.1.
8. Brass Waste Fittings: ASME A112.18.2.

H. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Brass and Copper Supplies: ASME A112.18.1.
3. Manual-Operation Flushometers: ASSE 1037.
4. Brass Waste Fittings: ASME A112.18.2.

I. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Hose-Coupling Threads: ASME B1.20.7.
2. Off-Floor Fixture Supports: ASME A112.6.1M.
3. Pipe Threads: ASME B1.20.1.
4. Plastic Toilet Seats: ANSI Z124.5.
5. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
2. Flushometer Valve, Repair Kits: One (1) of each type installed.

PART 2 - PRODUCTS

2.1 LAVATORY FAUCETS

A. Lavatory Faucets, Type 1:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Chicago Faucet Model No. 2200-4E2805CP or a comparable product by one of the following:

a. American Standard Companies, Inc.

b. Chicago Faucets.
c. Delta Faucet Company.
d. Eljer.
e. Kohler Co.
f. Speakman Company.
g. T & S Brass and Bronze Works, Inc.
h. Zurn Plumbing Products Group; Commercial Brass Operation.

2. Description: Single-control mixing valve. Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
3. Body Material: Commercial, solid brass.
4. Finish: Polished chrome plate.
5. Maximum Flow Rate: 0.5 gpm.
6. Centers: 4 inches.
7. Mounting: Deck, exposed.
8. Valve Handle(s): Lever.
9. Inlets: NPS 3/8 tubing, plain end.
10. Spout: Rigid type.
11. Spout Outlet: Vandal resistant aerator.
12. Operation: Non-compression, manual.
13. Drain: Grid
14. Tempering Device: Required, (MV-1).

2.2 SINK FAUCETS

A. Sink Faucet, Type 1:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Chicago Faucet Model No. 930-369-VRCP or a comparable product by one of the following:

a. Chicago Faucet Co.
b. Cambridge Brass; Div. Of Masco Corp.
c. Delta Faucet Co.; Div. Of Masco Corp.
d. T & S Brass and Bronze Works, Inc.
e. Water Saver Faucet Co.

2. Maximum Flow Rate: 2.5 gpm, unless otherwise indicated.
3. Body Material: Cast brass.
4. Finish: Polished chrome plate.
5. Type: Science sink faucet.
6. Mixing Valve: Two-lever handle.
7. Centers: Single hole.
8. Mounting: Deck, exposed.
9. Handle[s]: Lever.
10. Inlet[s]: NPS 3/8 plain-end tubing.
11. Spout: Rigid.
12. Spout Outlet: Serrated hose nozzle.
13. Vacuum Breaker: Required.
14. Operation: Non-compression, manual.

15. Drain: Not required.
16. Tempering Device: Required for accessible sinks only.

2.3 GAS TURRETS

A. Gas Turret, Type 1:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Chicago Faucet Model No. 980-VR909CAGCP or a comparable product by one of the following:

    a. Cambridge Brass; Div. of Masco Corp.
    b. Chicago Faucet Co.
    c. T & S Brass and Bronze Works, Inc.

2. Body Material: Cast brass.
3. Finish: Polished chrome plate.
4. Type: Deck mounted laboratory vandal proof turret.
5. Ground Key Cocks: One indexed gas.
6. Checks: Required.
7. Mounting: Deck, concealed.
8. Handle[s]: Lever.
9. Inlet[s]: NPS 3/8 male shank.
10. Spout Outlet: Serrated nozzle.
11. Operation: Non-compression, manual.

2.4 FLUSHOMETERS

A. Flushometers, Type 1:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Sloan Valve Company.
    b. Zurn.

2. Description: Flushometer for water-closet-type fixture. Include brass body with corrosion-resistant internal components, non-hold-open feature, control stop with check valve, vacuum breaker, copper or brass tubing, and polished chrome-plated finish on exposed parts.

    a. Internal Design: Diaphragm operation.
    b. Style: Exposed.
    c. Inlet Size: NPS 1.
    d. Trip Mechanism: Manual lever actuator.
    e. Consumption: 1.6 gal./flush.
    f. Tailpiece Size: NPS 1-1/2 and standard length to top of bowl.

2.5 TOILET SEATS

A. Toilet Seats, Type 1:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Standard Companies, Inc.
    b. Bemis Manufacturing Company.
    c. Centoco Manufacturing Corp.
    d. Church Seats.
    e. Eljer.
    f. Kohler Co.
    g. Olsonite Corp.

2. Description: Toilet seat for water-closet-type fixture.

    a. Material: Molded, solid plastic.
    b. Configuration: Open front without cover.
    c. Size: Elongated.
    d. Hinge Type: CK, check.
    e. Class: Heavy-duty commercial.
    f. Color: White.

2.6 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Enclosures:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Plumberex
    b. TRUEBRO, Inc.

2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

2.7 FIXTURE SUPPORTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Josam Company.
2. MIFAB Manufacturing Inc.
3. Smith, Jay R. Mfg. Co.
4. Tyler Pipe; Wade Div.
5. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
6. Zurn Plumbing Products Group; Specification Drainage Operation.

B. Lavatory Supports:

1. Description: Type II, lavatory carrier with concealed arms and tie rod for wall-mounting, lavatory-type fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.

2.8 DISHWASHER AIR-GAP FITTINGS

A. Dishwasher Air-Gap Fittings, Type 1:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Brass Craft Mfg. Co.; a Subsidiary of Masco Corporation.
   b. Geberit Manufacturing, Inc.
   c. Sioux Chief Manufacturing Company, Inc.
   d. Watts Brass & Tubular; a division of Watts Regulator Co.

2. Description: Fitting suitable for use with domestic dishwashers and for deck mounting; with plastic body, chrome-plated brass cover; and capacity of at least 5 gpm; and inlet pressure of at least 5 psig at a temperature of at least 140 deg F. Include 5/8-inch- ID inlet and 7/8-inch-ID outlet hose connections.
3. Hoses: Rubber and suitable for temperature of at least 140 deg F.

   a. Inlet Hose: 5/8-inch ID and 48 inches long.
   b. Outlet Hose: 7/8-inch ID and 48 inches long.

2.9 WATER CLOSETS

A. Water Closets, (WC-1):

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings American Standard Madera Model No. 3043.102 or a comparable product by one of the following:

   a. American Standard Companies, Inc.
   b. Crane Plumbing, L.L.C./Fiat Products.
   c. Eljer.
   d. Kohler Co.

2. Description: Accessible, floor-mounting, bottom-outlet, vitreous-china fixture designed for flushometer valve operation.

   a. Style: Flushometer valve.

      1) Bowl Type: Elongated with siphon-jet design.
      2) Design Consumption: 1.6 gal./flush.
      3) Color: White.
      4) Rim Height: 17-inches.

b. Flushometer: Type 1.
c. Toilet Seat: Type 1.

2.10 LAVATORIES

A. Lavatories, (L-1):

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings American Standard Lucerne Model 0355.012 or a comparable product by one of the following:

   a. American Standard Companies, Inc.
   b. Crane Plumbing, L.L.C./Fiat Products.
   c. Eljer.
   d. Kohler Co.
   e. Zurn Plumbing Products Group.

2. Description: Accessible, wall-mounting, vitreous-china fixture.

   a. Type: Ledge back.
   b. Size: 20 by 18 inches rectangular.
   c. Faucet Hole Punching: Three hole.
   d. Faucet Hole Location: Top.
   e. Pedestal: Not required.
   f. Color: White.
   g. Rim Height: 34-inches.
   h. Faucet: Lavatory Type 1.
   i. Supplies: NPS 3/8 chrome-plated copper with stops.
   j. Drain: Grid.
   k. Drain Piping: NPS 1-1/4 by NPS 1-1/2 chrome-plated, cast-brass P-trap; NPS 1-1/2, 0.045-inch- thick tubular brass waste to wall; and wall escutcheon.
   l. Protective Shielding Guards: Required.
   m. Fixture Support: Lavatory.

2.11 SINKS

A. Sink (S-1):

1. Description: Accessible, one-compartment, counter-mounting, science resin sink. Refer to Division 12, "Institutional Casework" for description.

   a. Sink Faucet: Type 1.
   b. Gas Turret: (2) Type 1.
   c. Eyewash Station: Not required.
   d. Supplies: NPS 3/8 chrome plated copper with stops.
   e. Drain Piping: NPS 1-1/2 acid waste offset and P-trap. Refer to Division 15 "Chemical Waste Piping".
   f. Disposer: Not required.
   g. Protective Shielding Guards: Required, by others.

B. Sink (S-2):

1. Description: Single-compartment, counter-mounting, science resin sink. Refer to Division 12, "Institutional Casework" for description.

a. Sink Faucet: Type 1.
b. Gas Turret: (2) Type 1.
c. Eyewash Station: Not required.
d. Supplies: NPS 3/8 chrome plated copper with stops.
e. Drain Piping: NPS 1-1/2 acid waste and P-trap, refer to Division 15, "Chemical Waste Piping".
f. Disposer: Not required.
g. Protective Shielding Guards: Not required.

C. Sink (S-3):

1. Description: Single-compartment, counter-mounting, science resin sink. Refer to Division 12, "Institutional Casework" for description.

a. Sink Faucet: Type 1.
b. Gas Turret: (2) Type 1.
c. Eyewash Station: EW-1. Refer to Division 15, "Emergency Plumbing Fixtures" for description.
d. Supplies: NPS 3/8 chrome plated copper with stops.
e. Drain Piping: NPS 1-1/2 acid-waste and P-trap, refer to Division 15 "Chemical Waste Piping".
f. Disposer: Not required.
g. Protective Shielding Guards: Not required.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports without waste fitting for fixtures with tubular waste piping.
2. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

D. Install wall-mounting fixtures with tubular waste piping attached to supports.

E. Install counter-mounting fixtures in and attached to casework.

F. Install fixtures level and plumb according to roughing-in drawings.

G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball or globe valves if supply stops are not specified with fixture. Valves are specified in Division 15 Section "Valves."

H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

I. Install flushometer valves for accessible water closets with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

J. Install toilet seats on water closets.

K. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

L. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

M. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

N. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

O. Install dishwasher air-gap fitting at each sink indicated to have air-gap fitting. Install in sink deck. Connect inlet hose to dishwasher and outlet hose to disposer.

P. Install escutcheons at piping wall or ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 15 Section "Basic Mechanical Materials and Methods."

Q. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 7 Section "Joint Sealants."

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. Ground equipment according to Division 16 Section "Grounding and Bonding."

D. Connect wiring according to Division 16 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 15410

SECTION 15412
EMERGENCY PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following emergency plumbing fixtures:

1. Eye/face wash equipment.

1.3 DEFINITIONS

A. Accessible Fixture: Emergency plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Plumbed Emergency Plumbing Fixture: Fixture with fixed, potable-water supply.

C. Self-Contained Emergency Plumbing Fixture: Fixture with flushing-fluid-solution supply.

D. Tepid: Moderately warm.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include flow rates and capacities, furnished specialties, and accessories.

B. Operation and Maintenance Data: For emergency plumbing fixtures to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. ANSI Standard: Comply with ANSI Z358.1, "Emergency Eyewash and Shower Equipment."

B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public

Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

PART 2 - PRODUCTS

2.1 EYE/FACE WASH EQUIPMENT

A. Eye/Face Wash Equipment (EW-1):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Chicago Faucet Model No. 9306 or a comparable product by one of the following:

    a. Chicago Faucet.
    b. Encon Safety Products.
    c. Guardian Equipment Co.
    d. WaterSaver Faucet Co.
    e. Speakman

2. Description: Plumbed, adjacent-to-sink, hose, counter-mounting eye/face wash equipment.

    a. Capacity: Deliver potable water at rate not less than 3.0 gpm for at least 15 minutes.
    b. Supply Piping: NPS 1/2 chrome-plated brass or stainless steel with flow regulator and stay-open control valve.
    c. Control-Valve Actuator: Paddle or squeeze handle.

2.2 WATER-TEMPERING EQUIPMENT

A. Water-Tempering Equipment (MV-2):

1. Manufacturers: Subject to compliance with requirements, provide Leonard Valve Co. Model No. TM650-STSTL-EXP or a product by one of the following:

    a. Armstrong International, Inc.
    b. Bradley Corporation.
    c. Haws Corporation.
    d. Lawler Manufacturing Co., Inc.
    e. Leonard Valve Company.
    f. Powers, a Watts Industries Co.
    g. Speakman Company.

2. Description: Factory-fabricated, hot- and cold-water-tempering equipment with thermostatic mixing valve.

a. Thermostatic Mixing Valve: Designed to provide 85 deg F tepid, potable water at emergency plumbing fixtures, to maintain temperature at plus or minus 5 deg F throughout required 15-minute test period, and in case of unit failure to continue cold-water flow, with union connections, controls, metal piping, and corrosion-resistant enclosure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before plumbed emergency plumbing fixture installation.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EMERGENCY PLUMBING FIXTURE INSTALLATION

A. Assemble emergency plumbing fixture piping, fittings, control valves, and other components.

B. Install fixtures level and plumb.

C. Fasten fixtures to substrate.

D. Install shutoff valves in water-supply piping to fixtures. Use ball, gate, or globe valve if specific type valve is not indicated. Install valves chained or locked in open position if permitted. Install valves in locations where they can easily be reached for operation. Valves are specified in Division 15 Section "Valves."

E. Install dielectric fitting in supply piping to fixture if piping and fixture connections are made of different metals. Dielectric fittings are specified in Division 15 Section "Basic Mechanical Materials and Methods."

F. Install escutcheons on piping wall and ceiling penetrations in exposed, finished locations. Escutcheons are specified in Division 15 Section "Basic Mechanical Materials and Methods."

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect hot- and cold-water-supply piping to hot- and cold-water-tempering equipment. Connect output from water-tempering equipment to emergency plumbing fixtures.

3.4 ADJUSTING

A. Adjust or replace fixture flow regulators for proper flow.

B. Adjust equipment temperature settings.

END OF SECTION 15412

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 15513
CONDENSING BOILERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes packaged, factory-fabricated and -assembled, gas-fired, pulse-combustion condensing boilers, trim, and accessories for generating hot water.

1.3 SUBMITTALS

A. Product Data: Include performance data, operating characteristics, furnished specialties, and accessories.

B. Operation and Maintenance Data: For boilers to include in emergency, operation, and maintenance manuals.

C. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASME Compliance: Fabricate and label boilers to comply with ASME Boiler and Pressure Vessel Code.

C. ASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil Fired Boilers - Minimum Efficiency Requirements."

D. UL Compliance: Test boilers for compliance with UL 795, "Commercial-Industrial Gas Heating Equipment." Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Pulse-Combustion Boilers:

a. Heat Exchanger Damaged by Thermal Shock: 10 years from date of Substantial Completion.
b. Heat-Exchanger Corrosion: Nonprorated for five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Aerco International, Inc.
2. Cleaver Brooks.
3. Fulton Boiler Works, Inc.

2.2 MANUFACTURED UNITS

A. Description: Factory-fabricated, -assembled, and -tested, pulse-combustion condensing boiler with heat exchanger sealed pressure tight, built on a steel base; including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls.

B. Heat Exchanger: Carbon-steel primary and secondary combustion chamber.

C. Pressure Vessel: Carbon steel with welded heads and tube connections.

D. Exhaust Decoupler: Fiberglass composite material in a corrosion-resistant steel box.

E. Burner: Natural gas, self-aspirating and self-venting after initial start.

F. Blower: Centrifugal fan to operate only during start of each burner sequence.

1. Motors: Comply with requirements specified in Division 15 Section "Motors."

a. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

G. IRI Gas Train: Combination gas valve with manual shutoff and pressure regulator. Include 100 percent safety shutoff with electronic flame supervision with a keyboard display module.

H. Ignition: Spark ignition with 100 percent main-valve shutoff with electronic flame supervision.

I. Casing:

1. Jacket: Sheet metal, with snap-in or interlocking closures.
2. Control Compartment Enclosure: NEMA 250, Type 1A.
3. Finish: Powder-coated protective finish.
4. Insulation: Minimum 2-inch- thick, mineral-fiber insulation surrounding the heat exchanger.
5. Combustion-Air Connection: Inlet duct collar and sheet metal closure over burner compartment.
6. Mounting base to secure boiler to concrete base.

J. Mufflers: Carbon-steel intake muffler and stainless steel exhaust.

K. Condensate Trap: Cast-iron body with stainless-steel internal parts.

2.3 TRIM

A. Include devices sized to comply with ANSI B31.1, "Power Piping."

B. Aquastat Controllers: Operating and high limit.

C. Safety Relief Valve: ASME rated.

D. Pressure and Temperature Gage: Minimum 3-1/2-inch- diameter, combination water-pressure and -temperature gage. Gages shall have operating-pressure and -temperature ranges so normal operating range is about 50 percent of full range.

E. Drain Valve: Minimum NPS 3/4 hose-end gate valve.

2.4 CONTROLS

A. Refer to Division 15 Section "HVAC Instrumentation and Controls."

2.5 ELECTRICAL POWER

A. Single-Point Field Power Connection: Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to boiler.

1. House in NEMA 250, Type 1 enclosure.
2. Wiring shall be numbered and color-coded to match wiring diagram.

3. Install factory wiring outside of an enclosure in a metal raceway.
4. Field power interface shall be to wire lugs.
5. Provide branch power circuit to each motor and to controls.
6. Provide each motor with overcurrent protection.

2.6 VENTING KITS

A. Kit: Complete system, ASTM A 959, Type 29-4C stainless steel, pipe, vent terminal, thimble, indoor plate, vent adapter, condensate trap and dilution tank, and sealant.

B. Combustion-Air Intake: Complete system, PVC schedule 40 pipe, vent terminal with screen, inlet air coupling, and sealant.

2.7 SOURCE QUALITY CONTROL

A. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency; perform hydrostatic test.

B. Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code.

C. Allow Owner access to source quality control testing of boilers. Notify Architect 14 days in advance of testing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before boiler installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting boiler performance, maintenance, and operations.

1. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

B. Examine mechanical spaces for suitable conditions where boilers will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 BOILER INSTALLATION

A. Install boilers level on concrete base. Concrete base is specified in Division 15 Section "Basic Mechanical Materials and Methods," and concrete materials and installation requirements are specified in Division 3.

B. Vibration Isolation: Restrained spring isolators with a minimum static deflection of 2-inches. Vibration isolation devices and installation requirements are specified in Division 15 Section "Mechanical Vibration and Seismic Controls."

C. Install gas-fired boilers according to NFPA 54.

D. Assemble and install boiler trim.

E. Install electrical devices furnished with boiler but not specified to be factory mounted.

F. Install control wiring to field-mounted electrical devices.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to boiler to allow service and maintenance.

C. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.

D. Connect piping to boilers, except safety relief valve connections, with flexible connectors of materials suitable for service. Flexible connectors and their installation are specified in Division 15 Section "Basic Mechanical Materials and Methods."

