



CSK ARCHITECTS, P.C.

NEW LOCKER ROOM FACILITY and RENOVATIONS to the EXISTING CONCESSION and TENNIS FACILITIES PROJECT at the MERRILLVILLE HIGH SCHOOL

276 E 68th Place

MERRILLVILLE, INDIANA 46410

For the

MERRILLVILLE COMMUNITY SCHOOL CORPORATION

DR. DEXTER SUGGS, Sr., SUPERINTENDENT / BUSINESS

MEGHAN DAMRON, CHIEF FINANCIAL OFFICER

GREG GRIFFITH, DIRECTOR: MAINTENANCE SERVICES

BOARD OF SCHOOL TRUSTEES

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October 2, 2026

Architect's Project #26027



6919 W. LINCOLN HIGHWAY

CROWN POINT, IN 46307

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CERTIFICATION PAGE

Project: **New Locker Room Facility and Renovations to the Existing Concession and Tennis Facilities Project at the Merrillville High School**
276 E 68th Place
Merrillville, Indiana 46410

Owner: **Merrillville Community School Corporation**
Dr. Dexter Suggs, Sr., Superintendent / Business
Meghan Damron, Chief Financial Officer
Greg Griffith, Director: Maintenance Services

Board of School Trustees
Judy Dunlap, President
James Donohue, Vice President
DeLena Thomas, Secretary
Bob Krause, Member
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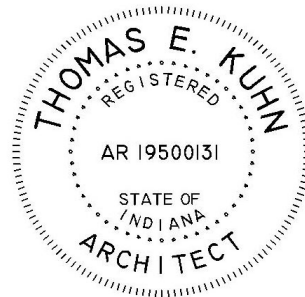
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Architect's Project #'s: **26027**

Dated: **October 2, 2026**

Certified By: 
Thomas E. Kuhn, AIA, CSI, ALA



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SECTION 00 1113

NOTICE TO BIDDERS
#578

New Locker Room Facility and Renovations to the
Existing Concession and Tennis Facilities Project at the
Merrillville High School
276 E 68th Place
Merrillville, IN 46410

Sealed proposals for the New Locker Room Facility and Renovations to the Existing Concession and Tennis Facilities Project at the Merrillville High School for the Merrillville Community School Corporation in accordance with Bid Documents as prepared by CSK Architects, P.C. will be received by the Merrillville Community School Corporation at their Administrative Services Building at 6701 Delaware Street, Merrillville, Indiana 46410 until 1:00 PM on Tuesday October 20th, 2026, at which time they will be opened and publicly read aloud. Bids received after the above stated time and date as specified, shall be returned to the sender unopened and declared non-acceptable.

All Bidders are requested to attend the Pre-Bid Meeting. The Pre-Bid Meeting will start at 9:00 AM on Thursday October 15th, 2025. Meet at the existing Concession facility northeast of the football stadium.

Work includes: General Construction to include Construction of a New Locker Room Facility and Renovations to the Concessions and Tennis Facilities.

Prime Bids will be received per the Architect's Bid Form for General Construction.

All Bidders must submit a satisfactory bid bond executed by the bidder and surety company or a certified check or bank draft, payable to the Merrillville Community School Corporation in an amount equal to five percent (5%) of their maximum bid, as provided by law.

The successful Bidder, within ten (10) days of acceptance of bids, will be required to execute a performance bond requiring one hundred percent (100%) performance and one hundred percent (100%) labor and material payment for any contract over \$200,000.00 In the event of failure of the successful bidder to execute said bond as stated above, the bidder shall forfeit its bid guaranty as liquidated damages. Bid guaranties of unsuccessful bidders shall be returned upon award of contracts.

Electronic copies of the Bid Documents will be made available at no cost via Dropbox upon an Email request from the Architect. Email Tom Kuhn at tkuhn@cskarchitects.com. Electronic copies of the Bid Documents will be made available at no cost and the Merrillville Community School Corporation website at www.mvsc.k12.in.us/bid. Hard copies of the Bid documents are available for review at the Office of the Architect and also available for review at the Merrillville Community School Corporation Administrative Services Building at 6701 Delaware Street, Merrillville, Indiana 46410.

All bids shall be sealed and submitted on the Bid Proposal Form in the Project Manual obtained from the office of CSK Architects, P.C., 6919 W. Lincoln Highway, Crown Point, 46307. Bids shall be properly executed on Form 96 including the Non-collusion Affidavit and Contractor's Financial Statement, as prescribed by the Indiana State Board of Accounts and all other Bid Documents requested.

The Merrillville Community School Corporation reserves the right to reject any or all bids, to waive any informalities in bidding, or to return unopened any proposal received after the time fixed herein.

No Base Bid or Alternates shall be withdrawn for a period of sixty (60) days, subsequent to the opening of bids.

Merrillville Community School Corporation, 6701 Delaware Street, Merrillville, Indiana 46410

(First Publication: October 2, 2026) (Second Publication: October 9th, 2026)

END OF SECTION

SECTION 00 1115

BID AND POST BID SUBMISSION REQUIREMENTS

PART 1 GENERAL

1.01 BID SUBMISSION REQUIREMENTS

- A. The following Bid Package Documents must be submitted in accordance with the Architect's Bid Documents and the Advertisement for Bid published by the Post Tribune and The Times on October 2, 2026 and October 9, 2026.
1. Current Indiana State Form 96. Fully executed with the Non-Collusion Affidavit signed.
 2. Financial Statement as prescribed by the Indiana State Board of Accounts.
 3. Bid guarantee in the form of a Bid Bond from a surety company or a certified check equal to 5% of the total of all Base Bids and Alternate Bids proposed by Bidder.
 4. Qualification Statement per Specification Section 00 4513 - Bidder's Qualifications Statement.
 5. Certification of E-Verify Program. Fully executed and notarized.
 6. Certification Statement Regarding Investments in Iran.
 7. Architect's Bid Form fully executed, signed and dated. Signator must be legally authorized by the bidder. All addendums issued by the Architect must be acknowledged on the Bid Proposal.

The above documents shall be submitted in sealed envelopes per specification Section 00 2113 - Instructions to Bidders and 00 1115 – Bid and Post Bid Submission Requirements. Failure to submit any of the above documents may disqualify the bidder's bid.

B. POST BID SUBMISSION REQUIREMENTS

1. The Bidders are also required to submit all RFI's for all portions of their and their subcontractors work for outstanding issues, clarifications, etc. that were not addressed prior to the bid. RFI's are required to be submitted to the Architect within seven (7) consecutive calendar days of the bid due date and time. The Owner is requesting this information in order to evaluate the bidders understanding of the Bid Documents, their responsiveness and level of responsibility and their complete and thorough comprehension of the Scope of Work.
2. The intention of this requirement is also intended to encourage the bidders to thoroughly evaluate the Scope of Work and to submit during the bidding process RFI's in order for the Architect to provide all Bidders with the level of detailed information the bidders require to submit a sound and competitive bid.
3. The bidders are required to submit to the Architect within 24 hours of bid due date and time a complete list of subcontractors listing only one contractor to be awarded a contract for each work category. The bidder may not deviate from awarding contracts to the listed subcontractors without permission from the Owner.

END OF SECTION

SECTION 00 2113

INSTRUCTIONS TO BIDDERS

1.01 SPECIAL INVITATION TO BIDDERS

- A. The Owner reserves the right to reject any or all bids. Bidder's bid must comply with all requirements of Bid Documents. See Section 00 1115 Bid and Post Bid Submission Requirements.
- B. Bidders are required to inform themselves fully as to the conditions relating to construction and labor under which the work will be or is now being performed, and insofar as practicable, the Contractor must employ such methods and means in the carrying out of his work as will not cause any interruption of or interference with any other Contractor.
- C. This Project Manual has bound hereto a complete set of bidding forms; these are for the convenience only of the bidders and are not to be detached from the Project Manual or filled or executed. Separate copies of bid forms are furnished for that purpose.
- D. All bidders are cautioned to carefully read and examine the complete set of Bid Documents to acquaint themselves with any and all requirements therein and submit Requests for Information (RFI) to clarify all issues that are not understood by the bidder.
- E. The Project Manual is bound into one book. The specifications are divided into sections. Such assembly and divisions do not relieve the Contractor from any work shown or specified in any part of the drawings or Project Manual. Bidders should also notice all cases where it is specified that certain work or materials, or both, is to be omitted by them, and is to be furnished by others or incorporated therein. It is understood that the various bidders have included such work in their bids even though the same is not specifically mentioned within various sections of the specifications upon which they are bidders.

1.02 BID FORMS

- A. All bids must be submitted in conformity with and shall be based upon and submitted subject to all requirements of the Bid Documents.
- B. Bid documents shall be enclosed in two envelopes (outer and inner), both of which shall be sealed and clearly labeled "Bid Documents" so as to guard against opening prior to the time set therefore. The bidder shall be responsible for the placement of his firm name and number of the project on the outside of both of such bid envelopes.
- C. The Owner may consider as informal any bid on which there is an alteration of or departure from the Bid Form hereto attached.
- D. The Bid will be based upon the completion of the work according to the Bid Documents together with all Addenda thereto and any alternates which may be requested.
- E. Bidders may offer Voluntary Combination Bids on the Bid Form provided the Bidder also provides bids for all Base Bids included in Combination Bids.

1.03 INTERPRETATIONS

- A. If any person contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of these proposed Bid Documents, he may submit to the Architect a written request for an interpretation thereof. The person submitting the request will be responsible for its prompt and actual delivery. Any interpretation of such documents will be made only by written addendum duly issued by the office of the architect and a copy of such addendum will be provided to each bidder on record at the Architect's office as a plan holder. The Owner will not be responsible for any other explanation or interpretations of such documents which anyone presumes to make on behalf of the Owner before expiration of the ultimate time set for the receipt of the bids.

1.04 CONDITIONS OF SITE AND WORK

- A. All bidders shall examine the site and thoroughly familiarize themselves on the conditions to be met both above and below grade on the site of the proposed building. Any bidder that is awarded a contract, shall not be allowed any extra compensation by reason of any matter or thing concerning which such bidder might have fully informed himself prior to the bidding. The Contractor shall have free use of the premises surrounding the building and within the Owner's property, but shall box all trees and shrubs that come within his operations and which are not to be removed.

1.05 TAXES

- A. This project has tax exempt status

1.06 PERMITS, FEES, LICENSES AND NOTICES

- A. Unless otherwise provided in the Bid Documents, the owner shall pay for all other permits and governmental fees, licenses and inspections necessary for the proper execution and completion of the work which are customarily secured after execution of the contract.
- B. The bidder shall give all notices and comply with all laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the performance of the work.
- C. It is not the responsibility of the contractor to make certain that the Bid Documents are in accordance with applicable laws, statutes, building codes and regulations. If the bidder observes that any of the Bid Documents are at variance therewith in any respect, he shall promptly notify the Architect in writing, and any necessary changes shall be accomplished by appropriate modification.
- D. The contractors and subcontractors are responsible to secure all local contractor licenses that may be required by the local governing agency having jurisdiction over the work.

1.07 CORRECTIONS

- A. All erasure, interpolations and other physical changes in a bid should be signed or initialed by the bidder. No erasures, interpolation or other physical changes should be made by anyone in any bid after its submission.

1.08 TIME FOR RECEIVING BIDS

- A. Bids received prior to the time of opening will be securely kept unopened. The officer whose duty it is to open them will decide when the specified time has arrived, and no bid received thereafter will be considered. No responsibility will attach to an officer for the premature opening of a bid not properly addressed and identified.
- B. Bidders are cautioned to allow ample time for transmittal of bids by mail or otherwise. Bidders should secure correction information relative to the provable time of arrival and distribution of mail at the place where bids are to be opened and, so far as practicable, make due allowance for possible delays.

1.09 WITHDRAWAL OF BIDS

- A. Bids may be withdrawn by written or facsimile request dispatched by the bidder in time for delivery in the normal course of business prior to the time fixed for opening, provided that telegraphic withdrawal is confirmed in writing over the signature of the bidder within 48 hours thereafter. Negligence on the part of the bidder in preparing the bid confers no rights for the withdrawals of the bid after it has been opened.

1.10 AWARD OF CONTRACT - REJECTION OF BIDS

- A. The Contract will be awarded to the lowest responsive and responsible bidder complying with the conditions of the advertisement for bids, provided his bid is reasonable and to the interest of the Owner to accept it. The bidder to whom the award is made will be notified at the earliest possible date. The Owner also reserves the right to reject the bid of any bidders who have previously failed to perform properly, or complete on time contracts of a similar nature, who is not in the position to perform the contract or has habitually and without just cause neglected the payment of bills or otherwise disregarded his obligations to subcontractors, material men or employees. In determining the lowest responsive and responsible bidder, the following elements in addition to those above mentioned will be considered: whether the bidder involved (a) maintains a permanent place of business, (b) has adequate plant equipment to do the work properly and expeditiously, (c) has a suitable financial status to meet the obligation incidental to the work, (d) has appropriate technical experience (e) has responded to all conditions of the Contract Documents.

1.11 TIME OF COMPLETION

- A. The work shall be commenced at the time stated in the notice to the Contractor to proceed or as stated in the contract and shall be completed in the number of days as proposed by the bidders on their Bid Form.

1.12 "OR EQUAL" CLAUSE

- A. Whenever in any of the Bid Documents an article, material, or equipment is defined by describing a proprietary product, or by using the name of a manufacturer or vendor, the term "or equal", if not inserted, shall be implied. The specific article, material or equipment mentioned shall be understood as indicating the type, function, minimum standard of design, efficiency and quality desired and shall not be construed in such a manner as to exclude manufacturer's products of comparable quality, design and efficiency.

- B. The bidders will be required to base their proposals on the articles, materials and equipment specified, and shall not make any substitutions, unless approval of proposed substitution is issued by an addendum issued by the Architect.
- C. The contractor may offer any voluntary alternate for alternate articles, materials or equipment on the Bid Proposal. Award of bid shall not be based on voluntary alternates.

1.13 PERFORMANCE BOND, LABOR AND MATERIAL PAYMENT BOND AND EXECUTION OF CONTRACT

- A. On Contracts \$200,000 and above the successful bidder shall furnish a performance bond and a labor and material payment bond in the sum of at least one hundred percent (100%) of the total amount payable by the terms of the contract. Cost of performance bond and labor and material payment bond shall be included in the bid.
- B. The successful bidder shall execute the contract with the Owner in the form of the contract included in the specifications in such number of counter-parts as the Owner may request.
- C. Such performances and payment bond shall be furnished and such contract shall be executed and delivered by the successful bidder within 10 days after the receipt by the successful bidder of notice of acceptance of his bid by the Owner.
- D. Address and Signature: Each bid should give the full business address of the bidder and should be signed by him with his usual signature. Bid by partnerships should be signed with the partnership name by one of the members of the partnership or by an authorized representative, followed by the signature and designation of the President, Secretary, or other person authorized to bid it in the matter. The names of all persons affixes to this signature the word "President", "Secretary", "Agent" or other designation, without disclosing his principal, may be held to the bid of the individual signing. When requested by the Owner, satisfactory evidence of the authority of the officer signing in behalf of the corporation should be furnished.

1.14 RIGHT OF FIRST REFUSAL

- A. Owner shall have right of first refusal on any removed materials. If Owner elects not to keep any removed materials, bidder shall remove from site. If Owner elects to keep removed materials, bidder shall store on site as directed by Owner, until Owner can remove at a later date if he wishes.

END OF SECTION

SECTION 00 3100

AVAILABLE PROJECT INFORMATION

1.01 INFORMATION AVAILABLE

- A. Certification Statement Regarding Investments in Iran – copy attached to this section.
- B. CSK Architects, P.C.'s Disclaimer Form for limited use of electronic copies of the Contract Documents which will be made available to the successful bidder for their use to assist in the construction of the project per the requirements of such will be made available electronically from the Architect.
- C. K & S Engineers, Inc. Report of Geotechnical Exploration dated September 8, 2026 File No. 14477

END OF SECTION

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CERTIFICATION STATEMENT REGARDING INVESTMENTS IN IRAN

I, _____, certify to the following:

1. Pursuant to Indiana Code 5-22-16.5 *et seq.*, I am not now engaged in investment activities in Iran.
2. I understand that providing a false certification could result in the fines, penalties, and civil action listed in I.C. 5-22-16.5-14.

Executed this _____ day of _____, 2021.

Signature: _____

Printed: _____

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**DISCLAIMER FOR USE OF
CSK ARCHITECTS, P.C.
CADD DRAWINGS**

_____ does hereby acknowledge they have the authority to act as the legal agent of _____ and does hereby acknowledge that CSK Architects, P.C. has been requested to deliver to them CADD Drawings for the Architect's Project #_____- _____ as prepared by CSK Architects, P.C. The requested drawings listed below are to be used at their own risk and solely in order to assist with the _____ Project's As-Built Drawings, Shop Drawings, Submittals or Diagrams. CSK Architects, P.C. makes no warranty, expressed or implied for the use of such CADD Drawings.

Drawings requested:

Accepted: _____
(Signature)

Date: _____

Please return signed Disclaimer Form.

V:\CSK PC Architects\CSK Forms\CSK Disclaimer.docx

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**REPORT OF GEOTECHNICAL EXPLORATION
PROPOSED ATHLETIC LOCKER ROOM COMPLEX
276 EAST 68th PLACE
MERRILLVILLE, IN 46410**

Prepared For:

**CSK Architects, P.C
6919 W Lincoln Highway
Schererville, IN 46375**

**Mr. Mack Pearson
(219) 322-5950
mpearson@cskarchitects.com**

**September 08, 2026
K&S File No. 14477**



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September 08, 2026
K&S File No. 14477

CSK Architects, P.C
6919 W Lincoln Highway
Schererville, IN 46375

Attn:
Mr. Mack Pearson
(219) 322-5950
mpearson@cskarchitects.com

**REPORT OF GEOTECHNICAL EXPLORATION
PROPOSED ATHLETIC LOCKER ROOM COMPLEX
276 EAST 68th PLACE
MERRILLVILLE, IN 46410**

Dear Mr. Pearson,

Pursuant to your request, K&S Engineers, Inc. (K&S) is pleased to present this report of a geotechnical exploration performed at the above-referenced project site located in Merrillville, Indiana. This work was completed in general accordance with our Proposal No. 14827R dated August 06, 2026, and upon your subsequent authorization on August 25, 2026.

The purpose of this exploration was to evaluate the subsurface conditions at the site and to formulate conclusions and recommendations pertaining to the influence of those conditions upon the proposed construction. The scope of work included subsurface exploration by drilling five (5) soil borings, engineering analysis of the pertinent geotechnical data, and preparation of this report. Samples obtained during this exploration will be retained in our facility for a period of 60 days, after which time they will be discarded unless other arrangements are made.

The approximate boring locations are shown on the attached **Exhibit 1 - Boring Location Plan**, and the boring logs are presented on **Exhibits 2 through 6**. Relevant findings, conclusions, and recommendations derived from this exploration are presented in the following text.

SITE INFORMATION

The site for the proposed athletic locker room complex consists of approximately 0.21 acres of land located at 276 East 68th Place, Merrillville, Indiana. Based on our field observations, the site is presently vacant, and ground cover consisted predominantly of vegetation (i.e., grass, weeds). The ground surface over the site, in general, appeared to be relatively level, with surface elevations ranging between (±) 630 feet and (±) 633 feet.

PROJECT INFORMATION

The site is proposed for an athletic locker room building with a footprint of approximately 8,850 square feet. The structure is anticipated to be a single-story athletic locker room building.