E. Connect gas piping to boiler gas-train inlet with union. Piping shall be at least full size of gas train connection. Provide a reducer if required.

F. Connect hot-water piping to supply- and return-boiler tappings with shutoff valve and union or flange at each connection.

G. Install piping from safety relief valves to nearest floor drain.

H. Boiler Venting:

1. Install flue venting kit and combustion-air intake.
2. Connect full size to boiler connections.

I. Ground equipment according to Division 16 Section "Grounding and Bonding."

J. Connect wiring according to Division 16 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Perform installation and startup checks according to manufacturer's written instructions.
2. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

    a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level.
    b. Set field-adjustable switches and circuit breaker trip ranges as indicated.

C. Remove and replace malfunctioning units and retest as specified above.

D. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

E. Performance Tests:

1. Engage a factory-authorized service representative to inspect component assemblies and equipment installations, including connections, and to conduct performance testing.
2. Boilers shall comply with performance requirements indicated, as determined by field performance tests. Adjust, modify, or replace equipment to comply.
3. Perform field performance tests to determine capacity and efficiency of boilers.

    a. Test for full capacity.

4. Repeat tests until results comply with requirements indicated.
5. Provide analysis equipment required to determine performance.
6. Provide temporary equipment and system modifications necessary to dissipate the heat produced during tests if building systems are not adequate.
7. Notify Architect in advance of test dates.
8. Document test results in a report and submit to Architect.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain boilers. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION 15513

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 15550
BREECHINGS, CHIMNEYS, AND STACKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Listed double-wall vents.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Special gas vents.
2. Guy wires and connectors.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain listed system components through one source from a single manufacturer.

1.5 COORDINATION

A. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 LISTED SPECIAL GAS VENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Heat-Fab, Inc.
2. Metal-Fab, Inc.

B. Description: Double-wall metal vents tested according to UL 1738 and rated for 480 deg F continuously, with positive or negative flue pressure complying with NFPA 211.

C. Construction: Inner shell and outer jacket separated by at least a 1/2-inch airspace.

D. Inner Shell: ASTM A 959, Type 29-4C stainless steel.

E. Outer Jacket: Stainless steel.

F. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.

1. Termination: Round chimney top designed to exclude minimum 98 percent of rainfall.

2.2 GUYING AND BRACING MATERIALS

A. Cable: Three galvanized, stranded wires of the following thickness:

1. Minimum Size: 1/4 inch in diameter.
2. For ID Sizes 4 to 15 Inches: 5/16 inch.
3. For ID Sizes 18 to 24 Inches: 3/8 inch.
4. For ID Sizes 27 to 30 Inches: 7/16 inch.
5. For ID Sizes 33 to 36 Inches: 1/2 inch.
6. For ID Sizes 39 to 48 Inches: 9/16 inch.
7. For ID Sizes 51 to 60 Inches: 5/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATION

A. Listed Type B and BW Vents: Vents for certified gas appliances.

B. Listed Special Gas Vent: Condensing gas appliances.

3.3 INSTALLATION OF LISTED VENTS AND CHIMNEYS

A. Locate to comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211, whichever is most stringent.

B. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding appliance loading.

C. Lap joints in direction of flow.

3.4 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

B. Clean breechings internally, during and after installation, to remove dust and debris. Clean external surfaces to remove welding slag and mill film. Grind welds smooth and apply touchup finish to match factory or shop finish.

C. Provide temporary closures at ends of breechings, chimneys, and stacks that are not completed or connected to equipment.

END OF SECTION 15550

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 15671
CONDENSING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes air-cooled condensing units.

1.3 SUBMITTALS

A. Product Data: For each condensing unit, include rated capacities, operating characteristics, furnished specialties, and accessories. Include equipment dimensions, weights and structural loads, required clearances, method of field assembly, components, and location and size of each field connection.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For condensing units to include in emergency, operation, and maintenance manuals.

D. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of condensing units and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Fabricate and label refrigeration system according to ASHRAE 15, "Safety Code for Mechanical Refrigeration."

1. Units shall be designed to operate with HCFC-free refrigerants.

D. ASME Compliance: Fabricate and label water-cooled condensing units to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

1.5 COORDINATION

A. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

B. Coordinate location of piping and electrical rough-ins.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of condensing units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Compressor failure.
b. Condenser coil leak.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 CONDENSING UNITS, AIR COOLED, 1 TO 15 TONS

A. Manufacturers:

1. Carrier Corporation; Carrier Air Conditioning Div.
2. Trane Co. (The); Worldwide Applied Systems Group.
3. York.

B. Description: Factory assembled and tested, consisting of compressor, condenser coil, fan, motors, refrigerant reservoir, and operating controls.

C. Compressor: Scroll, hermetically sealed, with rubber vibration isolators.

1. Motor: Two speed, and includes thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

2. Refrigerant Charge: R-22.

D. Condenser Coil: Seamless copper-tube, aluminum-fin coil; circuited for integral liquid subcooler, with removable drain pan and brass service valves with service ports.

E. Condenser Fan: Direct-drive, aluminum propeller fan; with permanently lubricated, totally enclosed fan motor with thermal-overload protection and ball bearings.

F. Accessories:

1. Crankcase heater.
2. Low Ambient Controller: Cycles condenser fan to permit operation down to 0 deg F with time-delay relay to bypass low-pressure switch.
3. Low-Pressure Switch: Automatic-reset switch cycles compressor off on low refrigerant pressure.
4. PE mounting base to provide a permanent foundation.
5. Precharged and insulated suction and liquid tubing.

G. Unit Casing: Galvanized steel, finished with baked enamel; with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Mount service valves, fittings, and gage ports on exterior of casing.

2.3 MOTORS

A. General requirements for motors are specified in Division 15 Section "Motors."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 16 Sections.

2.4 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate condensing units according to ARI 210/240.

1. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE/IESNA 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
2. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE/IESNA 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

B. Testing Requirements: Factory test sound-power-level ratings according to ARI 270.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of condensing units.

B. Examine roughing-in for refrigerant piping systems to verify actual locations of piping connections before equipment installation.

C. Examine walls, floors, and roofs for suitable conditions where condensing units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.

B. Install roof-mounting units on equipment supports specified in Division 7.

C. Vibration Isolation: Mount condensing units on restrained spring isolators. Vibration isolation devices and installation requirements are specified in Division 15 Section "Mechanical Vibration and Seismic Controls."

D. Maintain manufacturer's recommended clearances for service and maintenance.

E. Loose Components: Install electrical components, devices, and accessories that are not factory mounted.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect precharged refrigerant tubing to unit's quick-connect fittings. Install tubing so it does not interfere with access to unit. Install furnished accessories.

D. Connect refrigerant piping to air-cooled condensing units; maintain required access to unit. Install furnished field-mounted accessories. Refrigerant piping and specialties are specified in Division 15 Section "Refrigerant Piping."

E. Ground equipment according to Division 16 Section "Grounding and Bonding."

F. Connect wiring according to Division 16 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Perform electrical test and visual and mechanical inspection.
2. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
5. Verify proper airflow over coils.

B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

C. Remove and replace malfunctioning condensing units and retest as specified above.

3.5 STARTUP SERVICE

A. Complete installation and startup checks according to manufacturer's written instructions and perform the following:

1. Inspect for physical damage to unit casing.
2. Verify that access doors move freely and are weathertight.
3. Clean units and inspect for construction debris.
4. Verify that all bolts and screws are tight.
5. Adjust vibration isolation and flexible connections.
6. Verify that controls are connected and operational.

B. Lubricate bearings on fans.

C. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.

D. Adjust fan belts to proper alignment and tension.

E. Start unit according to manufacturer's written instructions and complete manufacturer's startup checklist.

F. Measure and record airflow over coils.

G. Verify proper operation of condenser capacity control device.

H. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

I. After startup and performance test, lubricate bearings.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain condensing units. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 15671

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 15725
MODULAR AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes constant-volume, modular air-handling units with coils for indoor installations.

1.3 SUBMITTALS

A. Product Data: For each type of modular indoor air-handling unit indicated. Include the following:

1. Certified fan-performance curves with system operating conditions indicated.
2. Certified fan-sound power ratings.
3. Certified coil-performance ratings with system operating conditions indicated.
4. Motor ratings, electrical characteristics, and motor and fan accessories.
5. Material gages and finishes.
6. Filters with performance characteristics.
7. Dampers, including housings, linkages, and operators.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain modular indoor air-handling units through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of modular indoor air-handling units and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. NFPA Compliance: Modular indoor air-handling units and components shall be designed, fabricated, and installed in compliance with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."

E. ARI Certification: Modular indoor air-handling units and their components shall be factory tested according to ARI 430, "Central-Station Air-Handling Units," and shall be listed and labeled by ARI.

F. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate size and location of structural-steel support members.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set for each modular indoor air-handling unit.
2. Fan Belts: One set for each modular indoor air-handling unit fan.
3. Gaskets: One set for each access door.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carrier; Div. of United Technologies Corp.
2. McQuay International.
3. Trane Company (The); Worldwide Applied Systems Group.
4. York International Corporation.

2.2 MANUFACTURED UNITS

A. Modular indoor air-handling units shall be factory assembled and consist of fans, motor and drive assembly, coils, damper, plenums, filters, condensate pans, mixing dampers, control devices, and accessories.

2.3 CABINET

A. Materials: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.

1. Outside Casing: Galvanized steel, 0.0635 inch thick.
2. Inside Casing: Galvanized steel, 0.0276 inch thick.
3. Floor Plate: Galvanized steel, 0.1382 inch thick.

B. Cabinet Insulation: Comply with NFPA 90A or NFPA 90B.

1. Materials: ASTM C 1071 with coated surface exposed to airstream to prevent erosion of glass fibers.
2. Thickness: 2 inches.
3. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.
4. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50, when tested according to ASTM C 411.
5. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and ASTM C 916.
6. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
7. Location and Application: Factory applied with adhesive and mechanical fasteners to the internal surface of section panels downstream from and including the cooling coil section.
8. Location and Application: Encased between outside and inside casing.

C. Access Panels and Doors: Same materials and finishes as cabinet, complete with hinges, latches, handles, and gaskets. Inspection and access panels and doors shall be sized and located to allow periodic maintenance and inspections. Provide access panels and doors in the following locations:

1. Fan Section: Doors.
2. Access Section: Doors.
3. Coil Section: Inspection panel.
4. Damper Section: Doors.
5. Filter Section: Doors to allow periodic removal and installation of filters.

D. Condensate Drain Pans: Formed sections of galvanized-steel sheet complying with requirements in ASHRAE 62. Fabricate pans with slopes in two planes to collect condensate from cooling coils (including coil piping connections and return bends) and humidifiers when units are operating at maximum catalogued face velocity across cooling coil.

1. Double-Wall Construction: Fill space between walls with foam insulation and seal moisture tight.
2. Drain Connections: Both ends of pan.
3. Pan-Top Surface Coating: Elastomeric compound.
4. Units with stacked coils shall have an intermediate drain pan or drain trough to collect condensate from top coil.

2.4 FAN SECTION

A. Fan-Section Construction: Belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and support structure and equipped with formed-steel channel base for integral mounting of fan, motor, and casing panels. Mount fan with vibration isolation.

B. Centrifugal Fan Housings: Formed- and reinforced-steel panels to make curved scroll housings with shaped cutoff, spun-metal inlet bell, and access doors or panels to allow entry to internal parts and components.

1. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
2. Performance Class: AMCA 99-2408, Class II.
3. Horizontal Flanged Split Housing: Bolted construction.
4. Plug Fans: With steel cabinet. Fabricate without fan scroll and volute housing.

C. Fan Assemblies: Statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and motor horsepower.

D. Shafts: Statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.

1. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.
2. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

E. Prelubricated and Sealed Shaft Bearings: Self-aligning, pillow-block-type ball bearings.

1. Ball-Bearing Rating Life: ABMA 9, L_{10} of 120,000 hours.

F. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation and with 1.5 service factor based on fan motor.

1. Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
2. Motor Pulleys: Adjustable pitch for use with 5-hp motors and smaller; fixed pitch for use with motors larger than 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
3. Belts: Oil resistant, nonsparking, and nonstatic; matched for multiple belt drives.
4. Belt Guards: Fabricate to OSHA/SMACNA requirements; 0.1046-inch- thick, 3/4-inch diamond-mesh wire screen welded to steel angle frame or equivalent; prime coated. Provide belt guards for motors mounted on outside of cabinet.
5. Motor Mount: Adjustable for belt tensioning.

G. Fan-Section Source Quality Control:

1. Sound Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Test fans according to AMCA 300,

"Reverberant Room Method for Sound Testing of Fans." Fans shall bear AMCA-certified sound ratings seal.

2. Factory test fan performance for flow rate, pressure, power, air density, rotation speed, and efficiency. Establish ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

2.5 MOTORS

A. General: Comply with requirements in Division 15 Section "Motors."

B. Noise Rating: Quiet.

2.6 COILS

A. Coil Sections: Common or individual, insulated, galvanized-steel casings for heating and cooling coils. Design and construct to facilitate removal and replacement of coil for maintenance and to ensure full airflow through coils.

B. Water Coils: Continuous circuit coil fabricated according to ARI 410.

1. Face-and-Bypass Dampers: Extruded-aluminum blades with full-length drive rod.
2. Piping Connections: Threaded, on same end.
3. Tubes: Copper.
4. Fins: Aluminum with fin spacing 0.125 inch.
5. Fin and Tube Joint: Mechanical bond.
6. Headers: Cast iron with drain and air vent tappings.
7. Frames: Galvanized-steel channel frame, 0.052 inch.
8. Frames: Stainless steel, 0.0625 inch.
9. Ratings: Design tested and rated according to ASHRAE 33 and ARI 410.

    a. Working-Pressure Ratings: 200 psig, 325 deg F.

10. Source Quality Control: Test to 300 psig and to 200 psig underwater.

2.7 DAMPERS

A. General: Leakage rate, according to AMCA 500, "Laboratory Methods for Testing Dampers for Rating," shall not exceed 2 percent of air quantity at 2000-fpm face velocity through damper and 4-inch wg pressure differential.

B. Damper Operators: Electric specified in Division 15 Section "HVAC Instrumentation and Controls."

C. Low-Leakage, Outside-Air Dampers: Double-skin, airfoil-blade galvanized-steel dampers with compressible jamb seals and extruded-vinyl blade edge seals, in [opposed] [parallel]-blade arrangement with steel operating rods rotating in [stainless-steel sleeve] [sintered bronze or nylon] bearings mounted in a single galvanized-steel frame, and with operating rods connected with a common linkage. Leakage rate shall not exceed 5 cfm/sq. ft. at 1-inch wg and 9 cfm/sq. ft. at 4-inch wg.

D. Combination Filter and Mixing Box: Parallel-blade galvanized-steel dampers mechanically fastened to steel operating rod in reinforced, galvanized-steel cabinet. Connect operating rods with common linkage and interconnect linkages so dampers operate simultaneously. Cabinet support members shall hold 2-inch- thick, pleated, flat permanent or throwaway filters. Provide hinged access panels or doors to allow removal of filters from both sides of unit.

2.8 FILTER SECTION

A. Filters: Comply with NFPA 90A.

B. Filter Section: Provide filter holding frames arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side.

C. Extended-Surface, Disposable Panel Filters: Factory-fabricated, dry, extended-surface filters with holding frames.

1. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.
2. Media and Media-Grid Frame: Nonflammable cardboard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of steam, hydronic, and condensate drainage piping systems and electrical services to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Concrete Bases: Install floor mounting units on 4-inch- high concrete bases. See Division 15 Section "Basic Mechanical Materials and Methods" for concrete base materials and fabrication requirements.

B. Install modular indoor air-handling units with the following vibration-control devices. Vibration-control devices are specified in Division 15 Section "Mechanical Vibration."

1. Units with Internally Isolated Fans: Secure units to anchor bolts installed in concrete bases.
2. Floor-Mounted Units: Support on concrete bases using housed-spring isolators. Secure units to anchor bolts installed in concrete bases.

C. Arrange installation of units to provide access space around modular indoor air-handling units for service and maintenance.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect piping to modular indoor air-handling units mounted on vibration isolators with flexible connectors.

D. Connect condensate drain pans using NPS 1-1/4, Type M copper tubing. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.

E. Hot-Water Piping: Comply with applicable requirements in Division 15 Section "Hydronic Piping." Connect to supply and return coil tappings with shutoff or balancing valve and union or flange at each connection.

F. Duct installation and connection requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connections.

G. Electrical: Comply with applicable requirements in Division 16 Sections for power wiring, switches, and motor controls.

H. Ground equipment according to Division 16 Section "Grounding and Bonding."

I. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

1. Leak Test: After installation, fill water and steam coils with water and test coils and connections for leaks. Repair leaks and retest until no leaks exist.
2. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Final Checks before Startup: Perform the following:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to piping, ducts, and electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Perform cleaning and adjusting specified in this Section.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify free fan wheel rotation and smooth bearing operations. Reconnect fan drive system, align belts, and install belt guards.
5. Lubricate bearings, pulleys, belts, and other moving parts with factory-recommended lubricants.
6. Set face-and-bypass dampers to full face flow.
7. Set outside- and return-air mixing dampers to minimum outside-air setting.
8. Comb coil fins for parallel orientation.
9. Install clean filters.
10. Verify that manual and automatic volume control and fire and smoke dampers in connected duct systems are in fully open position.

C. Starting procedures for modular indoor air-handling units include the following:

1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated rpm. Replace fan and motor pulleys as required to achieve design conditions.
2. Measure and record motor electrical values for voltage and amperage.
3. Manually operate dampers from fully closed to fully open position and record fan performance.

D. Refer to Division 15 Section "Testing, Adjusting, and Balancing" for modular indoor air-handling system testing, adjusting, and balancing.

3.6 ADJUSTING

A. Adjust damper linkages for proper damper operation.

3.7 CLEANING

A. Clean modular indoor air-handling units internally, on completion of installation, according to manufacturer's written instructions. Clean fan interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheels, cabinets, and coils entering air face.

B. After completing system installation and testing, adjusting, and balancing modular indoor air-handling and air-distribution systems, clean filter housings and install new filters.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain modular indoor air-handling units. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 15725

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 15732
PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes packaged, outdoor, central-station air-handling units (rooftop units) with the following components and accessories:

1. Direct-expansion cooling.
2. Economizer outdoor- and return-air damper section.
3. Roof curbs.

1.3 DEFINITIONS

A. DDC: Direct-digital controls.

B. Outdoor-Air Refrigerant Coil: Refrigerant coil in the outdoor-air stream to reject heat during cooling operations and to absorb heat during heating operations. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

C. Outdoor-Air Refrigerant-Coil Fan: The outdoor-air refrigerant-coil fan in RTUs. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

D. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, outdoor, central-station air-handling units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.