Foundations are anticipated to consist of conventional shallow spread footings (i.e., continuous wall and individual column footings) with slab-on-grade at floor levels. Although the maximum structural design loads were not available at the time of this report, we have preliminarily assumed for this analysis that the maximum column and wall loadings will not exceed 100 kips and 4 kips per linear foot, respectively.

Due to the preliminary nature of the project at the time of this report, building layout and grading plans were not available. However, for this analysis, we have assumed that the design grades would likely follow the existing topography such that any cut/fill required to establish the design building grades would be minor.

FIELD EXPLORATION

The field exploration consisted of drilling five (5) soil borings: borings B-1 through B-5, each to a maximum depth of 30.0 feet below grade. The borings were staked and drilled at the approximate locations within the proposed building footprints by a K&S representative. Refer to **Exhibit 1** for the approximate boring locations.

The borings were drilled using a truck-mounted D-120 drill rig. The borings were advanced using continuous hollow-stem augers (3¼-inch I.D.). Representative soil samples were obtained using the split-barrel sampling procedure in general conformance with ASTM Standard D1586. Split-spoon samples and Standard Penetration Test resistances (SPT N-values) were obtained at 2½-foot intervals up to 10.0 feet and 5-foot

intervals thereafter to the maximum termination depth. Groundwater level observations were made during drilling and shortly after completion of the drilling operations.

LABORATORY TESTING

The soil samples obtained from each soil boring were logged, labeled, sealed, and transported to our laboratory for further classification and testing. The soil samples were visually classified, based upon their texture and plasticity, by an experienced K&S soils engineer in general conformance with the Unified Soil Classification System (ASTM D2487 and D2488), and the field boring logs were reviewed as necessary. Moisture content and pocket penetrometer resistance (PPR) tests were performed on all cohesive soil samples. The moisture contents and PPR test results are plotted on boring logs in **Exhibits 2 through 6**.

SUBSURFACE CONDITIONS

General

The soil profile described below is a generalized description of the conditions observed at the boring locations. The boring logs should be referred to for more specific information. It should be noted that stratification lines on the soil boring logs represent approximate transitions between material types. In-situ stratum changes could occur gradually or at slightly different depths. In addition, the boring logs depict conditions disclosed at the location and times indicated. Some conditions, particularly the groundwater levels, could change with time.

Soil Conditions

The borings extended to a maximum depth of 30.0 feet below the existing ground surface at the explored locations. The soil conditions encountered at the boring locations are described below.

- **Topsoil** – Approximately 10 inches of topsoil was encountered at the surface of all the borings. The topsoil was dark brown and/or black in color and was described as sandy clay topsoil with traces of gravel and organics.
- **Cohesive soils** – Cohesive soils were encountered below the surficial topsoil layer in all borings as follows:

- In boring B-1, from below the surficial topsoil layer to the depth of 5.5 feet and again from 12.5 feet to 22.0 feet below grade.
- In boring B-2, from below the surficial topsoil layer to the depth of 3.0 feet.
- In boring B-3, from below the surficial topsoil layer to the depth of 5.5 feet, from 12.5 feet to 22.0 feet, and again from 27.5 feet to the boring terminus.
- In boring B-4, from below the surficial topsoil layer to the depth of 3.0 feet.
- In boring B-5, from below the surficial topsoil layer to the depth of 5.5 feet, and again from 12.5 feet to 17.5 feet.

These soils were gray, brown, and/or black in color and were classified as lean clay (CL), silty clay (CL-ML), and sandy silty clay (CL-MLS) with traces of gravel. The consistency of the cohesive soils ranged from very soft to hard, as signified by PPR values ranging from 0.25 to 4.5 tons per square foot (tsf). The moisture contents of these soils ranged from 11.1 percent to 17.5 percent.

- **Granular Soils** – Granular soils were encountered below the surficial topsoil layer in all borings as follows:
 - In boring B-1, from below the cohesive soils from 5.5 feet to the depth of 12.5 feet and again from 22.0 feet to the boring terminus.
 - In boring B-2, from below the cohesive soils, from 3.0 feet to the boring terminus.
 - In boring B-3, from below the cohesive soils, from 5.5 feet to the depth of 12.5 feet and again from 22.0 feet to 27.5 feet.
 - In boring B-4, from below the cohesive soils, from 3.0 feet to the boring terminus.
 - In boring B-5, from below the cohesive soils, from 5.5 feet to the depth of 12.5 feet and again from 17.5 feet to the boring terminus

These soils were generally brown and/or gray in color, moist to wet in water content by visual observation, and were classified as poorly graded sand (SP) and silty sand (SM) with traces of gravel. The relative density of the granular soil encountered was very loose to dense, with SPT N-values ranging from 4 to 44 blows per foot (bpf).

Groundwater Conditions

Groundwater level observations were made in the boreholes during drilling and shortly following completion of the drilling operations. Based on these observations, groundwater was observed in all borings at depths ranging from 6.0 to 8.5 feet below grade during

drilling activities. Upon completion of drilling, groundwater was not noted in all borings, and cave-in depths were observed in all borings at depths ranging from 10.0 to 18.5 feet in all borings, below existing grade.

It should be noted that groundwater levels, whether perched or potentiometric, are subject to seasonal and long-term variations in response to climatic conditions, man-made influences, and other environmental or physical factors. Due to the low-permeability nature of the clay soils encountered in the borings, this site is considered to be prone to perched water conditions and ponding of surface water after precipitation or during wet periods. Groundwater levels, particularly in less permeable cohesive soils (clay), may not have had adequate time to stabilize prior to backfilling. Consequently, the lack of groundwater during drilling may or may not represent present or future conditions.

CONCLUSIONS AND CONSTRUCTION CONSIDERATIONS

Basis

Our geotechnical exploration for the proposed one-story athletic locker room facility is based on a soil boring program consisting of five (5) soil borings. Subsurface variations can still exist on the site which may not be indicated by the exploratory program. If such variations or unexpected conditions are encountered during construction, or if the project information is incorrect or changed, we should be informed immediately since the validity of our recommendations may be affected. Refer to the **General Qualifications** attachment for additional qualification considerations.

Foundation Conditions

Based on the borings and depending on the actual building locations and foundation grade, it appears that foundations placed at, or below, the typical 3.5-foot depth for frost protection would bear on very stiff to hard cohesive soils and/or loose granular soils. Loose granular soils and/or load-bearing fill after adequate densification and native very stiff to hard cohesive soils should provide adequate support for the proposed athletic locker room complex building, provided our recommendations for site/subgrade preparation, fill placement, and inspection are followed.

During excavation for a shallow foundation, if any loose granular soils, soft cohesive soils, and/or debris are discovered, these unsuitable soils and/or materials should be improved or removed and replaced with load-bearing fill. The load-bearing fill used to backfill the

undercut areas should meet the requirements discussed under the **Load-Bearing Fill** section of this report.

Following any necessary and successful ground improvement coupled with successful dewatering, should it become necessary, it is our opinion that the proposed buildings may then be supported using conventional shallow spread footing and slab-on-grade construction. Our construction and design recommendations related to shallow foundation and slab-on-grade support after ground improvement are provided in the following paragraphs.

Site Preparation

All existing topsoil, organics, or otherwise unsuitable material, as well as frozen, wet, soft, or loose soils, should be removed from the structural areas. The mass grading operation should be performed in a manner consistent with good erosion and sediment control practices. The contractor must maintain the construction area in a well-drained condition both during and after construction. Positive drainage is an important part of a successful earthwork operation and long-term performance. Improper site drainage can increase the need for remedial treatment of excessively wet soils. Disturbed areas should be sealed off with a rubber-tired or smooth drum roller at the end of each day and prior to anticipated inclement weather to minimize infiltration of water.

The time period between late spring and early fall is typically favorable for earthwork in the project area. Earthwork activities undertaken during late fall and winter often encounter substantial difficulties associated with snow, rain, and cold temperatures. The contractor must take adequate precautions to minimize deterioration of an otherwise suitable subgrade, especially from construction traffic

Following the stripping/removal activities and prior to placement of any load-bearing fill to raise site grade, any exposed clayey soils in the at-grade structural areas should first be proof-rolled to detect any localized soft or loose materials. Proof-rolling consists of repeated passes, as necessary, of a loaded, rubber-tired vehicle such as a tandem-axle dump truck or scraper. The proof-rolling operations should be observed by the Geotechnical Engineer or his representative. Any areas judged by the engineer to rut, pump, or deflect excessively should be undercut and replaced with load-bearing fill, or otherwise stabilized.

After the exposed subgrades have been proof-rolled and any detected soft areas have been stabilized, fill placement may proceed as necessary to establish design grades for the building pad and pavement areas. Load-bearing fill used to backfill undercut areas and any grade-raising fill required to establish design grades in structural areas should meet the requirements under the **Load-Bearing Fill** section of this report. The placement and compaction criteria for the load-bearing fill are also provided under this section of the report.

Where granular-type soils are exposed in the at-grade areas following the stripping/removal activities, these soils should first be compacted in-place and then proof-rolled prior to placement of any grade-raising fill. The compaction should be performed using at least six passes (thrice in opposite directions), as necessary, of a 10-ton minimum vibratory roller capable of a sustained operation of 27 cycles per second or greater. These operations should densify the granular soils with depth and achieve a minimum of 95 percent of the standard Proctor maximum dry density (ASTM D698) in the upper 2 feet. Any areas that do not readily compact in-place should be undercut, and the undercut area should be backfilled in thin lifts with each lift compacted to 95 percent of the standard Proctor dry density. The undercut area should be backfilled with load-bearing fill meeting the requirements under the **Load-Bearing Fill** section of this report.