E. Supply-Air Fan: The fan providing supply air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

F. Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating

operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

1.4 SUBMITTALS

A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

B. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

C. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. ARI Compliance:

1. Comply with ARI 210/240 and ARI 340/360 for testing and rating energy efficiencies for RTUs.

B. ASHRAE Compliance:

1. Comply with ASHRAE 15 for refrigeration system safety.
2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
3. Comply with ASHRAE/IESNA 90.1 for minimum efficiency of heating and cooling.

C. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.

D. UL Compliance: Comply with UL 1995.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of RTUs that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Manufacturer's standard, but not less than 10 years from date of Substantial Completion.
2. Warranty Period for Control Boards: Manufacturer's standard, but not less than three years from date of Substantial Completion.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fan Belts: One set for each belt-driven fan.
2. Filters: One set of filters for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carrier Corporation.
2. McQuay International.
3. Trane; American Standard Companies, Inc.
4. YORK International Corporation.

2.2 CASING

A. General Fabrication Requirements for Casings: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.

B. Exterior Casing Material: Galvanized steel with factory-painted finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.

1. Exterior Casing Thickness: 0.079 inch thick.

C. Inner Casing Fabrication Requirements:

1. Inside Casing: Galvanized steel, 0.034 inch thick.

D. Casing Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

1. Materials: ASTM C 1071, Type I.
2. Thickness: 1 inch.
3. Liner materials shall have air-stream surface coated with an erosion- and temperature-resistant coating or faced with a plain or coated fibrous mat or fabric.
4. Liner Adhesive: Comply with ASTM C 916, Type I.

E. Condensate Drain Pans: Formed sections of galvanized-steel sheet, a minimum of 2 inches deep, and complying with ASHRAE 62.

1. Double-Wall Construction: Fill space between walls with foam insulation and seal moisture tight.
2. Drain Connections: Threaded nipple both sides of drain pan.
3. Pan-Top Surface Coating: Corrosion-resistant compound.

2.3 FANS

A. Belt-Driven Supply-Air Fans: Double width, forward curved, centrifugal; with permanently lubricated, installed on an adjustable fan base resiliently mounted in the casing. Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls. Unit shall be equipped with Variable Frequency Drive (VFD, inverter). The VFD shall be provided with a metal enclosure and shall be factory-mounted, wired and tested. The VFD shall control motor speed to maintain set point static pressure at the sensor tube location of the supply duct pressure transducer (transducer is factory-provided and installed; sensor tube must be field-routed). The VFD may be field-adjustable to maintain supply duct static pressure set points from 0 in. wg to 3.5 in. wg.

B. Condenser-Coil Fan: Propeller, mounted on shaft of permanently lubricated motor.

C. Relief-Air Fan: Forward curved, shaft mounted on permanently lubricated motor.

D. Fan Motor: Comply with requirements in Division 15 Section "Motors."

2.4 COILS

A. Supply-Air Refrigerant Coil:

1. Aluminum-plate fin and seamless internally grooved copper tube in steel casing with equalizing-type vertical distributor.
2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
3. Coil Split: Interlaced.
4. Baked phenolic coating.
5. Condensate Drain Pan: Galvanized steel with corrosion-resistant coating formed with pitch and drain connections complying with ASHRAE 62.

2.5 REFRIGERANT CIRCUIT COMPONENTS

A. Number of Refrigerant Circuits: Two.

B. Compressor: Hermetic, scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater.

C. Refrigeration Specialties:

1. Refrigerant Charge: R-22.
2. Expansion valve with replaceable thermostatic element.
3. Refrigerant filter/dryer.
4. Manual-reset high-pressure safety switch.
5. Automatic-reset low-pressure safety switch.
6. Minimum off-time relay.
7. Automatic-reset compressor motor thermal overload.
8. Brass service valves installed in compressor suction and liquid lines.
9. Low-ambient kit high-pressure sensor.
10. Hot-gas reheat solenoid valve with a replaceable magnetic coil.

11. Hot-gas bypass solenoid valve with a replaceable magnetic coil.
12. Four-way reversing valve with a replaceable magnetic coil, thermostatic expansion valves with bypass check valves, and a suction line accumulator.

2.6 AIR FILTRATION

A. Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

1. Glass Fiber: Minimum 30 percent arrestance, and MERV 5.

2.7 DAMPERS

A. Outdoor-Air Damper: Linked damper blades, for 0 to 25 percent outdoor air, with motorized damper filter.

B. Outdoor- and Return-Air Mixing Dampers: Parallel- or opposed-blade galvanized-steel dampers mechanically fastened to cadmium plated for galvanized-steel operating rod in reinforced cabinet. Connect operating rods with common linkage and interconnect linkages so dampers operate simultaneously.

1. Damper Motor: Modulating with adjustable minimum position.
2. Relief-Air Damper: Gravity actuated with bird screen and hood.

2.8 ELECTRICAL POWER CONNECTION

A. Provide for single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

2.9 CONTROLS

A. Control equipment and sequence of operation are specified in Division 15 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation". Provided by temperature controls contractor, factory installed.

2.10 ACCESSORIES

A. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required. Outlet shall be energized even if the unit main disconnect is open.

B. Low-ambient kit using variable-speed condenser fans for operation down to 35 deg F.

C. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.

D. Coil guards of painted, galvanized-steel wire.

E. Hail guards of galvanized steel, painted to match casing.

2.11 ROOF CURBS

A. Roof curbs with vibration isolators and wind or seismic restraints are specified in Division 15 Section "Vibration Controls for HVAC Piping and Equipment."

B. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.

1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

a. Materials: ASTM C 1071, Type I or II.
b. Thickness: 1-1/2 inches.

2. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.

a. Liner Adhesive: Comply with ASTM C 916, Type I.
b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
d. Liner Adhesive: Comply with ASTM C 916, Type I.

C. Curb Height: 18 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.

B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.

C. Examine roofs for suitable conditions where RTUs will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Roof Curb: Install on roof structure level and secure, according to ARI Guideline B. Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in

Division 7 Section "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.

3.3 CONNECTIONS

A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

B. Install piping adjacent to RTUs to allow service and maintenance.

C. Duct installation requirements are specified in other Division 15 Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors specified in Division 15 Section "Duct Accessories."
4. Install return-air duct continuously through roof structure.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Report results in writing.

C. Tests and Inspections:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions and do the following:

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to compressor, coils, and fans.
3. Inspect internal insulation.
4. Verify that labels are clearly visible.
5. Verify that clearances have been provided for servicing.
6. Verify that controls are connected and operable.
7. Verify that filters are installed.
8. Clean condenser coil and inspect for construction debris.
9. Remove packing from vibration isolators.
10. Inspect operation of barometric relief dampers.
11. Verify lubrication on fan and motor bearings.
12. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
13. Adjust fan belts to proper alignment and tension.
14. Start unit according to manufacturer's written instructions.

    a. Start refrigeration system.
    b. Do not operate below recommended low-ambient temperature.
    c. Complete startup sheets and attach copy with Contractor's startup report.

15. Inspect and record performance of interlocks and protective devices; verify sequences.
16. Operate unit for an initial period as recommended or required by manufacturer.
17. Adjust and inspect high-temperature limits.
18. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
19. Start refrigeration system and measure and record the following when ambient is a minimum of 15 deg F above return-air temperature:

    a. Coil leaving-air, dry- and wet-bulb temperatures.
    b. Coil entering-air, dry- and wet-bulb temperatures.
    c. Outdoor-air, dry-bulb temperature.
    d. Outdoor-air-coil, discharge-air, dry-bulb temperature.

20. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
21. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.

    a. Supply-air volume.
    b. Return-air volume.
    c. Relief-air volume.
    d. Outdoor-air intake volume.

22. Simulate maximum cooling demand and inspect the following:

    a. Compressor refrigerant suction and hot-gas pressures.
    b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.

23. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.6 CLEANING AND ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site during other-than-normal occupancy hours for this purpose.

B. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION 15732

SECTION 15768
UNIT VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes unit ventilators and accessories with the following heating and cooling features:

1. Hydronic heating coil.
2. Direct-expansion refrigerant cooling coil.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, and furnished specialties and accessories for each unit type and configuration.

B. Operation and Maintenance Data: For unit ventilators to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. Maintenance schedules and repair part lists for motors, coils, integral controls, and filters.

C. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

C. Comply with minimum COP/efficiency levels according to ASHRAE/IESNA 90.1.

1.5 COORDINATION

A. Coordinate size and location of wall sleeves for outdoor-air intake and relief dampers.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of condensing units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Compressor failure.
b. Condenser coil leak.

2. Warranty Period: Five years from date of Substantial Completion.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Unit Ventilator Filters: Furnish one spare filter for each filter installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. McQuay International.
2. Trane.

2.2 MANUFACTURED UNITS

A. Description: Factory-packaged and -tested units rated according to ARI 840, ASHRAE 33, and UL 1995, including finished cabinet, filter, cooling coil, drain pan, supply-air fan and motor in blow-through configuration, and hydronic cooling coil.

2.3 CABINETS

A. Insulation: Coated glass fiber or matte-finish, closed-cell foam complying with ASTM C 1071 and attached with adhesive complying with ASTM C 916.

1. Fire-Hazard Classification: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.

B. Drain Pans: Insulated galvanized steel with plastic liner, formed to slope from all directions to the drain connection as required by ASHRAE 62. Drain pan shall be removable.

C. Cabinet Frame and Access Panels: Welded-steel frame with removable panels fastened with hex-head tamperproof fasteners and key-operated control and valve access doors.

1. Steel components exposed to moisture shall be hot-dip galvanized after fabrication.

D. Cabinet Finish: Baked enamel, in manufacturer's standard paint color as selected by Architect.

E. Return-Air Inlet: Front toe space.

F. End Panels: Matching material and finish of unit ventilator.

G. Electrical Connection: Single electrical connection with non-fused disconnect switch.

2.4 COILS

A. Test and rate unit ventilator coils according to ASHRAE 33.

B. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve.

C. Indoor Refrigerant Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, and brazed joints at fittings. Comply with ARI 210/240, and leak test to minimum 450 psig for a minimum 300-psig working pressure. Include thermal expansion valve.

2.5 INDOOR FAN

A. Fan and Motor Board: Removable.

1. Fan: Forward curved, double width, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels; and aluminum, painted-steel, or galvanized-steel fan scrolls.
2. Fan Shaft and Bearings: Hollow steel shaft with permanently lubricated, resiliently mounted bearings.
3. Motor: Permanently lubricated, multispeed, resiliently mounted on motor board. Comply with requirements in Division 15 Section "Motors."
4. Wiring Termination: Connect motor to chassis wiring with plug connection.

2.6 DAMPERS

A. Mixing Dampers: Galvanized-steel blades with edge and end seals and nylon bearings; with electric actuator.

B. Face and Bypass Dampers: Galvanized-steel damper blades with edge and end seals and nylon bearings; with factory-mounted electric actuator.

2.7 ACCESSORIES

A. Subbase: Sheet metal floor-mounting base with leveling screws and black enamel finish.

B. Insulated false back with gasket seals on wall and outdoor-air plenum.

1. Insulation: Minimum 1-inch thick, coated glass fiber or matte-finish, closed-cell foam complying with ASTM C 1071 and attached with adhesive complying with ASTM C 916.

a. Fire-Hazard Classification: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.

C. Filters: Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

D. Pleated Cotton-Polyester Media: 90 percent arrestance and 7 MERV.

E. Filler Section to match unit ventilator color.

F. Laminate back splash and window filler. Match UV color.

G. Insulated cross over pipe chase.

2.8 INTEGRAL COOLING CHASSIS

A. Description: Assembly mounted within unit ventilator, factory assembled and tested; consisting of compressors, condenser coils, fans, motors, and refrigerant receivers; removable for maintenance, with plug and receptacle connections for control and power wiring. Construct, test, and rate condensing units according to ARI 210/240 and ASHRAE 15.

B. HCFC-22 Refrigerant.

C. Casing: Galvanized steel with removable panels for access to controls and refrigerant piping.

D. Exterior Louver: Extruded aluminum with splitters as indicated.

1. Refer to wall intake louver and grille schematic on drawings.
2. Manufacturer: Curbs and Dampers, Model L-200.

E. Compressor: Hermetic, scroll type; internally isolated for vibration with factory-installed mechanical safeties as follows:

1. Antirecycle timer.
2. High-pressure cutout.
3. Low-pressure cutout or loss-of-charge switch.
4. Internal thermal-overload protection.
5. Current- and voltage-sensitive safety devices.

F. Refrigerant Piping Materials:

1. Drawn-Temper Copper Tube: ASTM B 88, Type L.
2. Annealed-Temper Copper Tube: ASTM B 88, Type L.
3. Wrought-Copper Fittings: ASME B16.22.

G. Charge: HCFC-22 refrigerant.

H. Low ambient controls to permit operation down to 45 deg F.

I. Charging and service fittings.

J. Filter dryer.

K. Condenser: Copper-tube, aluminum-fin coil, with liquid subcooler.

L. Direct-Driven Condenser Fan: Forward curved, double width, centrifugal; thermoplastic or painted-steel wheels and galvanized-steel fan scrolls.

1. Motor: Comply with requirements in Division 15 Section "Motors."

M. Refer to Unit Ventilator Schematic Diagram for accessories by Unit Manufacturer.

2.9 BASIC UNIT CONTROLS

A. Control device is specified in Division 15 Section "HVAC Instrumentation and Controls". Controls provided by temperature controls contractor, factory installed and wired by unit manufacturer.

B. Refer to Vertical Self-contained Unit Ventilator wiring diagram on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive unit ventilators for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in for piping and electrical connections to verify actual locations before unit ventilator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install unit ventilators to comply with NFPA 90A.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:

1. Install piping adjacent to machine to allow service and maintenance.
2. Connect piping to unit ventilator factory hydronic piping package. Install piping package if shipped loose.

B. Install refrigerant piping as required by Division 15 Section "Refrigerant Piping," and add refrigerant as required to compensate for length of piping.

C. Ground equipment according to Division 16 Section "Grounding and Bonding."

D. Connect wiring according to Division 16 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain unit ventilators. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION 15768

SECTION 15785
AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Packaged energy recovery units.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, furnished specialties, and accessories.

B. Operation and Maintenance Data: For air-to-air energy recovery equipment to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ARI Compliance: Capacity ratings for air-to-air energy recovery equipment shall comply with ARI 1060, "Rating Air-to-Air Energy Recovery Equipment."

C. UL Compliance: Packaged heat recovery ventilators shall comply with requirements in UL 1812, "Ducted Heat Recovery Ventilators"; or UL 1815, "Nonducted Heat Recovery Ventilators."

1.5 COORDINATION

A. Coordinate layout and installation of air-to-air energy recovery equipment and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air-to-air energy recovery equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Packaged Energy Recovery Units: Two years.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set of each type of filter specified.
2. Fan Belts: One set of belts for each belt-driven fan in energy recovery units.
3. Wheel Belts: One set of belts for each heat wheel.

PART 2 - PRODUCTS

2.1 PACKAGED ENERGY RECOVERY UNITS

A. Basis-of-Design Product: Subject to compliance with requirements, provide ER-101 Greenheck Model MV-450 or comparable product by one of the following:

1. Greenheck Fan Corporation.
2. Loren Cook Company.
3. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division.
4. RenewAire LLC.

B. Housing: Manufacturer's standard construction with corrosion-protection coating and exterior finish, removable panels with neoprene gaskets for inspection and access to internal parts, minimum 1-inch-thick thermal insulation, knockouts for electrical and piping connections, exterior drain connection, and lifting lugs.

C. Heat Recovery Device: Heat wheel.

D. Supply and Exhaust Fans: Forward-curved, centrifugal fan with neoprene vibration isolation kit and insulated flexible duct connections.

1. Motor and Drive: Direct driven.
2. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified inDivision 15 Section "Common Motor Requirements for HVAC Equipment."
3. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
4. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 16 Sections.

E. Disposable Panel Filters:

1. Comply with NFPA 90A.
2. Provide filter holding frames arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lift out from access plenum.
3. Factory-fabricated, viscous-coated, flat-panel type.
4. Thickness: 1 inch.
5. Initial Resistance: 0.015" wc
6. Recommended Final Resistance: 0.1" wc.
7. Media: Interlaced glass fibers sprayed with nonflammable adhesive and antimicrobial agent.
8. Frame: Galvanized steel with metal grid on outlet side, steel rod grid on inlet side, hinged, and with pull and retaining handles.

F. Piping and Wiring: Fabricate units with space within housing for piping and electrical conduits. Wire motors and controls so only external connections are required during installation.

1. Indoor Enclosure: NEMA 250, Type 12 enclosure contains relays, starters, and terminal strip.
2. Include nonfused disconnect switches.
3. Variable-speed controller to vary fan capacity from 100 to approximately 50 percent.

G. Accessories:

1. Low-Leakage, Isolation Dampers: Double-skin, airfoil-blade, galvanized-steel dampers with compressible jamb seals and extruded-vinyl blade edge seals, in opposed or parallel-blade arrangement with cadmium-plated steel operating rods rotating in stainless-steel sleeve bearings mounted in a single galvanized-steel frame, with operating rods connected with a common linkage. Leakage rate shall not exceed 5 cfm/sq. ft. at 1-inch wg and 9 cfm/sq. ft. at 4-inch wg.
2. Duct flanges.
3. Rubber-in-shear isolators for ceiling-mounted units.

2.2 PACKAGED ENERGY RECOVERY UNITS

A. Basis-of-Design Product: Subject to compliance with requirements, provide ER-102 Carrier Model 62MD H430---501 or comparable product by one of the following:

1. Carnes.
2. Carrier

3. Greenheck Fan Corporation.
4. Loren Cook Company.
5. SEMCO Incorporated.

B. Housing: Manufacturer's standard construction with corrosion-protection coating and exterior finish, hinged access doors with neoprene gaskets for inspection and access to internal parts, minimum 2-inch-thick thermal insulation, knockouts for electrical and piping connections, exterior drain connection, and lifting lugs.

1. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
2. Inlet: Weatherproof hood, with damper for exhaust and supply.

    a. Exhaust: Spring-return, two-position, motor-operated damper.
    b. Supply: Spring-return, two-position, motor-operated damper.

3. Roof Curb: Refer to Division 7 Section "Roof Accessories" for roof curbs and equipment supports.

C. Heat Recovery Device: Heat wheel.

D. Supply and Exhaust Fans: Forward-curved, centrifugal fan with neoprene vibration isolation pads and insulated factory transition connection between ER and RTU.

1. Motor and Drive: Belt driven with adjustable sheaves, motor mounted on adjustable base.
2. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified inDivision 15 Section "Common Motor Requirements for HVAC Equipment."
3. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
4. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 16 Sections.

E. Disposable Panel Filters:

1. Comply with NFPA 90A.
2. Provide filter holding frames arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lift out from access plenum.
3. Factory-fabricated, pleated type.
4. Thickness: 2 inches.
5. Merv (ASHRAE 52.2): 8.
6. Media: Interlaced glass fibers sprayed with nonflammable adhesive.
7. Frame: Galvanized steel with metal grid on outlet side, steel rod grid on inlet side, hinged, and with pull and retaining handles.

F. Piping and Wiring: Fabricate units with space within housing for piping and electrical conduits. Wire motors and controls so only external connections are required during installation.

G. Accessories:

1. Roof Curb: Galvanized steel with gasketing, and factory-installed wood nailer; complying with NRCA standards; minimum height of 18 inches.
2. Louvered intake weather hood with 2-inch- thick filters in V-bank configuration.
3. Exhaust weather hood with birdscreen.
4. Low-Leakage, Isolation Dampers: Double-skin, airfoil-blade, galvanized-steel dampers with compressible jamb seals and extruded-vinyl blade edge seals, in opposed or parallel-blade arrangement with cadmium-plated steel operating rods rotating in stainless-steel sleeve bearings mounted in a single galvanized-steel frame, with operating rods connected with a common linkage. Leakage rate shall not exceed 5 cfm/sq. ft. at 1-inch wg and 9 cfm/sq. ft. at 4-inch wg.
5. Duct flanges.
6. Hinged access doors with quarter-turn latches.
7. Exhaust air defrost control.

2.3 CAPACITIES AND CHARACTERISTICS

A. See Schedule on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine casing insulation materials and filter media before air-to-air energy recovery equipment installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for electrical services to verify actual locations of connections before installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Roof Curb: Install on roof structure, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts". Install air-to-air energy recovery equipment on curbs and coordinate roof penetrations and flashing with roof construction specified in Division 7 Section "Roof Accessories." Secure air-to-air energy recovery equipment to upper curb rail, and secure curb base to roof framing with anchor bolts.

B. Suspended Units: Suspend units from structural using threaded steel rods and spring hangers.

C. Install units with clearances for service and maintenance.

D. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.

3.3 CONNECTIONS

A. Comply with requirements for ductwork specified in Division 15 Section "Metal Ducts."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Air-to-air energy recovery equipment will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-to-air energy recovery units.

END OF SECTION 15785

SECTION 15815
METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2- to plus 10-inch wg. Metal ducts include the following:

1. Rectangular ducts and fittings.
2. Single-wall, round, spiral-seam ducts and formed fittings.
3. Duct liner.

B. Related Sections include the following:

1. Division 15 Section "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select size and type of air-moving and -distribution equipment and other air system components. Changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.4 SUBMITTALS

A. Shop Drawings: CAD-generated and drawn to 1/4 inch equals 1 foot scale. Show fabrication and installation details for metal ducts.

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Duct layout indicating sizes and pressure classes.

3. Elevations of top and bottom of ducts.
4. Dimensions of main duct runs from building grid lines.
5. Fittings.
6. Reinforcement and spacing.
7. Seam and joint construction.
8. Penetrations through fire-rated and other partitions.
9. Equipment installation based on equipment being used on Project.
10. Duct accessories, including access doors and panels.
11. Hangers and supports, including methods for duct and building attachment, vibration isolation, and seismic restraints.

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Ceiling suspension assembly members.
2. Other systems installed in same space as ducts.
3. Ceiling- and wall-mounting access doors and panels required to provide access to dampers and other operating devices.
4. Ceiling-mounting items, including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

C. Welding certificates.

D. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," for hangers and supports.

B. NFPA Compliance:

1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 DUCT LINER

A. Fibrous-Glass Liner: Comply with NFPA 90A or NFPA 90B and with NAIMA AH124.

1. Manufacturers:

   a. CertainTeed Corp.; Insulation Group.
   b. Johns Manville International, Inc.
   c. Knauf Fiber Glass GmbH.
   d. Owens Corning.

2. Materials: ASTM C 1071; surfaces exposed to airstream shall be coated to prevent erosion of glass fibers.

   a. Thickness: Band and Choir Rooms: 2"; All other areas: 1".
   b. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.
   c. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
   d. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
   e. Mechanical Fasteners: Galvanized steel suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in duct.

      1) Tensile Strength: Indefinitely sustain a 50-lb- tensile, dead-load test perpendicular to duct wall.
      2) Fastener Pin Length: As required for thickness of insulation and without projecting more than 1/8 inch into airstream.
      3) Adhesive for Attaching Mechanical Fasteners: Comply with fire-hazard classification of duct liner system.

2.4 SEALANT MATERIALS

A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

B. Tape Sealing System: Woven-fiber tape impregnated with gypsum mineral compound and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.

2.5 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

B. Hanger Materials: Galvanized sheet steel or threaded steel rod.

1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
2. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.
3. Galvanized-steel straps attached to aluminum ducts shall have contact surfaces painted with zinc-chromate primer.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

2.6 RECTANGULAR DUCT FABRICATION

A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.

C. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.

1. Duct Size: Maximum 30 inches wide and up to 2-inch wg pressure class.
2. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.

D. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of nonbraced panel area unless ducts are lined.

2.7 APPLICATION OF LINER IN RECTANGULAR DUCTS

A. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.

B. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.

C. Butt transverse joints without gaps and coat joint with adhesive.

D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

E. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.

F. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.

G. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

H. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

1. Fan discharges.
2. Intervals of lined duct preceding unlined duct.
3. Upstream edges of transverse joints in ducts where air velocities are greater than 2500 fpm (12.7 m/s) or where indicated.

I. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.8 ROUND DUCT AND FITTING FABRICATION

A. Diameter as applied to flat-oval ducts in this Article is the diameter of a round duct with a circumference equal to the perimeter of a given size of flat-oval duct.

B. Round, Spiral Lock-Seam Ducts: Fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

C. Duct Joints:

1. Ducts up to 20 Inches in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.

D. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal-seam straight ducts.

E. Diverging-Flow Fittings: Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.

F. Fabricate elbows using die-formed, gored, pleated, or mitered construction. Bend radius of die-formed, gored, and pleated elbows shall be 1-1/2 times duct diameter. Unless elbow construction type is indicated, fabricate elbows as follows:

1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
2. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg:

    a. Ducts 3 to 36 Inches in Diameter: 0.034 inch.

3. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from 2- to 10-inch wg:

    a. Ducts 3 to 26 Inches in Diameter: 0.034 inch.

4. 90-Degree, 2-Piece, Mitered Elbows: Use only for supply systems or for material-handling Class A or B exhaust systems and only where space restrictions do not permit using radius elbows. Fabricate with single-thickness turning vanes.
5. Round Elbows 8 Inches and Less in Diameter: Fabricate die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
6. Round Elbows 9 through 14 Inches in Diameter: Fabricate gored or pleated elbows for 30, 45, 60, and 90 degrees unless space restrictions require mitered elbows. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
7. Die-Formed Elbows for Sizes through 8 Inches in Diameter and All Pressures 0.040 inch thick with 2-piece welded construction.
8. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.
9. Pleated Elbows for Sizes through 14 Inches in Diameter and Pressures through 10-Inch wg: 0.022 inch.

PART 3 - EXECUTION

3.1 DUCT APPLICATIONS

A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:

1. Supply Ducts: 2-inch wg.
2. Supply Ducts (before Air Terminal Units): 2-inch wg.
3. Supply Ducts (after Air Terminal Units): 1-inch wg.
4. Supply Ducts (in Mechanical Equipment Rooms): 2-inch wg.
5. Return Ducts (Negative Pressure): 1-inch wg.
6. Exhaust Ducts (Negative Pressure): 1-inch wg.

B. All ducts shall be galvanized steel.

3.2 DUCT INSTALLATION

A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.

B. Install round and flat-oval ducts in lengths not less than 12 feet unless interrupted by fittings.

C. Install ducts with fewest possible joints.

D. Install fabricated fittings for changes in directions, size, and shape and for connections.

E. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches, with a minimum of 3 screws in each coupling.

F. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.

J. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.

K. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.

L. Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

M. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction."

N. Paint interiors of metal ducts, that do not have duct liner, for 24 inches upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.

3.3 DUCT LINER INSTALLATION

A. Install duct liner in accordance with SMACNA "HVAC Duct Construction Standards".

B. Install lined ductwork 25 feet from inlet and outlet of return and supply fans. Fresh air ductwork shall be wrapped with insulation only and relief air ductwork shall not be lined if within 25 feet.

C. Install lined ductwork to all transfer air ducts and boots.

D. Install lined ductwork where shown on drawings.

3.4 SEAM AND JOINT SEALING

A. Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for duct pressure class indicated.

1. For pressure classes lower than 2-inch wg, seal transverse joints.

B. Seal ducts before external insulation is applied.

3.5 HANGING AND SUPPORTING

A. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.

B. Support vertical ducts at maximum intervals of 16 feet and at each floor.

C. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

D. Install concrete inserts before placing concrete.

E. Install powder-actuated concrete fasteners after concrete is placed and completely cured.

1. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors according to Division 15 Section "Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections according to SMACNA's "HVAC Air Duct Leakage Test Manual" and prepare test reports:

1. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
2. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.
3. Maximum Allowable Leakage: Comply with requirements for Leakage Class 3 for round and flat-oval ducts, Leakage Class 12 for rectangular ducts in pressure classes lower than and equal to 2-inch wg (both positive and negative pressures), and Leakage Class 6 for pressure classes from 2- to 10-inch wg.
4. Remake leaking joints and retest until leakage is equal to or less than maximum allowable.

3.8 CLEANING NEW SYSTEMS

A. Mark position of dampers and air-directional mechanical devices before cleaning, and perform cleaning before air balancing.

B. Use service openings, as required, for physical and mechanical entry and for inspection.

1. Create other openings to comply with duct standards.
2. Disconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling sections to gain access during the cleaning process.

C. Vent vacuuming system to the outside. Include filtration to contain debris removed from HVAC systems, and locate exhaust down wind and away from air intakes and other points of entry into building.

D. Clean the following metal duct systems by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.

3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, and actuators except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.

F. Cleanliness Verification:

1. Visually inspect metal ducts for contaminants.
2. Where contaminants are discovered, re-clean and reinspect ducts.

END OF SECTION 15815

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 15820
DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Volume dampers.
2. Fire dampers.
3. Turning vanes.
4. Duct-mounting access doors.
5. Flexible connectors.
6. Flexible ducts.
7. Duct accessory hardware.

B. Related Sections include the following:

1. Division 15 Section "HVAC Instrumentation and Controls" for electric and pneumatic damper actuators.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Volume dampers.
2. Fire dampers.
3. Turning vanes.
4. Duct-mounting access doors.
5. Flexible connectors.
6. Flexible ducts.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 VOLUME DAMPERS

A. Manufacturers:

1. Air Balance, Inc.
2. American Warming and Ventilating.
3. Flexmaster U.S.A., Inc.
4. McGill AirFlow Corporation.
5. METALAIRE, Inc.
6. Nailor Industries Inc.
7. Penn Ventilation Company, Inc.
8. Ruskin Company.
9. Vent Products Company, Inc.

B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

C. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch- thick, galvanized sheet steel.
3. Aluminum Frames: Hat-shaped, 0.10-inch- thick, aluminum sheet channels; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
4. Roll-Formed Aluminum Blades: 0.10-inch- thick aluminum sheet.
5. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.
6. Blade Axles: Galvanized steel.
7. Bearings: Oil-impregnated bronze.
8. Tie Bars and Brackets: Aluminum.
9. Tie Bars and Brackets: Galvanized steel.

D. Low-Leakage Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, low-leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch- thick, galvanized sheet steel.
3. Aluminum Frames: Hat-shaped, 0.10-inch- thick, aluminum sheet channels; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
4. Roll-Formed Aluminum Blades: 0.10-inch- thick aluminum sheet.
5. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.
6. Blade Axles: Galvanized steel.
7. Bearings: Oil-impregnated bronze thrust or ball.
8. Blade Seals: Vinyl or Neoprene.
9. Jamb Seals: Cambered stainless steel.
10. Tie Bars and Brackets: Galvanized steel.

E. Jackshaft: 1-inch- diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.

F. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.4 FIRE DAMPERS

A. Manufacturers:

1. Air Balance, Inc.
2. CESCO Products.
3. Greenheck.
4. McGill AirFlow Corporation.
5. METALAIRE, Inc.
6. Nailor Industries Inc.
7. Penn Ventilation Company, Inc.
8. Prefco Products, Inc.
9. Ruskin Company.
10. Vent Products Company, Inc.
11. Ward Industries, Inc.

B. Fire dampers shall be labeled according to UL 555.

C. Fire Rating: 1-1/2 hours.

D. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners.

E. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.052 or 0.138 inch thick as indicated and of length to suit application.
2. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.

F. Mounting Orientation: Vertical or horizontal as indicated.

G. Blades: Roll-formed, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.

H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

I. Fusible Links: Replaceable, 165 deg F rated.

2.5 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.

B. Manufactured Turning Vanes: Fabricate 1-1/2-inch- wide, single or double-vane, curved blades of galvanized sheet steel set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches o.c.; and set into vane runners suitable for duct mounting.

1. Manufacturers:

a. Ductmate Industries, Inc.
b. Duro Dyne Corp.
c. METALAIRE, Inc.
d. Ward Industries, Inc.

C. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.6 DUCT-MOUNTING ACCESS DOORS

A. General Description: Fabricate doors airtight and suitable for duct pressure class.

B. Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch butt or piano hinge and cam latches.

1. Manufacturers:

a. American Warming and Ventilating.
b. CESCO Products.
c. Ductmate Industries, Inc.
d. Flexmaster U.S.A., Inc.
e. Greenheck.
f. McGill AirFlow Corporation.
g. Nailor Industries Inc.
h. Ventfabrics, Inc.
i. Ward Industries, Inc.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Provide number of hinges and locks as follows:

a. Less Than 12 Inches Square: Secure with two sash locks.
b. Up to 18 Inches Square: Two hinges and two sash locks.
c. Up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.
d. Sizes 24 by 48 Inches and Larger: One additional hinge.

C. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

D. Insulation: 1-inch- thick, fibrous-glass or polystyrene-foam board.

2.7 FLEXIBLE CONNECTORS

A. Manufacturers:

1. Duro Dyne Corp.
2. Ventfabrics, Inc.
3. Ward Industries, Inc.

B. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

C. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Select metal compatible with ducts.

D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

2.8 FLEXIBLE DUCTS

A. Manufacturers:

1. Flexmaster U.S.A., Inc.
2. Hart & Cooley, Inc.
3. McGill AirFlow Corporation.

B. Insulated-Duct Connectors: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene or aluminized vapor barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 10 to plus 160 deg F.

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 through 18 inches to suit duct size.

2.9 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install volume dampers in ducts with liner; avoid damage to and erosion of duct liner.

D. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts as required for air balancing. Install at a minimum of two duct widths from branch takeoff.

E. Provide test holes at fan inlets and outlets and elsewhere as indicated.

F. Install fire dampers with fusible links, according to manufacturer's UL-approved written instructions.

G. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:

1. On both sides of duct coils.
2. Downstream from volume dampers, turning vanes, and equipment.
3. To interior of ducts for cleaning; before and after each change in direction, at maximum 50-foot spacing.
4. On sides of ducts where adequate clearance is available.

H. Install the following sizes for duct-mounting, rectangular access doors:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body Plus Ladder Access: 25 by 17 inches.

I. Install the following sizes for duct-mounting, round access doors:

1. One-Hand or Inspection Access: 8 inches in diameter.
2. Two-Hand Access: 10 inches in diameter.
3. Head and Hand Access: 12 inches in diameter.
4. Head and Shoulders Access: 18 inches in diameter.
5. Body Access: 24 inches in diameter.

J. Label access doors according to Division 15 Section "Mechanical Identification."

K. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.

L. For fans developing static pressures of 5-inch wg and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

M. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

N. Connect diffusers or light troffer boots to low pressure ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

O. Connect flexible ducts to metal ducts with adhesive plus sheet metal screws.

P. Install duct test holes where indicated and required for testing and balancing purposes.

3.2 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire and smoke dampers for proper action.

C. Final positioning of manual-volume dampers is specified in Division 15 Section "Testing, Adjusting, and Balancing."

END OF SECTION 15820

SECTION 15838
POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Centrifugal roof ventilators.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on sea level.

B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.
7. Fan speed controllers.

B. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Roof framing and support members relative to duct penetrations.
2. Ceiling suspension assembly members.
3. Size and location of initial access modules for acoustical tile.

4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.7 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set for each belt-driven unit.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acme Engineering & Mfg. Corp.
2. Carnes Company HVAC.
3. Greenheck.
4. Loren Cook Company.
5. Penn Ventilation.

B. Description: Direct- or belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.

C. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

D. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

E. Accessories:

1. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
2. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
3. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.

F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Self-flashing without a cant strip, with mounting flange.
2. Overall Height: 18 inches.

2.2 MOTORS

A. Comply with requirements in Division 15 Section "Motors."

B. Enclosure Type: Totally enclosed, fan cooled.

2.3 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 7 Section "Roof Accessories" for installation of roof curbs.

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Division 15 Section "Mechanical Identification."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 15 Section "Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Division 16 Section "Grounding and Bonding."

D. Connect wiring according to Division 16 Section "Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust damper linkages for proper damper operation.
6. Verify lubrication for bearings and other moving parts.
7. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
8. Shut unit down and reconnect automatic temperature-control operators.

9. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Refer to Division 15 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.

C. Replace fan and motor pulleys as required to achieve design airflow.

D. Lubricate bearings.

END OF SECTION 15838

SECTION 15840
AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Shutoff single-duct air terminal units.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include rated capacities, furnished specialties, sound-power ratings, and accessories.

B. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. Instructions for resetting minimum and maximum air volumes.
2. Instructions for adjusting software set points.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of air terminal units and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. NFPA Compliance: Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

1.5 COORDINATION

A. Coordinate layout and installation of air terminal units and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHUTOFF SINGLE-DUCT AIR TERMINAL UNITS

A. Manufacturers:

1. Anemostat; a Mestek Company.
2. Carnes.
3. Environmental Technologies, Inc.; Enviro-Air Div.
4. Krueger.
5. METALAIRE, Inc.; Metal Industries Inc.
6. Nailor Industries of Texas Inc.
7. Price Industries.
8. Titus.

B. Configuration: Volume-damper assembly inside unit casing with control components located inside a protective metal shroud.

C. Casing: 0.034-inch steel.

1. Casing Lining: 1-inch- thick, coated, fibrous-glass duct liner complying with ASTM C 1071; secured with adhesive.
2. Casing Lining: Adhesive attached, 3/4-inch- thick, polyurethane foam insulation complying with UL 181 erosion requirements, and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
3. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
4. Air Outlet: S-slip and drive connections.
5. Access: Removable panels for access to dampers and other parts requiring service, adjustment, or maintenance; with airtight gasket.

D. Regulator Assembly: Extruded-aluminum or galvanized-steel components; key damper blades onto shaft with nylon-fitted pivot points located inside unit casing.