Care must be exercised during the grading and construction operations at this site. The low permeability and moisture-sensitive nature of the clayey soils make this site particularly susceptible to poor site drainage and potential subgrade deterioration. Combinations of excess surface water from precipitation ponding on the site and the traffic of heavy construction equipment may create pumping and general deterioration of the bearing capacities of the shallower soils. The severity of this potential problem depends to a great extent on the weather conditions prevailing during construction. Therefore, grading should be performed during the dry season, if at all possible. The contractor must also exercise discretion when selecting equipment sizes and make a concerted effort to control surface water while the subgrade soils are exposed. This should reduce these potential problems, although they may not be eliminated. If such problems arise, the operations in the affected area should be halted pending an evaluation of the conditions by the Geotechnical Engineer.

Foundation Excavations

The foundation excavations should proceed downward until the proposed foundation bearing elevation is reached. Excavation walls should be sloped, shielded, or shored in accordance with current Occupational and Safety Health Administration (OSHA) regulations (see the **Excavation Slope Stability** section of this report). Once the foundation subgrade level is reached, the exposed subgrade soil should be observed by the Geotechnical Engineer or his representative.

Where cohesive soil is exposed at the foundation subgrade level, these soils should be evaluated and tested by the Geotechnical Engineer or his representative to check that the cohesive soils are of adequate bearing strength and consistency. Any localized weak soil zones detected at the bearing elevation should be undercut to adequate support soil, and the cavity backfilled with load-bearing fill or lean concrete. Alternatively, the footing concrete could be placed at the over-excavated depth.

Granular soils are exposed at the foundation subgrade, these soils should first be compacted in-place and then tested to determine that a minimum density equivalent to 95 percent of the Standard Proctor Maximum Dry Density (ASTM D698) exists to a depth of at least 1 to 2 feet below the foundation subgrade. This can be achieved by over-excavating the onsite materials and placing them back in compacted lifts. Granular soils that do not readily compact shall be undercut, backfilled in thin lifts, and recompacted or, if necessary, replaced with compacted load-bearing fill or lean concrete.

Load-bearing fill used to establish footing grades or to backfill undercut areas below the footings should meet the requirements under the **Load-Bearing Fill** section of this report. The placement and compaction criteria are also outlined in the **Load-Bearing Fill** section of this report.

If undercutting becomes necessary, the over-excavation must be widened and extend at least one foot beyond all edges of the footings for each one foot of undercut or fill depth required below the bottom of the footing. This configuration is depicted on the attached **Exhibit 7 - Foundation Undercut Detail**.

Additionally, all foundation excavations should be protected from freezing conditions and maintained free of standing water before concrete placement. The footings should be cast as soon as possible after excavation or placement of load-bearing fill and be backfilled after the concrete has attained its initial strength.

Load-Bearing Fill

Load-bearing fill should be free of organic material and have a plasticity index of less than 25, a maximum particle size of no more than 3 inches, and a maximum dry density of more than 100 pounds per cubic foot, as determined by the standard Proctor compaction test (ASTM D698). If a fine-grained soil is used, the moisture content should be within ± 3 percent of its optimum moisture content. In addition, load-bearing fill should not be frost-susceptible within the zone of frost penetration (i.e., within 4.0 feet of final exterior grade) in areas that can be adversely affected by frost action (e.g., below flatwork areas such as concrete driveways and sidewalks).

Except for any surficial topsoil, the inorganic, native, clay soils encountered by the borings appear suitable for use as load-bearing fill. However, it should be recognized that the clayey site soils are moisture-sensitive and are usually more difficult to work with since they drain poorly. These soils typically require more time and effort to achieve adequate compaction, which may require aeration by discing to reduce the moisture content. In some climatic conditions, such as cold or wet weather periods, adequate moisture conditioning can be difficult to achieve. In this case, we suggest that imported clean sand, gravel, crushed aggregate or crushed concrete (or combinations thereof) be used as fill where required, since granular materials are typically easier to compact and perform better than cohesive soils.

Below foundations, we recommend the use of well-graded crushed aggregate or crushed concrete. The crushed material should have a maximum particle size of no more than 1½ inches and not more than 10 percent fines by dry weight passing the No. 200 U.S. standard sieve. The Indiana Department of Transportation (INDOT) Coarse Aggregate No. 53 gradation may be utilized for this purpose. Lean concrete may also be used to backfill below foundation areas. Additionally, clean, free-draining sand, gravel, or open-graded crushed aggregate with a fines content of less than eight percent (e.g., the INDOT No. 8 gradation) may be considered for use below floor slab and rigid pavement areas.

Any load-bearing fills must be placed in essentially horizontal lifts not exceeding 8 inches in loose thickness. Each lift should be compacted to at least 95 percent of the standard Proctor dry density (ASTM D698) beneath footings, floor slab, and pavement areas. The aggregate base material below pavements should likewise be compacted to 95 percent of the standard Proctor dry density. The compaction must be performed by mechanical means, such as a vibratory plate or roller. Along the inside and outside of the foundation

walls, a manual compaction device may be needed due to the narrow spacing. In these areas, the loose lift thickness should be limited to 6 inches to achieve the required density.

Excavation Slope Stability

Temporary open cut excavations 5 feet or more in depth must conform to current OSHA regulations. Based on the borings, the soils at this site consisted predominantly of very soft to hard cohesive soil (OSHA Type A) and loose to dense granular soils (OSHA Type C).

Per OSHA publication CFR 1926 Subpart P, Appendices A and B, the maximum allowable slopes (horizontal to vertical) for excavations less than 20 feet deep can likely be cut with side slopes of 1-1/2:1.0 horizontal to 1.0 vertical (1-1/2H:1.0V) in the conservative Type C soils. If signs of distress are observed or if these slope values cannot be maintained due to soft or loose soil zones, then the excavation sides should be flattened, shielded, or shored, as necessary, in accordance with current OSHA standards. It is also recommended that any surcharge fill or heavy equipment be kept at least 5 feet from the edge of excavations. However, we again emphasize that current OSHA requirements must be met and may be more restrictive.

DESIGN RECOMMENDATION

Shallow Foundation Design Considerations

Depending on the actual structure, location, and foundation depth, the foundation subgrade soils are expected to consist of very stiff to hard cohesive soils and/or loose granular soils. In our opinion, these soils should provide adequate support of shallow spread footings, provided the foundation subgrades are prepared in compliance with the recommendations for site/subgrade preparation, fill placement, and inspection as previously discussed under the **Site Preparation – Proposed Building Area** and the **Foundation Excavations** sections of this report.

Based on our findings and depending on the actual building location and foundation grade, it is our opinion that spread footings bearing on firm, native clayey soils and/or adequately compacted granular soils, and load-bearing fills can be proportioned for a maximum net allowable soil bearing pressure of **2,200** pounds per square foot (psf). Although the maximum structural design loads were not available at the time of this report,

we have preliminarily assumed for this analysis that the maximum column and wall loadings will not exceed 100 kips and 4 kips per linear foot, respectively.

It is recommended that the foundation widths should not be less than 18 inches wide for continuous wall footings and not less than 36 inches wide for isolated column footings, regardless of the bearing pressure. Exterior footings which are subject to frost action should be placed at a depth of not less than 4.0 feet below the final adjacent exterior grade. It is also recommended to provide adequate reinforcement in the foundations. Provided the foundations are constructed as recommended herein, and the foundation loadings do not exceed those assumed under the **Project Description** section of this report, the total foundation settlement will be less than 1.0 inch.

Slab-on-Grade Floor Design Considerations

The floor slabs should be supported on a minimum 4-inch thick, granular base course (subfloor fill), bearing on a suitably prepared (proof-rolled and/or compacted) subgrade as discussed under the **Site Preparation – Proposed Building Areas** section of this report. The sub-floor fill should consist of a relatively clean, open-graded or free-draining, granular material (e.g., INDOT No. 8 coarse aggregate). Relatively clean, free-draining granular material should contain no more than eight (8) percent fines, by dry weight, passing the No. 200 U.S standard sieve. Such soils were not encountered in the borings. A six-mil-thick polyethylene membrane, or higher-rated vapor barrier, should be placed over the sub-floor fill to provide a “capillary break.” This membrane beneath the floor slab should help preclude floor dampness.

Groundwater Concerns

Groundwater was noted in all borings during drilling activities. Perched water may likely be encountered during the foundation excavation. It should be noted that the groundwater level fluctuates over time, and attention to potential groundwater should be taken during foundation construction.

The ground surface adjacent to the excavations should also be graded to direct surface water runoff away from the excavation.

Surface Drainage

The surface drainage adjacent to the proposed locker room facility should be positive, and the following drainage precautions should be exercised:

- a) Backfill around the exterior and interior foundation walls should be moistened within 2% of optimum content and compacted to 95% of standard Proctor maximum dry density according to ASTM D698 to reduce future settlement. The top 1.0 to 1.5 feet of the backfill should be cohesive/clayey in order to interrupt direct infiltration of water into the foundation walls.
- b) The ground surface along the perimeter foundation walls should be sloped to drain away from the structures in all directions using cohesive soils. K&S recommends a minimum slope of 12 inches in the first 10 feet, if possible. If properly compacted backfill is placed, a slope of 5% is reasonable. Concrete and pavement adjacent to structures are recommended to slope at a rate of 2% away from the structure.
- c) Watering adjacent to the structure should be minimized, as much as practical. If a sprinkler system is installed, the sprinkler heads should be placed so that the spray from the heads, under full pressure, does not fall within 5 feet of foundation walls.
- d) If lawn edging is used around the exterior of the structure, it should be perforated to prevent ponding of surface water in the vicinity of the backfill soils.
- e) Roof downspouts and other water collection systems should discharge well beyond the limits of the backfill. Splash blocks should be appropriately placed and maintained.

CONSTRUCTION MONITORING

It is recommended that full-time observation and monitoring be provided during foundation construction by a Geotechnical Engineer or experienced soils technician who is familiar with the subsurface conditions and the foundation design criteria. These services are especially critical given the possible need for undercut excavations and proper placement of load-bearing fills and backfill materials.