1. Automatic Flow-Control Assembly: Combined spring rates shall be matched for each volume-regulator size with machined dashpot for stable operation.

2. Factory-calibrated and field-adjustable assembly with shaft extension for connection to externally mounted control actuator.

E. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.

1. Maximum Damper Leakage: ARI 880 rated, 2 percent of nominal airflow at 3-inch wg inlet static pressure.

F. Hot-Water Heating Coil: Copper tube, mechanically expanded into aluminum-plate fins; leak tested underwater to 200 psig; and factory installed.

G. DDC Controls: Single-package unitary controller and actuator specified in Division 15 Section "HVAC Instrumentation and Controls." Controls provided by temperature controls contractor, factory installed.

2.3 SOURCE QUALITY CONTROL

A. Identification: Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory-set airflows, coil type, and ARI certification seal.

B. Verification of Performance: Rate air terminal units according to ARI 880.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to air terminal units to allow service and maintenance.

C. Hot-Water Piping: In addition to requirements in Division 15 Section "Hydronic Piping," connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve and union or flange.

D. Connect ducts to air terminal units according to Division 15 Section "Metal Ducts."

E. Ground units with electric heating coils according to Division 16 Section "Grounding and Bonding".

F. Connect wiring according to Division 16 Section "Conductors and Cables".

G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 15840

SECTION 15855
DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

B. Related Sections include the following:

1. Division 10 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Division 15 Section "Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 SUBMITTALS

A. Product Data: For each product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate Drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 GRILLES AND REGISTERS

A. Fixed Face:

1. Manufacturers:

    a. Anemostat; a Mestek Company.
    b. Carnes.
    c. Hart & Cooley, Inc.; Hart & Cooley Div.
    d. Krueger.
    e. Nailor Industries of Texas Inc.
    f. Price Industries.
    g. Titus.
    h. Tuttle & Bailey.

2. Material: Steel or Aluminum.
3. Finish: Baked enamel, white.
4. Face Arrangement: 1/2-by-1/2-by-1/2-inch grid core.

2.3 CEILING DIFFUSER OUTLETS

A. Square Ceiling Diffusers:

1. Manufacturers:

    a. Anemostat; a Mestek Company.
    b. Carnes.
    c. Hart & Cooley, Inc.; Hart & Cooley Div.
    d. Krueger.
    e. Nailor Industries of Texas Inc.
    f. Price Industries.
    g. Titus.
    h. Tuttle & Bailey.

2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face Size: 24 by 24 inches or 12 by 12 inches.
5. Face Style: Four cone.

2.4 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 15855

SECTION 15900
HVAC INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls.

B. Related Sections include the following:

1. Division 15 Section "Sequence of Operation" for requirements that relate to this Section.

1.3 DEFINITIONS

A. DDC: Direct digital control.

B. I/O: Input/output.

C. LonWorks: A control network technology platform for designing and implementing interoperable control devices and networks.

D. MS/TP: Master slave/token passing.

E. PC: Personal computer.

F. PID: Proportional plus integral plus derivative.

G. RTD: Resistance temperature detector.

1.4 SEQUENCE OF OPERATION See Section 15940 "Sequence of Operations.

1.5 SUBMITTALS

A. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Bill of materials of equipment indicating quantity, manufacturer, and model number.
2. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
3. Wiring Diagrams: Power, signal, and control wiring.
4. Details of control panel faces, including controls, instruments, and labeling.
5. Written description of sequence of operation.
6. Schedule of dampers including size, leakage, and flow characteristics.
7. Schedule of valves including flow characteristics.
8. Controlled Systems:

a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
b. Written description of sequence of operation including schematic diagram.
c. Points list.

B. Field quality-control test reports.

C. Operation and Maintenance Data.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with ASHRAE 135 for DDC system components.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to equipment manufacturer.

1.8 COORDINATION

A. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.

B. Coordinate supply of conditioned electrical branch circuits for control units and operator workstation.

C. Coordinate equipment with Division 16 Section "Electrical Power Monitoring and Control" to achieve compatibility of communication interfaces.

D. Coordinate equipment with Division 16 Section "Panelboards" to achieve compatibility with starter coils and annunciation devices.

E. Coordinate equipment with Division 16 Section "Motor-Control Centers" to achieve compatibility with motor starters and annunciation devices.

PART 2 - PRODUCTS

2.1 CONTROL SYSTEM

A. Manufacturers:

1. Andover Controls Corporation.

B. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, and accessories to control mechanical systems.

2.2 UNITARY CONTROLLERS

A. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application.

1. Configuration: Local keypad and display; diagnostic LEDs for power, communication, and processor; wiring termination to terminal strip or card connected with ribbon cable; memory with bios; and 72-hour battery backup.
2. Operating System: Manage I/O communication to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms. Perform scheduling with real-time clock. Perform automatic system diagnostics; monitor system and report failures.
3. Enclosure: Dustproof rated for operation at 32 to 120 deg F.

2.3 ALARM PANELS

A. Unitized cabinet with suitable brackets for wall or floor mounting. Fabricate of 0.06-inch-thick, furniture-quality steel or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock and with manufacturer's standard shop-painted finish. Provide common keying for all panels.

B. Indicating light for each alarm point, single horn, acknowledge switch, and test switch, mounted on hinged cover.

1. Alarm Condition: Indicating light flashes and horn sounds.
2. Acknowledge Switch: Horn is silent and indicating light is steady.
3. Second Alarm: Horn sounds and indicating light is steady.

4. Alarm Condition Cleared: System is reset and indicating light is extinguished.
5. Contacts in alarm panel allow remote monitoring by independent alarm company.

2.4 ELECTRONIC SENSORS

A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.

B. RTDs and Transmitters:

1. Accuracy: Plus or minus 0.2 percent at calibration point.
2. Wire: Twisted, shielded-pair cable.
3. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.
4. Averaging Elements in Ducts: Use where prone to temperature stratification length as required.
5. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.
6. Room Sensor Cover Construction: Manufacturer's standard locking covers.

    a. Set-Point Adjustment: Concealed.
    b. Set-Point Indication: Concealed.
    c. Thermometer: Concealed.
    d. Color: Match wall finish.
    e. Orientation: Vertical.

7. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.

C. Pressure Transmitters/Transducers:

1. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.

    a. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
    b. Output: 4 to 20 mA.
    c. Duct Static-Pressure Range: 0- to 5-inch wg.

2.5 THERMOSTATS

A. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch or equivalent solid-state type, with heat anticipator; listed for electrical rating; with concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 deg F maximum differential.

1. Electric Heating Thermostats: Equip with off position on dial wired to break ungrounded conductors.
2. Selector Switch: Integral, manual on-off-auto.

2.6 ACTUATORS

A. Manufacturers:

1. Belimo Aircontrols (USA), Inc.
2. Seimen's

B. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.

1. Valves: Size for torque required for valve close off at maximum pump differential pressure.
2. Dampers: Size for running torque calculated as follows:

    a. Parallel-Blade Damper with Edge Seals: 7 inch-lb/sq. ft. of damper.
    b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. of damper.
    c. Parallel-Blade Damper without Edge Seals: 4 inch-lb/sq. ft of damper.
    d. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. of damper.
    e. Dampers with 2- to 3-Inch wg of Pressure Drop or Face Velocities of 1000 to 2500 fpm: Increase running torque by 1.5.
    f. Dampers with 3- to 4-Inch wg of Pressure Drop or Face Velocities of 2500 to 3000 fpm: Increase running torque by 2.0.

3. Coupling: V-bolt and V-shaped, toothed cradle.
4. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
5. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on nonspring-return actuators.
6. Power Requirements (Two-Position Spring Return): 24-V ac.
7. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
8. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
9. Temperature Rating: 40 to 104 deg F.
10. Temperature Rating (Smoke Dampers): Minus 22 to plus 250 deg F.
11. Run Time: 12 seconds open, 5 seconds closed.

2.7 CONTROL VALVES

A. Manufacturers:

1. Belimo Aircontrols.
2. Seimen's

B. Control Valves: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

C. Hydronic system globe valves shall have the following characteristics:

1. NPS 2 and Smaller: Class 125 bronze body, bronze trim, rising stem, renewable composition disc, and screwed ends with backseating capacity repackable under pressure.

2. NPS 2-1/2 and Larger: Class 125 iron body, bronze trim, rising stem, plug-type disc, flanged ends, and renewable seat and disc.
3. Internal Construction: Replaceable plugs and stainless-steel or brass seats.

    a. Single-Seated Valves: Cage trim provides seating and guiding surfaces for plug on top and bottom.
    b. Double-Seated Valves: Balanced plug; cage trim provides seating and guiding surfaces for plugs on top and bottom.

4. Sizing: 3-psig maximum pressure drop at design flow rate or the following:

    a. Two Position: Line size.
    b. Two-Way Modulating: Either the value specified above or twice the load pressure drop, whichever is more.
    c. Three-Way Modulating: Twice the load pressure drop, but not more than value specified above.

5. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.
6. Close-Off (Differential) Pressure Rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 150 percent of total system (pump) head for two-way valves and 100 percent of pressure differential across valve or 100 percent of total system (pump) head.

D. Terminal Unit Control Valves: Bronze body, bronze trim, two or three ports as indicated, replaceable plugs and seats, and union and threaded ends.

1. Rating: Class 125 for service at 125 psig and 250 deg F operating conditions.
2. Sizing: 3-psig maximum pressure drop at design flow rate, to close against pump shutoff head.
3. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.

2.8 DAMPERS

A. Manufacturers:

1. Air Balance Inc.
2. Don Park Inc.; Autodamp Div.
3. TAMCO (T. A. Morrison & Co. Inc.).
4. United Enertech Corp.
5. Vent Products Company, Inc.

B. Dampers: AMCA-rated, parallel or opposed-blade design; 0.108-inch- minimum thick, galvanized-steel or 0.125-inch- minimum thick, extruded-aluminum frames with holes for duct mounting; damper blades shall not be less than 0.064-inch- thick galvanized steel with maximum blade width of 8 inches and length of 48 inches.

1. Secure blades to 1/2-inch- diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed

against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.

2. Operating Temperature Range: From minus 40 to plus 200 deg F.
3. Edge Seals, Standard Pressure Applications: Closed-cell neoprene.
4. Edge Seals, Low-Leakage Applications: Use inflatable blade edging or replaceable rubber blade seals and spring-loaded stainless-steel side seals, rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 4-inch wg when damper is held by torque of 50 in. x lbf; when tested according to AMCA 500D.

2.9 CONTROL CABLE

A. Electronic and fiber-optic cables for control wiring are specified in Division 16 Section "Voice and Data Communication Cabling."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that power supply is available to control units and operator workstation.

3.2 INSTALLATION

A. Install software in control units and operator workstation(s). Implement all features of programs to specified requirements and as appropriate to sequence of operation.

B. Connect and configure equipment and software to achieve sequence of operation specified.

C. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 60 inches above the floor.

1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

D. Install automatic dampers according to Division 15 Section "Duct Accessories."

E. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.

F. Install labels and nameplates to identify control components according to Division 15 Section "Mechanical Identification."

G. Install hydronic instrument wells, valves, and other accessories according to Division 15 Section "Hydronic Piping."

H. Install refrigerant instrument wells, valves, and other accessories according to Division 15 Section "Refrigerant Piping."

I. Install duct volume-control dampers according to Division 15 Sections specifying air ducts.

J. Install electronic and fiber-optic cables according to Division 16 Section "Voice and Data Communication Cabling."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
2. Test and adjust controls and safeties.
3. Test calibration of electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
4. Test each point through its full operating range to verify that safety and operating control set points are as required.
5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
6. Test each system for compliance with sequence of operation.
7. Test software and hardware interlocks.

C. DDC Verification:

1. Verify that instruments are installed before calibration, testing, and loop or leak checks.
2. Check instruments for proper location and accessibility.
3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
4. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
5. Check temperature instruments and material and length of sensing elements.
6. Check control valves. Verify that they are in correct direction.
7. Check DDC system as follows:

    a. Verify that DDC controller power supply is from emergency power supply, if applicable.
    b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
    c. Verify that spare I/O capacity has been provided.
    d. Verify that DDC controllers are protected from power supply surges.

D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.4 ADJUSTING

A. Calibrating and Adjusting:

1. Calibrate instruments.

2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
4. Control System Inputs and Outputs:

    a. Check analog inputs at 0, 50, and 100 percent of span.
    b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
    c. Check digital inputs using jumper wire.
    d. Check digital outputs using ohmmeter to test for contact making or breaking.
    e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.

5. Pressure:

    a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
    b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.

6. Temperature:

    a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
    b. Calibrate temperature switches to make or break contacts.

7. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.
8. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
9. Provide diagnostic and test instruments for calibration and adjustment of system.
10. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

B. Adjust initial temperature and humidity set points.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other than normal occupancy hours for this purpose.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION 15900

SECTION 15950
TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes TAB to produce design objectives for the following:

1. Air Systems:

    a. Constant-volume air systems.
    b. Variable-air-volume systems.

2. Hydronic Piping Systems:

    a. Constant-flow systems.

3. HVAC equipment quantitative-performance settings.
4. Verifying that automatic control devices are functioning properly.

1.3 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.

C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

E. Report Forms: Test data sheets for recording test data in logical order.

F. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

H. TAB: Testing, adjusting, and balancing.

I. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

J. Test: A procedure to determine quantitative performance of systems or equipment.

K. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

1.4 SUBMITTALS

A. Qualification Data: Within 30 days from Contractor's Notice to Proceed, submit 4 copies of evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 30 days from Contractor's Notice to Proceed, submit 4 copies of the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 60 days from Contractor's Notice to Proceed, submit 4 copies of TAB strategies and step-by-step procedures as specified in Part 3 "Preparation" Article. Include a complete set of report forms intended for use on this Project.

D. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

E. Sample Report Forms: Submit two sets of sample TAB report forms.

1.5 QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm certified by either AABC or NEBB.

B. TAB Conference: Meet with Owner's and Architect's representatives on approval of TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, HVAC controls installers, and other support personnel. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:

    a. Submittal distribution requirements.
    b. The Contract Documents examination report.
    c. TAB plan.
    d. Work schedule and Project-site access requirements.
    e. Coordination and cooperation of trades and subcontractors.

f. Coordination of documentation and communication flow.

C. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard forms from SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing." TAB firm's forms approved by Architect.

E. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

F. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.

1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

1.6 PROJECT CONDITIONS

A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of Contract.
2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine Project Record Documents described in Division 1 Section "Project Record Documents."

D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

G. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine terminal units, such as variable-air-volume boxes, to verify that they are accessible and their controls are connected and functioning.

L. Examine strainers for clean screens and proper perforations.

M. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

N. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

O. Examine system pumps to ensure absence of entrained air in the suction piping.

P. Examine equipment for installation and for properly operating safety interlocks and controls.

Q. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices are operated by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
6. Sensors are located to sense only the intended conditions.
7. Sequence of operation for control modes is according to the Contract Documents.
8. Controller set points are set at indicated values.
9. Interlocked systems are operating.
10. Changeover from heating to cooling mode occurs according to indicated values.

R. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.

7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

E. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling unit components.

L. Check for proper sealing of air duct system.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:

    a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
    d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

    a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.

3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.
4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
5. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

    a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a maximum set-point airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set outside-air dampers at minimum, and return- and exhaust-air dampers at a position that simulates full-cooling load.
2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
3. Measure total system airflow. Adjust to within indicated airflow.
4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow as described for constant-volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.

6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.
7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.

8. Record the final fan performance data.

3.7 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check flow-control valves for specified sequence of operation and set at indicated flow.
3. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
4. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.8 PROCEDURES FOR HYDRONIC SYSTEMS

A. Measure water flow at pumps. Use the following procedures, except for positive-displacement pumps:

1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.
3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
4. Report flow rates that are not within plus or minus 5 percent of design.

B. Set calibrated balancing valves, if installed, at calculated presettings.

C. Measure flow at all stations and adjust, where necessary, to obtain first balance.

1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.

D. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.

E. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:

1. Determine the balancing station with the highest percentage over indicated flow.

2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
3. Record settings and mark balancing devices.

F. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.

3.9 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.10 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.11 PROCEDURES FOR BOILERS

A. Hydronic Boilers: Measure and record entering- and leaving-water temperatures and water flow.

3.12 PROCEDURES FOR HEAT-TRANSFER COILS

A. Water Coils: Measure the following data for each coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.

7. Air pressure drop.

3.13 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:

1. New filters are installed.
2. Coils are clean and fins combed.
3. Drain pans are clean.
4. Fans are clean.
5. Bearings and other parts are properly lubricated.
6. Deficiencies noted in the preconstruction report are corrected.

B. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.

1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
4. Balance each air outlet.

3.14 PROCEDURES FOR TEMPERATURE MEASUREMENTS

A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of two successive eight-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.

C. Measure outside-air, wet- and dry-bulb temperatures.

3.15 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Check the operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Check free travel and proper operation of control devices such as damper and valve operators.

F. Check the sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.

G. Check the interaction of electrically operated switch transducers.

H. Check the interaction of interlock and lockout systems.

I. Check main control supply-air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine whether the system operates on a grounded or nongrounded power supply.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.16 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.
2. Air Outlets and Inlets: 0 to minus 10 percent.
3. Heating-Water Flow Rate: 0 to minus 10 percent.
4. Cooling-Water Flow Rate: 0 to minus 5 percent.

3.17 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.18 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to certified field report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of TAB firm.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB firm who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outside, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.

4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

F. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data: Include the following:

   a. Unit identification.
   b. Location.
   c. Make and type.
   d. Model number and unit size.
   e. Manufacturer's serial number.
   f. Unit arrangement and class.
   g. Discharge arrangement.
   h. Sheave make, size in inches, and bore.
   i. Sheave dimensions, center-to-center, and amount of adjustments in inches.
   j. Number of belts, make, and size.
   k. Number of filters, type, and size.

2. Motor Data:

   a. Make and frame type and size.
   b. Horsepower and rpm.
   c. Volts, phase, and hertz.
   d. Full-load amperage and service factor.
   e. Sheave make, size in inches, and bore.
   f. Sheave dimensions, center-to-center, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

   a. Total airflow rate in cfm.
   b. Total system static pressure in inches wg.
   c. Fan rpm.
   d. Discharge static pressure in inches wg.
   e. Filter static-pressure differential in inches wg.
   f. Preheat coil static-pressure differential in inches wg.
   g. Cooling coil static-pressure differential in inches wg.
   h. Heating coil static-pressure differential in inches wg.
   i. Outside airflow in cfm.
   j. Return airflow in cfm.
   k. Outside-air damper position.
   l. Return-air damper position.
   m. Vortex damper position.