Since the intent of the design recommendations is best understood by K&S, it is strongly recommended to involve K&S in the construction process. Observation services are considered a continuation of the design process. These services should include the

observation and documentation of all phases of foundation construction, evaluation of bearing materials, placement and compaction of load-bearing fill, and installation of foundation and floor slab elements and pavements.

LIMITATIONS

The conclusions and recommendations presented in this preliminary geotechnical report are based upon five (5) widely spaced soil borings and on the assumption that the subsurface conditions do not deviate appreciably from those disclosed by the soil borings. Our conclusions and recommendations presented in this preliminary geotechnical exploration report are also based upon the premise of competent field engineering, monitoring, and testing during construction.

The professional services provided in connection with this project were performed in a manner consistent with the level of care and skill ordinarily exercised by an engineering firm. The opinions and conclusions presented in this report are based upon visual observations, limited testing, and engineering judgment. No other representation, warranty, or guarantee is intended.

We appreciate the opportunity to work with you on this project. If you have any questions concerning this report, or if we may be of additional service, please do not hesitate to contact us.

Very truly yours,

K & S Engineers, Inc.



Sai Uday Varakavi
Civil Engineer-I



Dibakar Sundi, P.E.
Senior Engineer

Attachments:

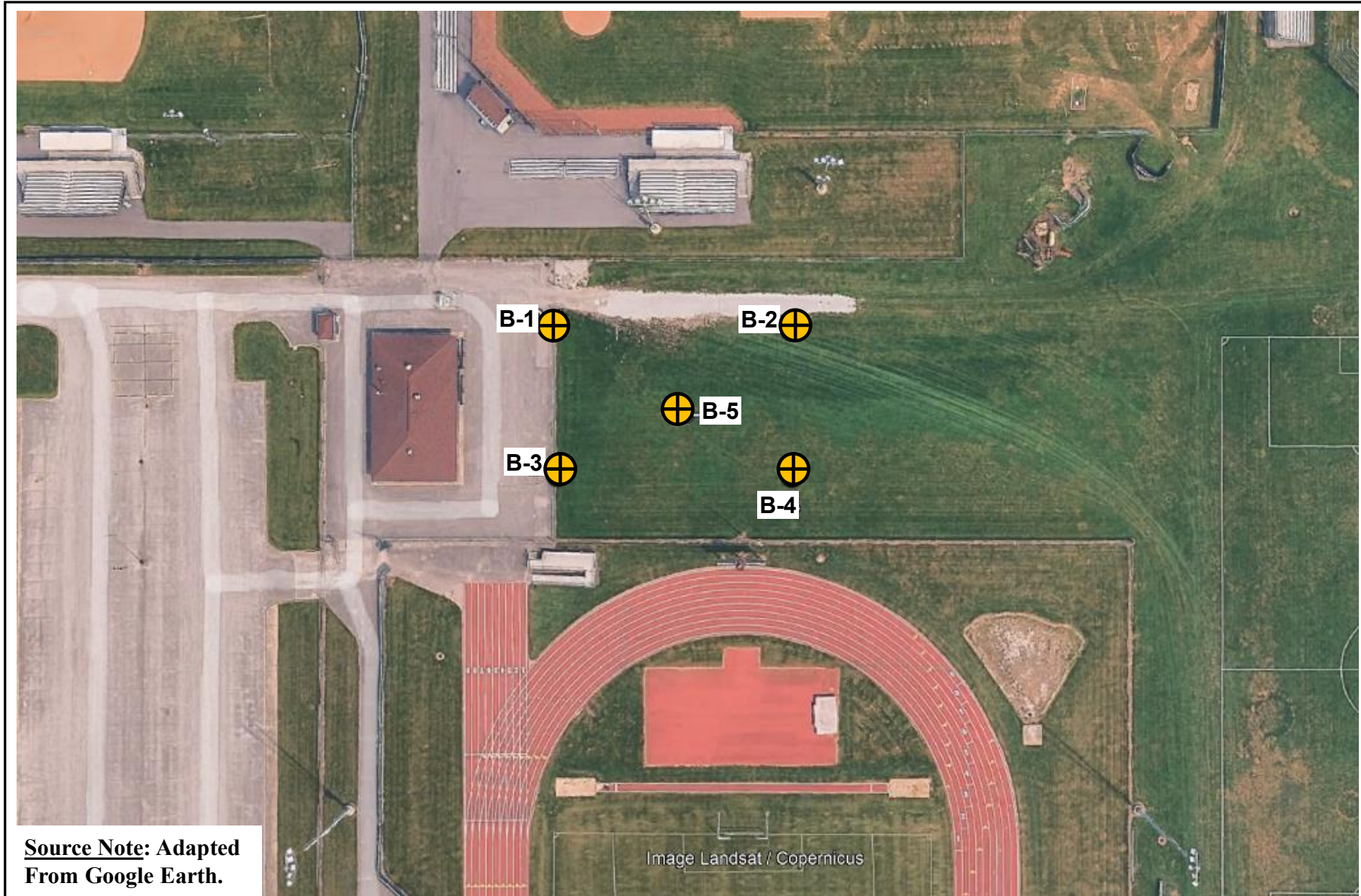
Exhibit 1 - Boring Location Plan

Exhibits 2 through 6 – Boring Logs B-1 through B-5

Exhibit 7 - Footing Undercut Detail

General Notes

General Qualifications



Source Note: Adapted
From Google Earth.

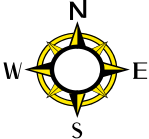
 K & S ENGINEERS, INC. SOIL TESTING AND FOUNDATION CONSULTANTS		Date: 09-01-2026	EXHIBIT-1
		Scale: Not to Scale	File No. 14477
		Legend: B-#  Approximate Boring Location	

EXHIBIT 2
Sheet 1 of 1

CLIENT C S K Architects, P.C		LOG OF BORING NUMBER B-1		DES. NO.	
PROJECT NAME Proposed Athletic Locker Room Complex				PROJECT NO. 14477	
SITE LOCATION 276 East 68th Place, Merrillville, IN		STRUCTURE NUMBER		Latitude	Longitude
BORING STARTED 8/26/2026	RIG D-120	FILE NUMBER 14477		⊕ CALIBRATED PENETROMETER, TONS/FT ² ○ UNCONFINED COMPRESSIVE STRENGTH, TONS/FT ²	
BORING COMPLETED 8/26/2026	FOREMAN Ed de Luca			● WATER CONTENT, % △ BLOW COUNTS	

(METERS) STRATA DEPTH (FEET)	TEXTURAL CLASSIFICATION	DESCRIPTION OF MATERIAL	DEPTH (FEET)	TYPE RECOVERY	NUMBER	DRY UNIT WEIGHT pcf (kg/m ³)							
0.8		TOPSOIL - Brown to Dark Brown, moist, Sandy Clayey Topsoil, trace gravel and fine roots			1								
1		Very stiff, moist, grayish brown, LEAN CLAY (CL), trace sand & gravel	2.5		2								
5.5		Loose, moist, brown, SILTY SAND (SM), trace gravel	5.0		3								
2		- becoming wet & medium dense	7.5		4								
12.5		Very stiff, moist, gray, SILTY CLAY (CL-ML), trace gravel	12.5		6								
17.5		Very soft, moist, gray, SANDY SILTY CLAY (CL-MLS), trace gravel	17.5		7								
22.0		Medium dense, wet, gray, POORLY GRADED SAND (SP), trace gravel	22.5		8								
30.0		End of Boring at 30.0 Feet	30.0		9								

▽ WATER LEVEL WHILE DRILLING = 8.5 feet

▼ WATER LEVEL AFTER DRILLING = None observed

□ SPLIT SPOON ■ SHELBY TUBE □ AUGER ▨ ROCK CORE
 + PL - PLASTIC LIMIT + LL - LIQUID LIMIT ¼ - UNIT DRY WEIGHT

REMARKS
CAVE-IN DEPTH AFTER AUGER RETRIEVAL = 18.5 feet



K & S ENGINEERS, INC.

BORING LOG 14477 BORING LOGS.GPJ 9-8-26

EXHIBIT 3
Sheet 1 of 1

CLIENT C S K Architects, P.C				LOG OF BORING NUMBER		DES. NO.	
PROJECT NAME Proposed Athletic Locker Room Complex				B-2		PROJECT NO. 14477	
SITE LOCATION 276 East 68th Place, Merrillville, IN				STRUCTURE NUMBER		Latitude Longitude	
BORING STARTED 8/26/2026		RIG D-120		FILE NUMBER		⊕ CALIBRATED PENETROMETER, TONS/FT² ○ UNCONFINED COMPRESSIVE STRENGTH, TONS/FT² ● WATER CONTENT, % △ BLOW COUNTS 0 1 2 3 4 5 6 0 10 20 30 40 50 60 0 10 20 30 40 50 60	
BORING COMPLETED 8/26/2026		FOREMAN Ed de Luca		14477			
SURFACE ELEVATION ft				SAMPLE			
(METERS) STRATA DEPTH (FEET)	TEXTURAL CLASSIFICATION	DESCRIPTION OF MATERIAL		DEPTH (FEET)	TYPE RECOVERY	NUMBER	DRY UNIT WEIGHT pcf (kg/m ³)
0.8	[Hatched Box]	TOPSOIL - Black, moist, Sandy Clayey Topsoil, trace gravel and fine roots		2.5	[Slope]	1	
3.0	[Dotted Box]	Very stiff, moist, brown, LEAN CLAY (CL), trace sand & gravel Loose, moist, brown, POORLY GRADED SAND (SP) with little clay, trace silt & gravel		5.0	[Slope]	2	
1		- becoming wet		7.5	[Slope]	3	
2		- becoming medium dense		10.0	[Slope]	4	
3		- becoming gray		12.5	[Slope]	5	
4		- becoming dense		15.0	[Slope]	6	
5		- becoming medium dense		17.5	[Slope]	7	
6		- becoming medium dense		20.0	[Slope]	8	
7		- becoming medium dense		22.5	[Slope]	9	
8		- becoming medium dense		25.0	[Slope]	10	
9		- becoming medium dense		27.5	[Slope]	11	
30.0		End of Boring at 30.0 Feet		30.0	[Slope]	12	

▽ WATER LEVEL WHILE DRILLING = 8 feet

▼ WATER LEVEL AFTER DRILLING = None observed

 SPLIT SPOON
 SHELBY TUBE
 AUGER
 ROCK CORE

+ PL - PLASTIC LIMIT + LL - LIQUID LIMIT
 γ_d - UNIT DRY WEIGHT

REMARKS

CAVE-IN DEPTH AFTER AUGER RETRIEVAL = 13 feet

K & S ENGINEERS, INC.