G. Apparatus-Coil Test Reports:

1. Coil Data:

   a. System identification.

b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch o.c.
f. Make and model number.
g. Face area in sq. ft..
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outside-air, wet- and dry-bulb temperatures in deg F.
e. Return-air, wet- and dry-bulb temperatures in deg F.
f. Entering-air, wet- and dry-bulb temperatures in deg F.
g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. Water flow rate in gpm.
i. Water pressure differential in feet of head or psig.
j. Entering-water temperature in deg F.
k. Leaving-water temperature in deg F.
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig.
n. Refrigerant suction temperature in deg F.
o. Inlet steam pressure in psig.

H. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Sheave dimensions, center-to-center, and amount of adjustments in inches.

2. Motor Data:

a. Make and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Sheave dimensions, center-to-center, and amount of adjustments in inches.
g. Number of belts, make, and size.

3. Test Data (Indicated and Actual Values):

    a. Total airflow rate in cfm.
    b. Total system static pressure in inches wg.
    c. Fan rpm.
    d. Discharge static pressure in inches wg.
    e. Suction static pressure in inches wg.

I. Air-Terminal-Device Reports:

1. Unit Data:

    a. System and air-handling unit identification.
    b. Location and zone.
    c. Test apparatus used.
    d. Area served.
    e. Air-terminal-device make.
    f. Air-terminal-device number from system diagram.
    g. Air-terminal-device type and model number.
    h. Air-terminal-device size.
    i. Air-terminal-device effective area in sq. ft..

2. Test Data (Indicated and Actual Values):

    a. Airflow rate in cfm.
    b. Air velocity in fpm.
    c. Preliminary airflow rate as needed in cfm.
    d. Preliminary velocity as needed in fpm.
    e. Final airflow rate in cfm.
    f. Final velocity in fpm.
    g. Space temperature in deg F.

J. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

    a. System and air-handling unit identification.
    b. Location and zone.
    c. Room or riser served.
    d. Coil make and size.
    e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

    a. Airflow rate in cfm.
    b. Entering-water temperature in deg F.
    c. Leaving-water temperature in deg F.
    d. Water pressure drop in feet of head or psig.
    e. Entering-air temperature in deg F.
    f. Leaving-air temperature in deg F.

K. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1. Unit Data:

   a. Unit identification.
   b. Location.
   c. Service.
   d. Make and size.
   e. Model and serial numbers.
   f. Water flow rate in gpm.
   g. Water pressure differential in feet of head or psig.
   h. Required net positive suction head in feet of head or psig.
   i. Pump rpm.
   j. Impeller diameter in inches.
   k. Motor make and frame size.
   l. Motor horsepower and rpm.
   m. Voltage at each connection.
   n. Amperage for each phase.
   o. Full-load amperage and service factor.
   p. Seal type.

2. Test Data (Indicated and Actual Values):

   a. Static head in feet of head or psig.
   b. Pump shutoff pressure in feet of head or psig.
   c. Actual impeller size in inches.
   d. Full-open flow rate in gpm.
   e. Full-open pressure in feet of head or psig.
   f. Final discharge pressure in feet of head or psig.
   g. Final suction pressure in feet of head or psig.
   h. Final total pressure in feet of head or psig.
   i. Final water flow rate in gpm.
   j. Voltage at each connection.
   k. Amperage for each phase.

3.19 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional testing, inspecting, and adjusting during near-peak summer and winter conditions.

END OF SECTION 15950

SECTION 16050
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Supporting devices for electrical components.
2. Concrete equipment bases.
3. Electrical demolition.
4. Cutting and patching for electrical construction.
5. Touchup painting.

1.3 SUBMITTALS

A. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Coordinate electrical service connections to components furnished by utility companies.

1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section "Access Doors."

E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- diameter slotted holes at a maximum of 2 inches o.c., in webs.

1. Channel Thickness: Selected to suit structural loading.
2. Fittings and Accessories: Products of the same manufacturer as channel supports.

D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

F. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

G. Expansion Anchors: Carbon-steel wedge or sleeve type.

H. Toggle Bolts: All-steel springhead type.

2.2 CONCRETE BASES

A. Concrete Forms and Reinforcement Materials: As specified in Division 3 Section "Cast-in-Place Concrete."

B. Concrete: 3000-psi, 28-day compressive strength as specified in Division 3 Section "Cast-in-Place Concrete."

2.3 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Selection of Supports: Comply with manufacturer's written instructions.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

3.3 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 1/4-inch- diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws or screw-type nails.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Steel: Welded threaded studs or spring-tension clamps on steel.

a. Field Welding: Comply with AWS D1.1.

6. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
7. Light Steel: Sheet-metal screws.
8. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.5 DEMOLITION

A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.

B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.

C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.

D. Remove demolished material from Project site.

E. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.6 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.7 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Supporting devices for electrical components.
2. Concrete bases.
3. Electrical demolition.
4. Cutting and patching for electrical construction.
5. Touchup painting.

3.8 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint.

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.9 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 16050

SECTION 16060
GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment, plus the following special applications:

1. Underground distribution grounding.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Grounding arrangements and connections for separately derived systems.

C. Qualification Data: For testing agency and testing agency's field supervisor.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For grounding to include the following in emergency, operation, and maintenance manuals:

1. Instructions for periodic testing and inspection of grounding features at test wells, grounding connections for separately derived systems based on NETA MTS.

a. Tests shall be to determine if ground resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if they do not.
b. Include recommended testing intervals.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches in cross section, unless otherwise indicated; with insulators.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by10 feet in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0AWG minimum.

1. Bury at least 24 inches below grade.

C. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 1 inch, minimum, from wall 6 inches above finished floor, unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

F. Metal Poles Supporting Outdoors Lighting Fixtures: Install grounding electrode and a separate insulated equipment-grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 2 Section "Underground Ducts and Utility Structures," and shall be at least 12 inches deep, with cover.

1. Test Wells: Install at least one test well for each service, unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

B. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
    a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.
3. Prepare dimensioned drawings locating each test well, ground rod and ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity 500 kVA and less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.
3. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
4. Pad-Mounted Equipment: 5 ohms.
5. Manhole Grounds: 10 ohms.

D. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 16060

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 16075
ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with ANSI A13.1 and NFPA 70 for color-coding.

PART 2 - PRODUCTS

2.1 RACEWAY AND CABLE LABELS

A. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

1. Color: Black letters on orange field.
2. Legend: Indicates voltage and service.

B. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend overlaminated with a clear, weather- and chemical-resistant coating.

C. Pretensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the line it identifies and arranged to stay in place by pretensioned gripping action when placed in position.

D. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

E. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.

1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend indicating type of underground line.

F. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

G. Aluminum, Wraparound Marker Bands: Bands cut from 0.014-inch- thick aluminum sheet, with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.

H. Plasticized Card-Stock Tags: Vinyl cloth with preprinted and field-printed legends. Orange background, unless otherwise indicated, with eyelet for fastener.

I. Aluminum-Faced, Card-Stock Tags: Weather-resistant, 18-point minimum card stock faced on both sides with embossable aluminum sheet, 0.002 inch thick, laminated with moisture-resistant acrylic adhesive, punched for fasteners, and preprinted with legends to suit each application.

J. Brass or Aluminum Tags: 2 by 2 by 0.05-inch metal tags with stamped legend, punched for fastener.

2.2 NAMEPLATES AND SIGNS

A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.

B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.

C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.

D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.

E. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch.
2. Tensile Strength: 50 lb minimum.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: According to color-coding.

B. Paint: Formulated for the type of surface and intended use.

1. Primer for Galvanized Metal: Single-component acrylic vehicle formulated for galvanized surfaces.
2. Primer for Concrete Masonry Units: Heavy-duty-resin block filler.
3. Primer for Concrete: Clear, alkali-resistant, binder-type sealer.
4. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before applying.

E. Install painted identification according to manufacturer's written instructions and as follows:

1. Clean surfaces of dust, loose material, and oily films before painting.
2. Prime surfaces using type of primer specified for surface.
3. Apply one intermediate and one finish coat of enamel.

F. Color Banding Raceways and Exposed Cables: Band exposed and accessible raceways of the systems listed below:

1. Bands: Pretensioned, wraparound plastic sleeves; colored adhesive tape; or a combination of both. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
3. Apply the following colors to the systems listed below:

a. Fire Alarm System: Red.

b. Fire-Suppression Supervisory and Control System: Red and yellow.
c. Mechanical and Electrical Supervisory System: Green and blue.
d. Telecommunication System: Green and yellow.

G. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.

H. Circuit Identification Labels on Boxes: Install labels externally.

1. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.
2. Concealed Boxes: Plasticized card-stock tags.
3. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.

I. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single line marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.

J. Color-Coding of Secondary Phase Conductors: Use the following colors for service, feeder and branch-circuit phase conductors:

1. 208/120-V Conductors:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.

2. 480/277-V Conductors:

a. Phase A: Yellow.
b. Phase B: Brown.
c. Phase C: Orange.

3. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG:

a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.
b. Colored cable ties applied in groups of three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten to a snug fit, and cut off excess length.

K. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.

1. Legend: 1/4-inch- steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
2. Tag Fasteners: Nylon cable ties.
3. Band Fasteners: Integral ears.

L. Apply identification to conductors as follows:

1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

M. Apply warning, caution, and instruction signs as follows:

1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8-inch- high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

N. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch- high lettering on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

1. Panelboards, electrical cabinets, and enclosures.
2. Access doors and panels for concealed electrical items.
3. Electrical switchgear and switchboards.
4. Electrical substations.
5. Emergency system boxes and enclosures.
6. Motor-control centers.
7. Disconnect switches.
8. Enclosed circuit breakers.
9. Motor starters.
10. Push-button stations.
11. Power transfer equipment.
12. Contactors.
13. Remote-controlled switches.
14. Dimmers.

15. Control devices.
16. Transformers.
17. Fire alarm master station or control panel.

END OF SECTION 16075

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 16080
ELECTRICAL TESTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes general requirements for electrical field testing and inspecting. Detailed requirements are specified in each Section containing components that require testing. General requirements include the following:

1. Qualifications of testing agencies and their personnel.
2. Suitability of test equipment.
3. Calibration of test instruments.
4. Coordination requirements for testing and inspecting.
5. Reporting requirements for testing and inspecting.

1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications: As specified in each Section containing electrical testing requirements and in subparagraph and associated subparagraph below.

1. Independent Testing Agencies: Independent of manufacturers, suppliers, and installers of components to be tested or inspected.

    a. Testing Agency's Field Supervisor for Power Component Testing: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Division 16 power component Sections.

B. Test Equipment Suitability: Comply with NETA ATS, Section 5.2.

C. Test Equipment Calibration: Comply with NETA ATS, Section 5.3.

PART 2 - NOT USED

PART 3 - EXECUTION

3.1 GENERAL TESTS AND INSPECTIONS

A. If a group of tests are specified to be performed by an independent testing agency, prepare systems, equipment, and components for tests and inspections, and perform preliminary tests to ensure that systems, equipment, and components are ready for independent agency testing. Include the following minimum preparations as appropriate:

1. Perform insulation-resistance tests.
2. Perform continuity tests.
3. Perform rotation test (for motors to be tested).
4. Provide a stable source of single-phase, 208/120-V electrical power for test instrumentation at each test location.

B. Test and Inspection Reports: In addition to requirements specified elsewhere, report the following:

1. Manufacturer's written testing and inspecting instructions.
2. Calibration and adjustment settings of adjustable and interchangeable devices involved in tests.
3. Tabulation of expected measurement results made before measurements.
4. Tabulation of "as-found" and "as-left" measurement and observation results.

END OF SECTION 16080

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 16120
CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

B. Related Sections include the following:

1. Division 16 Section "Control/Signal Transmission Media" for transmission media used for control and signal circuits.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For testing agency.

C. Field Quality-Control Test Reports: From a qualified testing and inspecting agency engaged by Contractor.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 CONDUCTORS AND CABLES

A. Manufacturers:

1. Alcan Aluminum Corporation; Alcan Cable Div.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

C. Conductor Material: Copper complying with NEMA WC 5 or 7; stranded conductor.

D. Conductor Insulation Types: Type THW, THHN-THWN, UF and SO complying with NEMA WC 5 or 7.

E. Multiconductor Cable: Metal-clad cable, Type MC with ground wire – permitted use is limited to 6-foot long sections from junction box to light fixtures or within casework.

2.3 CONNECTORS AND SPLICES

A. Manufacturers:

1. AFC Cable Systems, Inc.
2. AMP Incorporated/Tyco International.
3. Hubbell/Anderson.
4. O-Z/Gedney; EGS Electrical Group LLC.
5. 3M Company; Electrical Products Division.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance: Type THHN-THWN, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspaces: Type THHN-THWN, single conductors in raceway.

E. Exposed Branch Circuits, including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.

H. Underground Feeders and Branch Circuits: Type THW in raceway.

I. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.

J. Fire Alarm Circuits: Power-limited, fire-protective, signaling circuit cable.

K. Class 1 Control Circuits: Type THHN-THWN, in raceway.

L. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.2 INSTALLATION

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."

F. Seal around cables penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."

G. Identify and color-code conductors and cables according to Division 16 Section "Electrical Identification."

3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.4 FIELD QUALITY CONTROL

A. Testing: Engage a qualified testing agency to perform the following field quality-control testing:

B. Testing: Perform the following field quality-control testing:

1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 16120

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 16130
RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Division 7 Section "Through-Penetration Firestop Systems" for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
2. Division 16 Section "Basic Electrical Materials and Methods" for supports, anchors, and identification products.
3. Division 16 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. LFNC: Liquidtight flexible nonmetallic conduit.

G. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

A. Manufacturers:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Electri-Flex Co.
4. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
5. LTV Steel Tubular Products Company.
6. Manhattan/CDT/Cole-Flex.
7. O-Z Gedney; Unit of General Signal.

B. Rigid Steel Conduit: ANSI C80.1.

C. IMC: ANSI C80.6.

D. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.

E. Plastic-Coated IMC and Fittings: NEMA RN 1.

F. EMT and Fittings: ANSI C80.3.

1. Fittings: Set-screw type with ground conductor.

G. FMC: Zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket.

I. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers:

1. American International.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Certainteed Corp.; Pipe & Plastics Group.
4. Condux International.
5. ElecSYS, Inc.
6. Electri-Flex Co.
7. Lamson & Sessions; Carlon Electrical Products.
8. RACO; Division of Hubbell, Inc.
9. Spiralduct, Inc./AFC Cable Systems, Inc.
10. Thomas & Betts Corporation.

B. ENT: NEMA TC 13.

C. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

D. ENT and RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

E. LFNC: UL 1660.

2.4 METAL WIREWAYS

A. Manufacturers:

1. Hoffman.
2. Square D.
3. Rittal Inc.

B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA **[1]** **[3R]**.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

E. Wireway Covers: Hinged type.

F. Finish: Manufacturer's standard enamel finish.

2.5 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating and off-white finished paint.

1. Manufacturers:

a. Mono-Systems.
b. Thomas & Betts Corporation.
c. Wiremold Company (The); Electrical Sales Division.

B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

C. Raceways shall have following features based on Wiremold #V-4000 series or approved equal:

1. Dual compartment with snap-on cover.

2. Fittings for blank communications outlets and duplex receptacles–Wiremold #V4049/5507B/5507D.

3. Wire Clips.

4. All required fittings and accessories.

5. For new construction, provide concealed conduit as indicated from low voltage compartment and terminate in accessible ceiling plenum. Provide conduits with bushings.

6. Duplex receptacles with dedicated neutral and ground for each circuit back to panel. Alternate circuiting to every other duplex receptacle where multiple circuits are indicated.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Emerson/General Signal; Appleton Electric Company.
3. Erickson Electrical Equipment Co.
4. Hoffman.
5. Hubbell, Inc.; Killark Electric Manufacturing Co.
6. O-Z/Gedney; Unit of General Signal.
7. RACO; Division of Hubbell, Inc.
8. Spring City Electrical Manufacturing Co.

9. Thomas & Betts Corporation.
10. Walker Systems, Inc.; Wiremold Company (The).
11. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

D. Floor Boxes: Cast metal (for slab-on grade applications), fully adjustable, rectangular. Floor boxes with combination of duplex receptacles and communications outlets shall be Wiremold #RFB4 series with RAMKII cover with insert to match finished floor.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

G. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

H. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.7 FACTORY FINISHES

A. Finish: For enclosure, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting. For surface metal raceways provide off-white paint.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors:

1. Exposed: Rigid steel or IMC.
2. Concealed: Rigid steel or IMC.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 4.

B. Indoors:

1. Exposed: EMT.
2. Concealed: EMT.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
4. Damp or Wet Locations: Rigid steel conduit.
5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:

    a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

C. Minimum Raceway Size: 1/2-inch trade size

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

3.2 INSTALLATION

A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

B. Complete raceway installation before starting conductor installation.

C. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."

D. Install temporary closures to prevent foreign matter from entering raceways.

E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.

F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.

3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above the floor.

I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

J. Join raceways with fittings designed and approved for that purpose and make joints tight.

1. Use insulating bushings to protect conductors.

K. Tighten set screws of threadless fittings with suitable tools.

L. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

N. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

O. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

P. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

Q. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

R. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

S. Set floor boxes level and flush with finished floor surface.

T. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 16130

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 16140
WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Single and duplex receptacles, ground-fault circuit interrupters.
2. Single- and double-pole snap switches and dimmer switches.
3. Device wall plates.
4. Floor service outlets, and multioutlet assemblies.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. PVC: Polyvinyl chloride.

D. RFI: Radio-frequency interference.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wiring Devices:

a. Hubbell Incorporated; Wiring Device-Kellems.
b. Leviton Mfg. Company Inc.
c. Pass & Seymour/Legrand; Wiring Devices Div.
d. Incandescent Dimmers: Lutron Nova-T series.

2. Wiring Devices for Hazardous (Classified) Locations:

a. Crouse-Hinds/Cooper Industries, Inc.; Arrow Hart Wiring Devices.
b. EGS/Appleton Electric Company.
c. Killark Electric Manufacturing Co./Hubbell Incorporated.

3. Multioutlet Assemblies:

a. Hubbell Incorporated; Wiring Device-Kellems.
b. Wiremold Company (The).

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 5351 (single), 5352 (duplex).
b. Hubbell; HBL5351 (single), CR5352 (duplex).
c. Leviton; 5891 (single), 5352 (duplex).
d. Pass & Seymour; 5381 (single), 5352 (duplex).

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, [non-feed]-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; GF20.
b. Pass & Seymour; 2084.
c. Hubbell
d. Leviton

2.4 SWITCHES

A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.

B. Snap Switches: Heavy-Duty grade, quiet type.

C. Keyed Switches: Provide real-key type switches.

D. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.