BORING LOG 14477 BORING LOGS.GPJ 9-8-26

EXHIBIT 4
Sheet 1 of 1

CLIENT C S K Architects, P.C		LOG OF BORING NUMBER B-3		DES. NO.	
PROJECT NAME Proposed Athletic Locker Room Complex				PROJECT NO. 14477	
SITE LOCATION 276 East 68th Place, Merrillville, IN		STRUCTURE NUMBER		Latitude	Longitude
BORING STARTED 8/26/2026	RIG D-120	FILE NUMBER 14477		⊕ CALIBRATED PENETROMETER, TONS/FT ² ○ UNCONFINED COMPRESSIVE STRENGTH, TONS/FT ² ● WATER CONTENT, % △ BLOW COUNTS	
BORING COMPLETED 8/26/2026	FOREMAN Ed de Luca				

(METERS)	STRATA DEPTH (FEET)	TEXTURAL CLASSIFICATION	DESCRIPTION OF MATERIAL	DEPTH (FEET)	SAMPLE		DRY UNIT WEIGHT pcf (kg/m ³)	BLOW COUNTS	PENETROMETER	WATER CONTENT
					TYPE	RECOVERY				
	0.8		TOPSOIL - Black, moist, Sandy Clayey Topsoil, trace gravel and fine roots							
			Hard, moist, brown, LEAN CLAY (CL), trace sand & gravel	2.5						
	5.5		Loose, moist, brown, SILTY SAND (SM), trace gravel	5.0						
				7.5						
				10.0						
	12.5		Very soft, moist, gray, SILTY CLAY (CL-MLS), trace gravel & sand	12.5						
				15.0						
			- becoming stiff	17.5						
				20.0						
	22.0		Medium dense, wet, brown, POORLY GRADED SAND (SP), trace gravel	22.5						
				25.0						
				27.5						
	27.5		Very stiff, moist, gray, SANDY SILTY CLAY (CL-MLS), trace gravel	27.5						
				30.0						
			End of Boring at 30.0 Feet							

▽ WATER LEVEL WHILE DRILLING = 8 feet

▼ WATER LEVEL AFTER DRILLING = None observed

□ SPLIT SPOON ■ SHELBY TUBE □ AUGER ▨ ROCK CORE
 + PL - PLASTIC LIMIT + LL - LIQUID LIMIT γ_d - UNIT DRY WEIGHT

REMARKS
CAVE-IN DEPTH AFTER AUGER RETRIEVAL = 11 feet

K & S ENGINEERS, INC.

BORING LOG 14477 BORING LOGS.GPJ 9-8-26

EXHIBIT 5
Sheet 1 of 1

CLIENT C S K Architects, P.C		LOG OF BORING NUMBER B-4		DES. NO.	
PROJECT NAME Proposed Athletic Locker Room Complex				PROJECT NO. 14477	
SITE LOCATION 276 East 68th Place, Merrillville, IN		STRUCTURE NUMBER		Latitude	Longitude
BORING STARTED 8/26/2026		RIG D-120		⊕ CALIBRATED PENETROMETER, TONS/FT² ○ UNCONFINED COMPRESSIVE STRENGTH, TONS/FT² ● WATER CONTENT, % △ BLOW COUNTS 0 1 2 3 4 5 6 0 10 20 30 40 50 60 0 10 20 30 40 50 60	
BORING COMPLETED 8/26/2026		FOREMAN Ed de Luca			
(METERS)	SURFACE ELEVATION ft	DEPTH (FEET)	SAMPLE		
	TEXTURAL CLASSIFICATION		TYPE RECOVERY	NUMBER	
	DESCRIPTION OF MATERIAL				
0.8	TOPSOIL - Black, moist, Sandy Clayey Topsoil, trace gravel and fine roots				
3.0	Hard, moist, brown, LEAN CLAY (CL), trace sand & gravel	2.5	1		5-8-8(16)
5.5	Loose, moist, brown, SILTY SAND (SM), trace gravel & clay	5.0	2		5-4-3(7)
	Medium dense, wet, brown, SILTY SAND (SM), trace gravel	7.5	3		4-6-8(14)
		10.0	4		4-7-8(15)
		12.5			
		15.0	5		4-5-6(11)
		17.5			
	- becoming loose and gray	20.0	6		3-3-5(8)
		22.5			
	- becoming medium dense	25.0	7		4-5-8(13)
		27.5			
30.0	End of Boring at 30.0 Feet	30.0	8		3-5-8(13)

▽ WATER LEVEL WHILE DRILLING = 6 feet

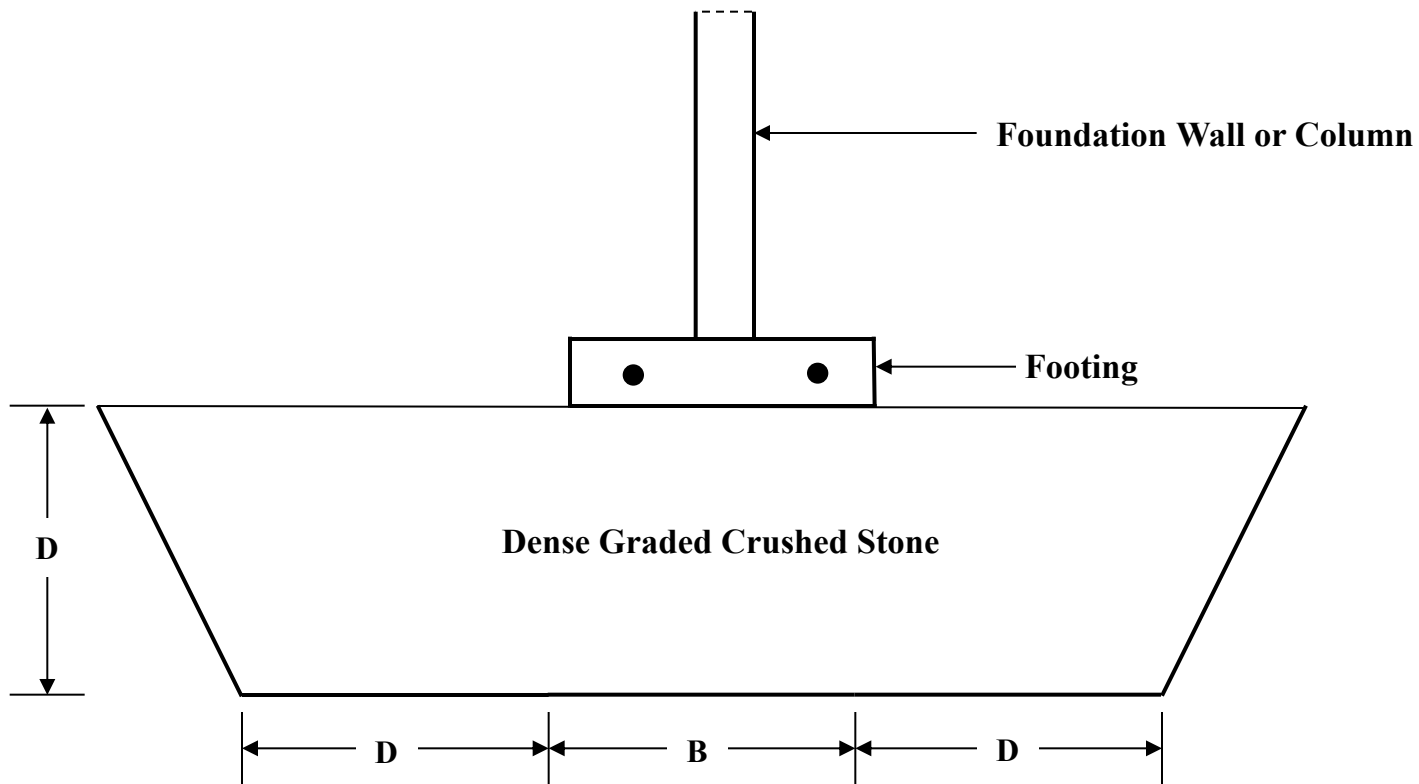
▼ WATER LEVEL AFTER DRILLING = None observed

□ SPLIT SPOON ■ SHELBY TUBE □ AUGER ▨ ROCK CORE
 + PL - PLASTIC LIMIT + LL - LIQUID LIMIT ¼ - UNIT DRY WEIGHT

REMARKS
CAVE-IN DEPTH AFTER AUGER RETRIEVAL = 10 feet

K & S ENGINEERS, INC.

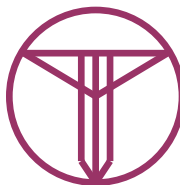
BORING LOG 14477 BORING LOGS.GPJ 9-8-26



B= Width of Footing
D= Depth of Undercut Below Bottom of Footing

K & S ENGINEERS, INC.
 SOIL TESTING AND FOUNDATION CONSULTANTS

Proposed Athletic Locker Room
 276 East 68th Place, Merrillville, IN



Date: 09/01/2026

EXHIBIT- 7

Scale as Shown

FILE No. 14477

Footing Undercut Detail

K & S Engineers, Inc.

9715 Kennedy Avenue
 Highland, IN 46322
 (219) 924-5231 (phone)
 (219) 924-5271 (fax)
 info@kandsengineers.com

General Notes

IN ORDER TO PROVIDE UNIFORMITY THROUGHOUT OUR PROJECTS, THE FOLLOWING SYSTEM HAS BEEN ADOPTED TO DESCRIBE EACH SOIL SAMPLE. ROCK, SHALE, AND OTHER MATERIALS WILL BE DESCRIBED IN DETAIL AS ENCOUNTERED.

CONSISTENCY OF COHESIVE SOILS**UNCONFINED COMPRESSIVE
STRENGTH, Q_u (tsf)****CONSISTENCY**

<0.25	Very Soft
0.26-0.49	Soft
0.50-0.99	Medium Stiff
1.00-1.99	Stiff
2.00-3.99	Very Stiff
4.00-8.00	Hard
>8.00	Very Hard

RELATIVE DENSITY OF GRANULAR SOILS**"N" VALUE*****RELATIVE DENSITY**

0-3	Very Loose
4-9	Loose
10-29	Medium Dense
30-49	Dense
50-80	Very Dense
>80	Extremely Dense

*Number of blows per foot required to drive a 2-inch O.D. split-spoon sampler using a 140-lb. weight falling freely for 30 inches, except where otherwise noted.

COLOR - AS DETERMINED ON THE FRESH, MOIST SAMPLES**PREDOMINATE COLORS****SHADES****MODIFYING ADJECTIVES**

Black	Yellow	Light	Vari-colored
Brown	Red	Dark	Steaked
Gray	Blue		Mottled

GRADATION DESCRIPTION AND TERMINOLOGY**COMPONENTS****SIZE RANGE**

Boulders	Over 8 inches
Cobbles	8 inches to 3 inches
Gravel	3 inches to #4 sieve (0.475 mm)
Sand	#4 sieve to #200 sieve (0.475 mm to 0.075 mm)
Silt	Passing #200 sieve to 0.005 mm (0.075 mm to 0.005 mm)
Clay	Smaller than 0.005 mm

ESTIMATED PROPORTIONS OF MATERIAL BY DRY WEIGHT IN PERCENT**DESCRIPTION OF COMPONENT
ALSO PRESENT IN SAMPLE****PERCENT OF
DRY WEIGHT**

Trace	1-9
Little	10-19
Some	20-34
And	35-50

WATER LEVELS ARE THOSE OBSERVED WHEN BORINGS WERE MADE, OR AS NOTED. POROSITY OF THE SOIL STRATA, VARIATIONS OF RAINFALL, SITE TOPOGRAPHY, ETC., MAY CAUSE CHANGES IN THESE LEVELS.

K & S Engineers, Inc.

9715 Kennedy Avenue
Highland, IN 46322
(219) 924-5231 (phone)
(219) 924-5271 (fax)
info@kandsengineers.com

General Qualifications

- This report has been prepared in order to aid in the evaluation of this property and to assist the architect and/or engineer in the design of this project. The scope is limited to the specific project and location described herein. In the event that any changes in the design or location of the building as outlined in this report are planned, we should be informed so that changes can be reviewed and the conclusions of this report modified as necessary. We recommend that we be authorized to review the project plans and specifications within our scope of work to confirm that the recommendations contained in this report have been interpreted in accordance with our intent. Without this review, we will not be responsible for misinterpretation of our data, our analysis, and/or our recommendations, nor how these are incorporated into the final design.
- The analysis and recommendations submitted in this report are based upon the data obtained from the soil borings performed at the locations indicated on the location diagram and from any other information discussed in this report. This report does not reflect any variations which may occur between these borings. In the performance of subsurface explorations, specific information is obtained at specific locations at specific times. However, it is a well-known fact that variations in soil and rock conditions exist on most sites between boring locations and also, such situations as groundwater levels vary from time to time. The nature and extent of variations may not become evident, it will be necessary for a re-evaluation of the recommendations of this report after performing on-site observations during construction period and noting the characteristics of any variations.

SECTION 00 4100

BID FORM

To: Merrillville Community School Corporation
6701 Delaware Street
Merrillville, Indiana 46410

Submitted By: _____
(Company Name)

The undersigned, having familiarized themselves with the local conditions affecting the cost of the work and the Bid Documents, including the Project Manual and Construction Documents on file in the Office of the Architect, hereby propose to perform everything required to be performed and to provide and furnish all of the labor and materials, necessary tools, expendable equipment, and all utility and transportation services necessary to complete in a workmanlike manner all of the work in connection with the New Locker Room Facility and Renovations to the Existing Concession and Tennis Facilities Project at the Merrillville High School for the Merrillville Community School Corporation 6701 Delaware Street Merrillville, Indiana 46410, all in accordance with the Bid Documents as prepared by the Architect CSK Architects, P.C., 6919 W. Lincoln Highway, Crown Point, Indiana 46307, including Addenda ____, ____, ____, ____, issued thereto for the sum stated below in accordance with the category designations listed:

BASE BID #1 – New Locker Room Facility

To include any and all work associated with the New Locker Room Facility all in accordance with the Bid Documents as Base Bid #1.

\$ _____

BASE BID #2 – Renovations to the Existing Concession Facility

To include any and all work associated with the Renovations to the Existing Concession Facility all in accordance with the Bid Documents as Base Bid #2.

\$ _____

BASE BID #3 – Renovations to the Existing Tennis Facility

To include any and all work associated with the Renovations to the Existing Tennis Facility all in accordance with the Bid Documents as Base Bid #3.

\$ _____

COMBINATION BASE BID #4 – Base Bids #1, #2 and #3

To include any and all work associated with the Base Bids #1, #2 and #3 all in accordance with the Bid Documents as Combination Base Bid #4.

\$ _____

In submitting this proposal, it is understood that the right is reserved by the Owner to reject any and all bids. It is agreed that this bid may not be withdrawn for a period of sixty (60) days from the opening thereof.

If awarded the contractor agrees to complete the work per Specification Section 01 1000 Summary of Work.

THIS BID PROPOSAL MUST BE ACCOMPANIED BY ALL REQUIRED BID DOCUMENTS AS SPECIFIED IN THE PROJECT MANUAL AND LISTED IN SECTION 00 11 53 BID AND POST BID SUBMISSION REQUIREMENTS.

Date: _____

Firm Name: _____

By: _____

Title: _____

Official Address: _____

END OF SECTION

SECTION 00 4513

BIDDER'S QUALIFICATIONS

QUALIFICATIONS FOR BIDDERS

In order for a Bidder to submit a prime bid on this project, the Bidder must have completed a project of comparable size, type and complexity and must have been in business as their current licensed/incorporated entity for at least five (5) years.

Bidder's shall submit a statement with their bid acknowledging this and shall so list those projects in that statement.

The Bidder is required to maintain on a continual basis at least one (1) major trade (i.e., carpentry, masonry, etc.) with their own employees (in house). The bidder may add additional employees, as they need. The intention of this requirement is to attract bidders that are contractors capable and experienced adequately to manage, coordinate and complete the work in accordance with typically accepted and required practices of general contracting and the Bid Documents.

END OF SECTION

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SECTION 00 5200

CONSTRUCTION CONTRACT

The attached Association of Licensed Architects Document ALA OC1-2023 Owner/Contractor Agreement (Lump Sum Fee) where the basis of payment is a stipulated sum is included as part of this Specification and all parties active on the project are bonded thereto. A copy of said document is available from the Architect for review upon request.

END OF SECTION

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SECTION 00 7200

GENERAL CONDITIONS

The Association of Licensed Architects Document GC1-2023 General Conditions Lump Sum Fee shall be included as part of this Specification by reference and all parties active on the project are bound thereto. A copy of said document is available from the Architect for review upon request.

END OF SECTION

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SECTION 00 7510

INDIANA'S ILLEGAL IMMIGRATION LAW

PART 1 – GENERAL

- 1.01 The Contractor shall comply with Indiana's Illegal Immigration Law, 2011 Senate Enrolled Act 590. The Contractor shall enroll in and verify the work eligibility status of all newly hired employees through E-verify, as that term is defined under Indiana Law. The requirement to enroll and verify the work status under E-verify shall terminate if the E-verify program ceases to exist.
- 1.02 The Contractor must submit with their bid a fully executed copy of the attached "Contractor's E-Verify Affidavit of Compliance with Indiana's Illegal Immigration Law".
- 1.03 If notified by the Owner of a violation of these provisions, the Contractor must, within thirty (30) days, remedy the breach and inform the Owner, in writing, of the actions taken to remedy. Failure to remedy within thirty (30) days can result in termination of the contract.

CONTRACTOR'S E-VERIFY AFFIDAVIT OF COMPLIANCE
WITH INDIANA'S ILLEGAL IMMIGRATION LAW

COMES NOW _____ and having been first sworn
(Printed Name)

upon his or her oath does affirm under penalties of perjury that:

1. I make this affidavit upon personal knowledge.
2. This affidavit is made by me as an individual or as the authorized legal agent of the below-noted entity.
3. I, nor the below-noted entity, knowingly employ unauthorized aliens as that term is defined under Indiana law.

I hereby verify under penalties for perjury that the foregoing statement is true.

(Signature)

(Date)

Executed as:

An Individual _____, or

A Representative of _____
(Name of Company)

(Address)

END OF SECTION

SECTION 01 1100

SUMMARY OF WORK

PART 1 GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. General: The work consists of furnishing all labor, materials, equipment, supplies, transportation, fuel, superintendence, temporary construction facilities, insurance, taxes, permits, fees and all other services and facilities, except as stated to be furnished by others, necessary to complete the work as called for on the plans and/or herein specified.