1. Switch: 20 A, 120/277-V ac.
2. Receptacle: NEMA WD 6, Configuration 5-20R.

2.5 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: satin-finished stainless steel, 0.04-inch- thick.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

2.6 MULTIOUTLET ASSEMBLIES

A. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

B. Raceway Material: Metal, with manufacturer's off-white standard finish.

C. Wire: No. 12 AWG.

2.7 FINISHES

A. Color:

1. Wiring Devices Connected to Normal Power System: White for new construction, unless otherwise indicated or required by NFPA 70.
2. Wiring Devices Connected to Normal Power System: Provide devices with color matching existing for renovated areas and for contiguous new additions, unless otherwise indicated or required by NFPA 70.

3. Wiring Devices Connected to Emergency Power System: Red.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies level, plumb, and square with building lines.

B. Install wall dimmers to achieve indicated rating after derating for ganging according to manufacturer's written instructions.

C. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' written instructions.

D. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on bottom. Group adjacent switches under single, multigang wall plates.

E. Remove wall plates and protect devices and assemblies during painting.

F. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Division 16 Section Electrical Identification.

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 CONNECTIONS

A. Ground equipment according to Division 16 Section "Grounding and Bonding."

B. Connect wiring according to Division 16 Section "Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 16140

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 16145
LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following lighting control devices:

1. Outdoor photoelectric switches.
2. Switch-box occupancy sensors.
3. Indoor occupancy sensors.
4. Multipole contactors.

B. Related Sections include the following:

1. Division 13 Section "Lighting Controls" for low-voltage, manual and programmable lighting control systems.
2. Division 16 Section "Wiring Devices" for wall-box dimmers and manual light switches.

1.3 DEFINITIONS

A. LED: Light-emitting diode.

B. PIR: Passive infrared.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Lighting plan showing location, orientation, and coverage area of each sensor.
2. Interconnection diagrams showing field-installed wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

A. Line-Voltage Surge Protection: An integral part of the devices for 120- and 277-V solid-state equipment. For devices without integral line-voltage surge protection, field-mounting surge protection shall comply with IEEE C62.41 and with UL 1449.

2.3 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers:

1. Intermatic, Inc.
2. Paragon Electric Co.
3. TORK.
4. Touchplate Technologies, Inc.
5. Watt Stopper (The).

B. Description: Solid state, with SPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, microprocessor input, and complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
2. Time Delay: 15-second minimum, to prevent false operation.
3. Surge Protection: Metal-oxide varistor type, complying with IEEE C62.41 for Category A1 locations.
4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the North sky exposure.

2.4 SWITCH-BOX OCCUPANCY SENSORS

A. Manufacturers:

1. Leviton Mfg. Company Inc. (Base bid)
2. Watt Stopper (The). (Alternate bid)

B. Description: PIR type with integral power-switching contacts rated for 20A at 120-V ac, suitable for incandescent light fixtures, flourescent light fixtures with magnetic or electronic ballasts, or 1/6-hp motors; and rated for 20A at 277-V ac, suitable for incandescent light fixtures, flourescent light fixtures with magnetic or electronic ballasts, or 1/3-hp motors, minimum.

1. Include ground wire.
2. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keeps lighting off when selected lighting level is present.

2.5 INDOOR OCCUPANCY SENSORS

A. Manufacturers:

1. Leviton Mfg. Company Inc. (Base bid)
2. Watt Stopper (The). (Alternate bid)

B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.

1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
4. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted though a 1/2-inch knockout in a standard electrical enclosure.

c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
6. Bypass Switch: Override the on function in case of sensor failure.
7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keeps lighting off when selected lighting level is present.

C. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.

1. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in..
2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 112-inch- high ceiling.
3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot- high ceiling.

D. Ultrasonic Type: Ceiling mounting; detect occupancy by sensing a change in pattern of reflected ultrasonic energy in area of coverage.

1. Detector Sensitivity: Detect a person of average size and weight moving at least 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 112-inch- high ceiling.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on an 112-inch - high ceiling.
4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 112-inch - high ceiling.
5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot- high ceiling in a corridor not wider than 14 feet.

E. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on and off functions shall be selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in., and detect a person of average size and weight moving at least 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 112-inch - high ceiling.

2.6 MULTIPOLE CONTACTORS

A. Manufacturers:

1. Allen-Bradley/Rockwell Automation.
2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
3. Cutler-Hammer; Eaton Corporation.
4. GE Industrial Systems; Total Lighting Control.
5. Square-D.

B. Description: Electrically operated and mechanically or electrically held as indicated, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Control-Coil Voltage: Match control power source.

2.7 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG, complying with Division 16 "Section Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded copper conductors not smaller than No. [18] AWG, complying with Division 16 Section "Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded copper conductors not smaller than No. [14] AWG, complying with Division 16 Section "Conductors and Cables."

D. Install unshielded, twisted-pair cable for control and signal transmission conductors, complying with Division 16 Section "Voice and Data Communication Cabling."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve at least 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 WIRING INSTALLATION

A. Wiring Method: Comply with Division 16 Section "Conductors and Cables." Minimum conduit size shall be 1/2 inch.

B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Install field-mounting transient voltage suppressors for lighting control devices in Category A locations that do not have integral line-voltage surge protection.

D. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Division 16 Section "Electrical Identification."

B. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify actuation of each sensor and adjust time delays.

B. Remove and replace lighting control devices where test results indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose.

END OF SECTION 16145

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 16289
TRANSIENT VOLTAGE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes TVSSs for low-voltage power, control, and communication equipment.

B. Related Sections include the following:

1. Division 16 Section "Switchboards" for factory-installed TVSSs.
2. Division 16 Section "Panelboards" for factory-installed TVSSs.

1.3 DEFINITIONS

A. SVR: Suppressed voltage rating.

B. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating weights, operating characteristics, furnished specialties, and accessories.

B. Operation and Maintenance Data: For transient voltage suppression devices to include in emergency, operation, and maintenance manuals.

C. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer.

B. Product Options: Drawings indicate size, dimensional requirements, and electrical performance of suppressors and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with IEEE C62.41, "IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits," and test devices according to IEEE C62.45, "IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits."

E. Comply with NEMA LS 1, "Low Voltage Surge Protection Devices."

F. Comply with UL 1283, "Electromagnetic Interference Filters," and UL 1449, "Transient Voltage Surge Suppressors."

1.6 PROJECT CONDITIONS

A. Service Conditions: Rate surge protection devices for continuous operation under the following conditions, unless otherwise indicated:

1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
2. Operating Temperature: 30 to 120 deg F.
3. Humidity: 0 to 85 percent, noncondensing.
4. Altitude: Less than 20,000 feet above sea level.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cutler-Hammer, Inc.; Eaton Corporation.
2. General Electric Company.
3. Siemens Energy & Automation, Inc.
4. Square D; Schneider Electric.

2.2 SERVICE ENTRANCE SUPPRESSORS

A. Surge Protection Device Description: Modular design with field-replaceable modules, sine-wave-tracking type with the following features and accessories:

1. Fuses, rated at 200-kA interrupting capacity.
2. Fabrication using bolted compression lugs for internal wiring.
3. Integral disconnect switch.
4. Arrangement with copper bus bars and for bolted connections to phase buses, neutral bus, and ground bus.
5. LED indicator lights for power and protection status.
6. Audible alarm, with silencing switch, to indicate when protection has failed.
7. One set of dry contacts rated at 5 A and 250-V ac, for remote monitoring of protection status. Coordinate with building power monitoring and control system.
8. Surge-event operations counter.

B. Peak Single-Impulse Surge Current Rating: See panelboard schedules.

C. Connection Means: Permanently wired.

D. Protection modes and UL 1449 SVR for grounded wye circuits with voltages of 480Y/277 and 208Y/120, 3-phase, 4-wire circuits shall be as follows:

1. Line to Neutral: 800 V for 480Y/277 and 400 V for 208Y/120.
2. Line to Ground: 800 V for 480Y/277 and 400 V for 208Y/120.
3. Neutral to Ground: 800 V for 480Y/277 and 400 V for 208Y/120.

2.3 PANELBOARD SUPPRESSORS

A. Surge Protection Device Description: Modular design with field-replaceable modules, sign-wave-tracking type with the following features and accessories:

1. Fuses, rated at 200-kA interrupting capacity.
2. Fabrication using bolted compression lugs for internal wiring.
3. Integral disconnect switch.
4. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
5. LED indicator lights for power and protection status.
6. Audible alarm, with silencing switch, to indicate when protection has failed.
7. One set of dry contacts rated at 5 A and 250-V, ac, for remote monitoring of protection status. Coordinate with building power monitoring and control system.
8. Surge-event operations counter.

B. Peak Single-Impulse Surge Current Rating: See panelboard schedules.

C. Protection modes and UL 1449 SVR for grounded wye circuits with voltages of 480Y/277 and 208Y/120, 3-phase, 4-wire circuits shall be as follows:

1. Line to Neutral: 800 V for 480Y/277 and 400 V for 208Y/120.
2. Line to Ground: 800 V for 480Y/277 and 400 V for 208Y/120.
3. Neutral to Ground: 800 V for 480Y/277 and 400 V for 208Y/120.

2.4 SUPPRESSORS FOR ELECTRONIC-GRADE PANELBOARDS

A. Surge Protection Device Description: Sine-wave-tracking type, panel-mounted design with the following features and accessories:

1. LED indicator lights for power and protection status.
2. Audible alarm, with silencing switch, to indicate when protection has failed.
3. One set of dry contacts rated at 5 A and 250-V ac, for remote monitoring of protection status.
4. Arrangement with wire connections to phase buses, neutral bus, and ground bus.

B. Peak Single-Impulse Surge Current Rating: See panelboard schedules.

C. Protection modes and UL 1449 SVR for grounded wye circuits with voltages of 480Y/277 and 208Y/120, 3-phase, 4-wire circuits shall be as follows:

1. Line to Neutral: 800 V for 480Y/277 and 400 V for 208Y/120.
2. Line to Ground: 800 V for 480Y/277 and 400 V for 208Y/120.
3. Neutral to Ground: 800 V for 480Y/277 and 400 V for 208Y/120.

2.5 ENCLOSURES

A. NEMA 250, with type matching the enclosure of panel or device being protected.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTION DEVICES

A. Install devices at service entrance on load side, with ground lead bonded to service entrance ground.

B. Install devices for panelboard and auxiliary panels with conductors or buses between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

1. Provide multipole, 30, 60, 100-A circuit breaker as a dedicated disconnect for suppressor, unless otherwise indicated.

3.2 PLACING SYSTEM INTO SERVICE

A. Do not energize or connect service entrance equipment and panelboards to their sources until surge protection devices are installed and connected.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust equipment installation, including connections, and to assist in field testing. Report results in writing.

1. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transient voltage suppression devices. Refer to Division 1 Section "Closeout Procedures & Demonstration and Training."

END OF SECTION 16289

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 16410
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following individually mounted, enclosed switches and circuit breakers:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit switches.
4. Molded-case switches.
5. Enclosures.

1.3 DEFINITIONS

A. GD: General duty.

B. GFCI: Ground-fault circuit interrupter.

C. HD: Heavy duty.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current rating.

4. UL listing for series rating of installed devices.
5. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Qualification Data: For testing agency.

D. Field quality-control test reports including the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Closeout Procedures," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current curves, including selectable ranges for each type of circuit breaker.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

1.7 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Manufacturers:
1. General Electric Co.; Electrical Distribution & Control Division.
2. Square D/Group Schneider.

B. Fusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Nonfusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.

2.3 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Manufacturers:
1. General Electric Co.; Electrical Distribution & Control Division.
2. Square D/Group Schneider.

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip-Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
6. GFCI Circuit Breakers: Single- and two-pole configurations with **[5]** **[30]**-mA trip sensitivity.

C. Molded-Case Circuit-Breaker Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical style with compression lug kits suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
4. Communication Capability: Circuit-breaker.
5. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.

D. Molded-Case Switches: Molded-case circuit breaker with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

E. Molded-Case Switch Accessories:

1. Lugs: Mechanical style with compression lug kits suitable for number, size, trip ratings, and material of conductors.
2. Application Listing: Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Key Interlock Kit: Externally mounted to prohibit operation; key shall be removable only when switch is in off position.

2.4 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section Electrical Identification.

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 16 Section Electrical Identification.

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance testing as follows:

1. Inspect mechanical and electrical connections.
2. Verify switch and relay type and labeling verification.
3. Verify rating of installed fuses.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

C. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Infrared Scanning:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Open or remove doors or panels so connections are accessible to portable scanner.

b. Follow-Up Infrared Scanning: Perform an additional follow-up infrared scan of each unit 11 months after date of Substantial Completion.

c. Instruments, Equipment and Reports:

    1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

    2) Prepare a certified report that identifies enclosed switches and circuit breakers included and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.6 CLEANING

A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION 16410

SECTION 16420
ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes ac, enclosed controllers rated 600 V and less, of the following types:

1. Across-the-line, manual and magnetic controllers.

B. Related Sections include the following:

1. Division 16 Section "Transient Voltage Suppression" for low-voltage power, control, and communication surge suppressors.

1.3 SUBMITTALS

A. Product Data: For each type of enclosed controller. Include dimensions and manufacturer's technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Manufacturer Seismic Qualification Certification: Submit certification that enclosed controllers, accessories, and components will withstand seismic forces defined in Division 16 Section "Electrical Supports and Seismic Restraints." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For enclosed controllers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. Routine maintenance requirements for enclosed controllers and all installed components.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

E. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed and arrange to demonstrate that dip switch settings for motor running overload protection suit actual motor to be protected.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 100 miles of Project site, a service center capable of providing training, parts, and emergency maintenance and repairs.

B. Source Limitations: Obtain enclosed controllers of a single type through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NFPA 70.

E. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed controllers, minimum clearances between enclosed controllers, and for adjacent surfaces and other items. Comply with indicated maximum dimensions and clearances.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

B. If stored in areas subject to weather, cover enclosed controllers to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers; install electric heating of sufficient wattage to prevent condensation.

1.6 COORDINATION

A. Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

C. Coordinate features of enclosed controllers and accessory devices with pilot devices and control circuits to which they connect.

D. Coordinate features, accessories, and functions of each enclosed controller with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. General Electrical Company; GE Industrial Systems.
2. Square D.

2.2 ACROSS-THE-LINE ENCLOSED CONTROLLERS

A. Manual Controller: NEMA ICS 2, general purpose, Class A, with "quick-make, quick-break" toggle or pushbutton action, and marked to show whether unit is "OFF," "ON," or "TRIPPED."

1. Overload Relay: Ambient-compensated type with inverse-time-current characteristics and NEMA ICS 2, Class 10 tripping characteristics. Relays shall have heaters and sensors in each phase, matched to nameplate, full-load current of specific motor to which they connect and shall have appropriate adjustment for duty cycle.

B. Magnetic Controller: NEMA ICS 2, Class A, full voltage, nonreversing, across the line, unless otherwise indicated.

1. Control Circuit: 120 V; obtained from [integral control power transformer] <Insert source of control power> with a control power [transformer] [source] of sufficient capacity to operate connected pilot, indicating and control devices, plus 100 percent spare capacity.
2. Adjustable Overload Relay: Dip switch selectable for motor running overload protection with NEMA ICS 2, Class [10] tripping characteristic, and selected to protect motor against voltage and current unbalance and single phasing. Provide relay with Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.

C. Combination Magnetic Controller: Factory-assembled combination controller and disconnect switch.

1. Circuit-Breaker Disconnecting Means: NEMA AB 1, motor-circuit protector with field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.

2.3 ENCLOSURES

A. Description: Flush- or surface-mounting cabinets as indicated. NEMA 250, Type 1, unless otherwise indicated to comply with environmental conditions at installed location.

1. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2.4 ACCESSORIES

A. Devices shall be factory installed in controller enclosure, unless otherwise indicated.

B. Push-Button Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type.

C. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.

D. Phase-Failure and Undervoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connection. Provide adjustable undervoltage setting.

2.5 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested enclosed controllers before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and surfaces to receive enclosed controllers for compliance with requirements, installation tolerances, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. For control equipment at walls, bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Division 16 Section "Electrical Supports and Seismic Restraints."

B. Comply with mounting and anchoring requirements specified in Division 16 Section "Electrical Supports and Seismic Restraints."

3.3 IDENTIFICATION

A. Identify enclosed controller, components, and control wiring according to Division 16 Section "Electrical Identification."

3.4 CONTROL WIRING INSTALLATION

A. Install wiring between enclosed controllers according to Division 16 Section "Conductors and Cables."

B. Bundle, train, and support wiring in enclosures.

C. Connect hand-off-automatic switch and other automatic-control devices where applicable.

1. Connect selector switches to bypass only manual- and automatic-control devices that have no safety functions when switch is in hand position.
2. Connect selector switches with enclosed controller circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.5 CONNECTIONS

A. Conduit installation requirements are specified in other Division 16 Sections. Drawings indicate general arrangement of conduit, fittings, and specialties.

B. Ground equipment according to Division 16 Section "Grounding and Bonding."

3.6 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each enclosed controller element, bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection, except optional tests, stated in NETA ATS, "Motor Control - Motor Starters." Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.7 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION 16420

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 16442
PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Transient voltage suppression panelboards.

1.3 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Enclosure types and details for types other than NEMA 250, Type 1.
b. Bus configuration, current, and voltage ratings.
c. Short-circuit current rating of panelboards and overcurrent protective devices.
d. UL listing for series rating of installed devices.
e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

2. Wiring Diagrams: Power, signal, and control wiring.

C. Qualification Data: For testing agency.

D. Field quality-control test reports including the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

F. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section " Closeout Procedures & Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.

B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of panelboards and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with NEMA PB 1.

F. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

1.6 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:

a. General Electric Co.; Electrical Distribution & Protection Div.
b. Square D.

2.2 MANUFACTURED UNITS

A. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1.

1. Rated for environmental conditions at installed location.

a. Outdoor Locatns: NEMA 250, Type 3R.
b. Kitchen Areas: NEMA 250, Type 4X, siotainless steel.

2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
3. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
4. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.

B. Phase and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
3. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.

C. Conductor Connectors: Suitable for use with conductor material.

1. Main and Neutral Lugs: Compression type.
2. Ground Lugs and Bus Configured Terminators: Compression type.

3. Feed-Through Lugs: Compression type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
4. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

D. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

2.3 PANELBOARD SHORT-CIRCUIT RATING

A. UL label indicating series-connected rating with integral or remote upstream overcurrent protective devices. Include size and type of upstream device allowable, branch devices allowable, and UL series-connected short-circuit rating.

2.4 DISTRIBUTION PANELBOARDS

A. Doors: Secured with vault-type latch with tumbler lock; keyed alike. Omit for fused-switch panelboards.

B. Main Overcurrent Protective Devices: Circuit breaker.

C. Branch Overcurrent Protective Devices:

1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.5 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.6 TRANSIENT VOLTAGE SUPPRESSION PANELBOARDS

A. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

B. Main Overcurrent Devices: Thermal-magnetic circuit breaker.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers.

D. Bus: Copper phase and neutral buses; 200 percent capacity neutral bus and lugs.

E. Transient Voltage Suppression Device: IEEE C62.41, integrally mounted, plug-in-style, solid-state, parallel-connected, sine-wave tracking suppression and filtering modules.

2.7 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: UL 489, with series-connected rating to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at [55] [75] percent of rated voltage.
5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage [without intentional] [with field-adjustable 0.1- to 0.6-second] time delay.
6. Multipole units enclosed in a single housing or factory-assembled to operate as a single unit.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Mount top of trim 74 inches above finished floor, unless otherwise indicated.

C. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

D. Install overcurrent protective devices and controllers.

1. Set field-adjustable switches and circuit-breaker trip ranges.

E. Install filler plates in unused spaces.

F. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

G. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Electrical Identification."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

A. Ground equipment according to Division 16 Section "Grounding and Bonding."

B. Connect wiring according to Division 16 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

D. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scanning of each panelboard. Remove panel fronts so joints and connections are accessible to portable scanner.

1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
2. Record of Infrared Scanning: Prepare a certified report that identifies panelboards checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 16442

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 16491
FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Cartridge fuses rated 600 V and less for use in switches, switchboards and controllers.

1.3 SUBMITTALS

A. Product Data: Include the following for each fuse type indicated:

1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.

B. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

1. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
2. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

C. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Division 1 Section "Closeout Procedures," include the following:

a. Let-through current curves for fuses with current-limiting characteristics.
b. Time-current curves, coordination charts and tables, and related data.
c. Ambient temperature adjustment information.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA FU 1.

D. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Bussman, Inc.
2. Eagle Electric Mfg. Co., Inc.; Cooper Industries, Inc.
3. Ferraz Shawmut, Inc.
4. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Service Entrance: Class L, time delay.

B. Feeders: Class RK5, time delay.

C. Motor Branch Circuits: Class RK5, time delay.

D. Other Branch Circuits: Class RK5, time delay.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 16491

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 16511
INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Interior lighting fixtures, lamps, and ballasts.
2. Lighting fixture supports.

B. Related Sections include the following:

1. Division 13 Section "Lighting Controls" for manual or programmable control systems with low-voltage control wiring or data communication circuits.
2. Division 16 Section "Wiring Devices" for manual wall-box dimmers for incandescent lamps.
3. Division 16 Section "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
4. Division 16 Section "Stage Lighting" for theatrical lighting fixtures and their controls.
5. Division 16 Section "Dimming Controls" for architectural dimming systems.

1.3 DEFINITIONS

A. BF: Ballast factor.

B. CRI: Color-rendering index.

C. HID: High-intensity discharge.

D. LER: Luminaire efficacy rating.

E. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.4 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Ballast.
3. Energy-efficiency data.
4. Life, output, and energy-efficiency data for lamps.
5. Photometric data, in IESNA format, based on laboratory tests of each lighting fixture type, outfitted with lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

    a. For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by the manufacturer.
    b. Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.

B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.

1. Wiring Diagrams: Power and control wiring.

C. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Lighting fixtures.
2. Suspended ceiling components.
3. Structural members to which suspension systems for lighting fixtures will be attached.
4. Other items in finished ceiling including the following:

    a. Air outlets and inlets.
    b. Speakers.
    c. Sprinklers.
    d. Smoke and fire detectors.
    e. Occupancy sensors.
    f. Access panels.

5. Perimeter moldings.

D. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, signed by product manufacturer.

E. Qualification Data: For agencies providing photometric data for lighting fixtures.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

H. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

D. FMG Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FMG.

1.6 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.7 WARRANTY

A. Special Warranty for Ballasts: Manufacturer's standard form in which ballast manufacturer agrees to repair or replace ballasts that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Electronic Ballasts: Five years from date of Substantial Completion.
2. Warranty Period for Electromagnetic Ballasts: Three years from date of Substantial Completion.

B. Special Warranty for T8 Fluorescent Lamps: Manufacturer's standard form, made out to Owner and signed by lamp manufacturer agreeing to replace lamps that fail in materials or workmanship, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In Interior Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

C. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

D. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.

E. Metal Parts: Free of burrs and sharp corners and edges.

F. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

H. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

I. Plastic Diffusers, Covers, and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

a. Lens Thickness: At least 0.125 inch minimum unless different thickness is indicated.
b. UV stabilized.

2. Glass: Annealed crystal glass, unless otherwise indicated.

J. Electromagnetic-Interference Filters: Factory installed to suppress conducted electromagnetic-interference as required by MIL-STD-461E. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.

2.3 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. Electronic Ballasts: Comply with ANSI C82.11; programmed-start type, unless otherwise indicated, and designed for type and quantity of lamps served. Ballasts shall be designed for full light output unless dimmer or bi-level control is indicated.

1. Sound Rating: A.
2. Total Harmonic Distortion Rating: Less than 10 percent.
3. Transient Voltage Protection: IEEE C62.41, Category A or better.
4. Operating Frequency: 42 kHz or higher.
5. Lamp Current Crest Factor: 1.7 or less.
6. BF: 0.85 or higher.
7. Power Factor: 0.98 or higher.
8. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C 82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.

B. Ballasts for Dimmer-Controlled Lighting Fixtures: Electronic type.

1. Dimming Range: 100 to 5 percent of rated lamp lumens.
2. Ballast Input Watts: Can be reduced to 20 percent of normal.
3. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.

C. Ballasts for Bi-Level Controlled Lighting Fixtures: Electronic type.

1. Operating Modes: Ballast circuit and leads provide for remote control of the light output of the associated lamp between high- and low-level and off.

    a. High-Level Operation: 100 percent of rated lamp lumens.
    b. Low-Level Operation: 50 percent of rated lamp lumens.

2. Ballast shall provide equal current to each lamp in each operating mode.
3. Compatibility: Certified by manufacturer for use with specific bi-level control system and lamp type indicated.

2.4 BALLASTS FOR COMPACT FLUORESCENT LAMPS

A. Description: Electronic programmed rapid-start type, complying with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:

1. Lamp end-of-life detection and shutdown circuit.
2. Automatic lamp starting after lamp replacement.
3. Sound Rating: A.

4. Total Harmonic Distortion Rating: Less than 20 percent.
5. Transient Voltage Protection: IEEE C62.41, Category A or better.
6. Operating Frequency: 20 kHz or higher.
7. Lamp Current Crest Factor: 1.7 or less.
8. BF: 0.95 or higher, unless otherwise indicated.
9. Power Factor: 0.98 or higher.
10. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
11. Ballast Case Temperature: 75 deg C, maximum.

2.5 BALLASTS FOR HID LAMPS

A. Electromagnetic Ballast for Metal-Halide Lamps: Comply with ANSI C82.4 and UL 1029. Include the following features, unless otherwise indicated:

1. Ballast Circuit: Constant-wattage autotransformer or regulating high-power-factor type.
2. Minimum Starting Temperature: Minus 22 deg F for single-lamp ballasts.
3. Normal Ambient Operating Temperature: 104 deg F.
4. Open-circuit operation that will not reduce average life.
5. Low-Noise Ballasts: Manufacturers' standard epoxy-encapsulated models designed to minimize audible fixture noise.

B. Electronic Ballast for Metal-Halide Lamps: Include the following features unless otherwise indicated:

1. Lamp end-of-life detection and shutdown circuit.
2. Sound Rating: A.
3. Total Harmonic Distortion Rating: Less than 15 percent.
4. Transient Voltage Protection: IEEE C62.41, Category A or better.
5. Lamp Current Crest Factor: 1.5 or less.
6. Power Factor: .90 or higher.
7. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
8. Protection: Class P thermal cutout.
9. Retain subparagraph and associated subparagraphs below for bi-level ballasts.
10. Bi-Level Dimming Ballast: Ballast circuit and leads provide for remote control of the light output of the associated fixture between high- and low-level and off.

    a. High-Level Operation: 100 percent of rated lamp lumens.
    b. Low-Level Operation: 50 percent of rated lamp lumens.
    c. Compatibility: Certified by ballast manufacturer for use with specific bi-level control system and lamp type indicated. Certified by lamp manufacturer that ballast operating modes are free from negative effect on lamp life and color-rendering capability.

C. Auxiliary Instant-On Quartz System: Factory-installed feature automatically switches quartz lamp on when fixture is initially energized and when power outages occur. System automatically turns quartz lamp off when HID lamp reaches approximately 60 percent light output.

2.6 EXIT SIGNS

A. Description: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.

2.7 FLUORESCENT LAMPS

A. LAMPS MANUFACTURERS:

1. General Electric (Base bid)
2. Philips (Alternate bid)
3. Sylvania (Alternate bid)

B. T8 rapid-startlamps, rated 32 W maximum, nominal length of 48 inches, 2800 initial lumens (minimum), CRI 82 (minimum), color temperature 4100 K, and average rated life 24,000 hours, unless otherwise indicated. T8 rapid-start

C. Compact Fluorescent Lamps: 4-Pin, CRI 80 (minimum), color temperature 4100 K, average rated life of 10,000 hours at 3 hours operation per start, unless otherwise indicated.

1. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
2. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).

2.8 HID LAMPS

A. LAMPS MANUFACTURERS:

1. Philips.
2. Sylvania.
3. General Electric

B. Metal-Halide Lamps: ANSI C78.1372, with a minimum CRI 65, and color temperature 4000 K.

C. Pulse-Start, Metal-Halide Lamps: Minimum CRI 65, and color temperature 4000 K.

D. Ceramic, Pulse-Start, Metal-Halide Lamps: Minimum CRI 80, and color temperature 4000 K.

2.9 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 16 Section "Electrical Supports and Seismic Restraints" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.

F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings: Use grid as a support element.

1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

C. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

D. Adjust aimable lighting fixtures to provide required light intensities.

E. Connect wiring according to Division 16 Section "Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 16511

Kingscott Associates, Inc.
Architects/Engineers
Kalamazoo, Michigan

Troy School District
International Academy East
Troy, Michigan

SECTION 16521
EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Exterior luminaires with lamps and ballasts.
2. Poles and accessories.

B. Related Sections include the following:

1. Division 16 Section "Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings.

1.3 DEFINITIONS

A. CRI: Color-rendering index.

B. HID: High-intensity discharge.

C. Luminaire: Complete lighting fixture, including ballast housing if provided.

D. Pole: Luminaire support structure, including tower used for large area illumination.

E. Standard: Same definition as "Pole" above.

1.4 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4.

B. Ice Load: Load of 3 lbf/sq. ft., applied as stated in AASHTO LTS-4.

C. Wind Load: Pressure of wind on pole and luminaire, calculated and applied as stated in AASHTO LTS-4.

1. Wind speed for calculating wind load for poles 50 feet or less in height is 80 mph.

1.5 SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
2. Details of attaching luminaires and accessories.
3. Details of installation and construction.
4. Luminaire materials.
5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.

    a. Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

6. Ballasts, including energy-efficiency data.
7. Lamps, including life, output, and energy-efficiency data.
8. Materials, dimensions, and finishes of poles.
9. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
10. Anchor bolts for poles.

B. Qualification Data: For agencies providing photometric data for lighting fixtures.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For [luminaires][and poles] to include in emergency, operation, and maintenance manuals.

E. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with IEEE C2, "National Electrical Safety Code."

D. Comply with NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B 660.

B. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

C. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.

1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
3. Warranty Period for Color Retention: Five years from date of Substantial Completion.
4. Warranty Period for Lamps: Replace lamps and fuses that fail within 12 months from date of Substantial Completion; furnish replacement lamps and fuses that fail within the second 12 months from date of Substantial Completion.
5. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In Exterior Lighting Device Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 LUMINAIRES, GENERAL REQUIREMENTS

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

B. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

J. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

M. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

    a. Color: As selected from manufacturer's standard catalog of colors.

N. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.

2.3 BALLASTS FOR HID LAMPS

A. Comply with ANSI C82.4 and UL 1029 and capable of open-circuit operation without reduction of average lamp life. Include the following features, unless otherwise indicated:

1. Ballast Circuit: Constant-wattage autotransformer or regulating high-power-factor type.
2. Minimum Starting Temperature: Minus 22 deg F.
3. Normal Ambient Operating Temperature: 104 deg F.
4. Ballast Fuses: One in each ungrounded power supply conductor. Voltage and current ratings as recommended by ballast manufacturer.

B. Auxiliary, Instant-On, Quartz System: Factory-installed feature automatically switches quartz lamp on when fixture is initially energized and when momentary power outages occur. System automatically turns quartz lamp off when HID lamp reaches approximately 60 percent of light output.

2.4 HID LAMPS

A. Manufactureres:

1. Philips.
2. Sylvania.
3. General Electric.

B. Metal-Halide Lamps: ANSI C78.1372, with a minimum CRI 65, and color temperature 4000 K.

C. Pulse-Start, Metal-Halide Lamps: Minimum CRI 65, and color temperature 4000 K.

2.5 POLES AND SUPPORT COMPONENTS, GENERAL REQUIREMENTS

A. Structural Characteristics: Comply with AASHTO LTS-4.

1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in Part 1 "Structural Analysis Criteria for Pole Selection" Article, with a gust factor of 1.3.
2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts, unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.

1. Materials: Shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication, unless stainless-steel items are indicated.
3. Anchor-Bolt Template: Plywood or steel.

D. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Division 3 Section "Cast-in-Place Concrete."

2.6 ALUMINUM POLES

A. Poles: Seamless, extruded structural tube complying with ASTM B 429, Alloy 6063-T6 with access handhole in pole wall.

B. Poles: ASTM B 209, 5052-H34 marine sheet alloy with access handhole in pole wall.

1. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

C. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

D. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Division 16 Section "Grounding and Bonding," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

E. Brackets for Luminaires: Detachable, with pole and adapter fittings of cast aluminum. Adapter fitting welded to pole and bracket, then bolted together with stainless-steel bolts.

1. Tapered oval cross section, with straight tubular end section to accommodate luminaire.
2. Finish: Same as pole and luminaire.

F. Aluminum Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.

2.7 POLE ACCESSORIES

A. Base Covers: Manufacturers' standard metal units, arranged to cover pole's mounting bolts and nuts. Finish same as pole.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports.

C. Adjust luminaires that require field adjustment or aiming.

3.2 POLE INSTALLATION

A. Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features, unless otherwise indicated on Drawings:

1. Fire Hydrants and Storm Drainage Piping: 60 inches.
2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
3. Trees: 15 feet.

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Division 3 Section "Cast-in-Place Concrete."

D. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.

1. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
2. Install base covers, unless otherwise indicated.
3. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

E. Raise and set poles using web fabric slings (not chain or cable).

3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Division 16 Section "Raceways and Boxes." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 GROUNDING

A. Ground metal poles and support structures according to Division 16 Section "Grounding and Bonding."

1. Install grounding electrode for each pole, unless otherwise indicated.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

3.5 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.

C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 16521

TROY SCHOOL DISTRICT
Bid 9444
International Academy East

	1.1	2.1	3.1	4.1	5.1
	Demolition	**Sitework**	**Concrete**	**Masonry**	**Structural Steel**
DKI Inc.	64,777.00				
Reese Contracting, LLC	73,600.00				
Precision Demolition Services Inc.	101,987.00				
Blue Star	117,900.00				
North American Dismantlng Corp.	400,300.00				
Chas. F. Irish Co., Inc.(Landscape)		19,676.00			
Cortis Brothers Trucking & Excavating		85,900.00			
RS-RE Enterprises, LLC		105,900.00			
Merlyn Contractors, Inc.		140,000.00			
McCarthy Construction Co., Inc.			27,885.00		
RS-RE Enterprises, LLC			30,900.00		
6-K Construction Co.			42,200.00		
Gemelli Concrete LLC			45,669.00		
E&L Construction Group, Inc.			78,400.00		
Cortis Brothers Trucking & Excavating			119,900.00		
Giannola Masonry Company				136,619.00	
Efficient Design, Inc.				142,790.00	
Baro Contracting Co., Inc.				142,900.00	
HMC Mason Contractors				147,700.00	
Brend Contracting Co.				151,000.00	
Masonry Developers, Inc.				152,500.00	
Durkn & Co. Contractors, Inc.				153,740.00	
Brazen & Greer, Inc.				158,800.00	
J & J Construction Company				164,000.00	
Liedal & Hart Mason Contractors, Inc.				196,600.00	
Nelson Iron Works Inc.					68,462.00

TROY SCHOOL DISTRICT
Bid 9444
International Academy East

	6.1 Carpentry & Acoustical Ceilings	7.1 Roofing	8.1 Aluminum Doors Window & Glazing	9.1 Painting	9.2 Ceramic Tile
EBI Detroit Inc.	338,800.00				
Arjac Inc.	339,085.00				
Westwood Carpentry Company	349,830.00				
Central Interiors, Inc.	357,000.00				
Hicks Constructin Co., Inc.	362,315.00				
Scheich Commercial Contracting Corp.	374,900.00				
T.F. Beck Company		81,100.00			
Hewett Co., Inc.			19,000.00		
Union Construction Services, Inc.			20,563.00		
Curtis Glass Company			22,200.00		
Glasco Corp.			23,510.00		
Harris Glass Inc.			23,765.00		
1XL Glass Company			38,000.00		
D'Angelo Construction Corp.			41,750.00		
G. M. Painting Inc.				12,400.00	
Hermes Painting				12,800.00	
Progressive Painting Inc.				12,997.00	
Martin Painting & Mainenance Co., Inc.				16,100.00	
Seven Brothers Painting				19,990.00	
Niles Construction Services, Inc.				19,969.00	
Boston Tile & Terrazzo Company					28,600.00
Empire Tile					34,774.00
Artisan Tile Inc.					53,000.00

TROY SCHOOL DISTRICT
Bid 9444
International Academy East

	9.3 Carpet, Resilient Tile & Base	11.1 Food Service Equip.	15.1 Mechanical	15.2 Temperature & Lighting Controls	16.1 Electrical
Shock Brothers Floorcovering Inc.	47,975.00				
Conventional Carpet, Inc.	48,500.00				
Great Lakes West		42,321.00			
Long Mechanical			660,000.00		
Contrast Mechanical Inc.			673,700.00		
Great Lakes Mechanical			722,000.00		
Ecker Mechanical Contractors, Inc.			772,000.00		
Macomb Mechanical Inc.			848,000.00		
Delta Temp.			880,000.00		
Mechanical Controls & Maintenance, Inc.				274,050.00	
DeMaster Electric Co., Inc. I**ncludes bot**				358,950.00	
Great Lakes Power & Lighting, Inc.					268,000.00
Munro Electric Co., Inc.					272,000.00
J & J Electric, Inc.					279,000.00
Omega Electric, Inc					289,500.00
Metro Electric Heating and Insulation					315,000.00
Giliis Electric, Inc.					322,500.00
Envision Electric Contracting LLC					347,000.00
McNulty Electric, Inc.					354,700.00
E & L Construction Group, Inc.					359,400.00