1.02 WORK BY OWNER

- A. Items noted 'NIC' (Not in Contract), and 'by others' will be furnished and installed by the Owner or by others under separate contracts. This does not relieve the Bidder to supply all requirements of the Bid Documents when certain portions of such are noted to be furnished by others.
- B. The bidder shall assist and accommodate all other contractors contracted directly with the Owner and must anticipate and accommodate their requirements during construction and scheduling.

1.03 CONTRACTOR USE OF SITE AND PREMISES

- A. Project Access: The Owner does not intend on closing the facilities or portions thereof to carry out the work which must be coordinated and scheduled with the Owner.
- B. Employee parking will be permitted where approved by the Owner.
- C. Utility Outages and Shutdowns: Coordinate with the Owner.

1.04 PROJECT SCHEDULE

- A. Assuming the bids are acceptable to the Owner the Owner intends to award the contracts at their next Board meeting on October 27, 2026.
- B. Work may commence immediately on Base Bid #1 after the execution of contracts along with the submission of the bidder's Certificate of Insurance and Bonds. Work may continue weather permitting. It is not expected of the Owner to have to pay for cold weather conditions.
- C. Work may commence immediately on Base Bids #2 & #3 after the execution of contracts along with the submission of the bidder's Certificate of Insurance and Bonds.
- D. The Owner expects all of the work to be completed for Base Bids #1, #2 & #3 prior to the start of school in the fall of 2027.

END OF SECTION

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SECTION 01 2600

CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 GENERAL

- A. Contract Documents: The Contract Documents include:
- Project Manual
 - Advertisement for Bid
 - Bid Proposal
 - Contract
 - General Conditions
 - Contractor's Qualification Statement
 - Instructions to Bidders
 - Specifications and Construction Documents
 - Addenda
 - Performance Bond
 - Insurance Policies

For convenience of reference, this Specification is divided into various headings and sub-headings. However, such divisions do not make the Owner or Architect responsible for the limitations of the Contract of any subcontractor, each of which is dependent upon its own definite confines, regardless of Specification Divisions. Also, all items shown on the Plans must be furnished and installed even though not specifically specified or noted in the Specifications.

Perform all work required to complete the Project, as awarded, and provide and furnish all labor, tools, materials, expendable equipment, transportation, services, Permits, Fees, Bonds, Insurance and Warranties required to perform and complete in a workmanlike manner, all the work required by the Drawings and/or described in the Specifications, including all addenda as prepared by CSK Architects, P.C., 6919 W. Lincoln Highway, Crown Point, 46307.

- B. Examination of Site: All Contractors are held to have examined the site and to have compared it with the Drawings and Specifications and to have satisfied themselves as to the conditions.
- C. Hours of Work: The Contractors shall furnish sufficient forces to insure the execution of the work in accordance with the approved progress schedule. Work shall be performed during regular working hours. Work may be performed on night shifts, overtime, and holidays when permission to do so has been obtained from the Owner. No requirements of work other than at regular working hours shall form the basis of claims by the Contractors for additional compensation. There shall be no compensation from owner to work on overtime hours. Contractor shall include all expected overtime expenses in their bid.
- D. Errors and Omissions: The Specifications, Drawings and directions furnished by the Architect are intended to cooperate and agree. The Drawings and Specifications are to be interpreted according to the true meaning, spirit and intention of the work without any extra charge whatsoever. If any discrepancies or variations appear between any of the Drawings or Specifications, such discrepancies are to be interpreted by the Architect. The contractors shall immediately notify the Architect of all such discrepancies. Architect has the right to

correct any errors or omissions in the work as necessary for proper fulfillment of their intentions for the Project. In case of discrepancies which vary in the quantity or quality, the greater quantity or quality of work shall prevail.

Anything shown on the Plans and not mentioned in the Specifications, or vice-versa, must be furnished by the respective contractor without extra compensation. Further, if any material or work is required which is absolutely necessary to carry out the full meaning and intent of the Plans and Specifications, the respective contractor hereby agrees to consider and allow for the same as fully as if they are so noted, and perform the work without extra charge or claim for extra compensation.

Drawings and Specifications shall be treated as equals. In the occurrence of discrepancies between drawings and specifications, it shall be the contractor's responsibility to notify the Architect in writing immediately upon discovery for interpretation by the Architect.

E. Contractor's Acknowledgment: The Contractor acknowledges, upon submittal of a Proposal:

1. That he understands the Bid Documents.
2. That he has the equipment, technical ability, personnel, and facilities to construct the Project in accordance with the Bid Documents.
3. That he has examined the Bid Documents and has found these sufficiently complete to prepare a sound Bid for the work contemplated.
4. That he has personally inspected the project site and verified information indicated.

F. Standards and Industry Specifications: Comply with any material or operation specified by reference to the published Specifications of a manufacturer, society, institute, association, administration, conference, council, bureau, etc. Use the requirements of the Specification or Standard listed. Those not listed herein, if any, must be current copies at time of Award of Contract.

In case of conflicts between the referenced Specifications or Standards, the one having the more stringent requirements govern. The Contractor, if requested, must furnish an affidavit from the requirements specified. Certification does not relieve the Contractor from the responsibility of complying with any added requirements specified herein.

G. Federal Construction and Safety Requirements (OSHA): All construction and safety procedures used on this Project must meet the Occupational Safety and Health Standards, National Consensus Standards, and Established Federal Standards including all requirements of the Williams-Steiger Occupational Safety and Health Act of 1970, Hornberge, Lee Occupational Safety and Health Act, Volume 36 Federal Register Number 105 Occupational Safety and Health Standards and any other requirements set by the Occupational Safety and Health Administration.

H. Other Construction and Safety Requirements: Work on this Project must comply with the requirements of any Specifications and/or Standards listed and/or organizations referred to throughout these Contract Documents.

I. Explanation of Specifications:

1. These specifications are of the abbreviated type and include incomplete sentences. Omissions of words or phrases such as "the Contractor shall", "shall be", etc., are intentional. Omitted words or phrases shall be supplied by inference in the same manner as they are when a "note" occurs on the drawings.
2. Where "as shown", "as indicated", "as detailed" or words of similar import are used, it shall be understood that reference to the drawings accompanying the specifications is made unless otherwise stated. Where "as directed", "as required", "as authorized", "as approved", "as accepted", or words of similar import are used, it shall be understood that the direction, requirement, permission, authorization, approval or acceptance of the Architect is intended unless otherwise stated. As used herein, "provide" shall be understood to mean "provided complete in place", that is, "furnished and installed".

J. No Damages for Delays:

1. An extension of time shall be the Contractor's exclusive remedy in the event of a delay, no matter how or by whom caused. Contractor further specifically acknowledges that it shall have no claim for increase in contract price or damages because of any delays whatsoever to all or any part of the work whether foreseen or unforeseen, and whether caused by any person's hindrance or active interference.

1.02 CASH ALLOWANCE

- A. Costs Included in Allowances: Actual cost of product to Contractor or Subcontractor and delivery to site, less applicable trade discounts. The Contractor shall not be allowed to mark up the cost of the materials. The Contractor must substantiate actual quantities purchased and costs of the products to the Contractor with copies of paid invoices referencing the project and submit them to the Architect.
- B. Costs Not Included in the Allowance: Substantiating and submitting cost estimates for selected materials, handling at the site, including unloading uncrating, and storage; protection of products from elements and from damage and labor for installation and finishing.
- C. Architect Responsibilities:
1. Consult with Contractor in consideration and selection of products and suppliers.
 2. Select products in consultation with Owner and transmit decision to Contractor.
 3. Prepare Change Order.
- D. Contractor Responsibilities:
1. Assist the Architect in selection of products and suppliers and verification of required quantities of each product and associated costs thereof.
 2. Obtain proposals from suppliers and offer recommendations.
 3. On notification of selection by Architect, execute purchase agreement with designated supplier.

4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
 5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
- E. Funds will be reconciled with the specified Cash Allowances only by Change Order prior to ordering materials.
- F. Cash Allowances: Refer to Specific Sections

1.03 SCHEDULE OF VALUES

- A. Submit three (3) typed schedule of values on AIA Form G703 - Application and Certificate for Payment Continuation Sheet with each Application for Payment.
- B. The AIA Form G703 - Application and Certificate for Payment continuation sheet shall be executed as follows:
1. The prime contractor's material supplier's name(s) and type(s) of material(s) shall be listed as a separate line item.
 2. Each subcontractor's name and type of work that his contract covers shall be listed as a separate line item.
 3. The subcontractor's material supplier's name(s) and type(s) of material(s) shall also be listed as a separate line item directly below the subcontractor.
 4. The prime contractor's profit and overhead shall be listed as a separate line item.
- C. Revise schedule to list approved Change Orders, with each Application for Payment.

1.04 APPLICATION FOR PAYMENT

- A. Submit three (3) copies of each application on AIA Form G702 - Application and Certificate for Payment, submit three (3) copies of Owner Claim Form when required by the owner.
- B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
- C. Progress payments: Based upon Application for Payment submitted to the architect by the Contractor and Certificates for Payment issued by the architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided in the Conditions of the Contracts as follows:

On the first day of each month 95% of the proportion of the Contract Sum properly provided and allocable to labor, materials and equipment incorporated in the work and 95% of the portion of the Contract Sum properly allocable to materials and equipment suitable stored at the site or at some other location agreed upon in writing by the parties, up to the first day of that month, less the aggregate of previous payments in each case.

Payout requests submitted in proper order and received by the Architect by the first of the month will be processed and delivered to the Owner by the 10th of the month for Owner processing.

Until final payment, the Owner will pay 95% of the amount due the Contractor on account of progress payments.

Until final payment, the Owner will withhold 5% retainage of the amount due to the contractor on account of progress payments.

On all contracts totaling \$200,000.00 or more the retainage withheld by the Owner for such progress payments shall be placed in an escrow account with a bank, savings and loan institution, or the State of Indiana or an instrumentality thereof as escrow agent pursuant to an escrow agreement as provided in I.C. 1971, 5-16-5.5 and the escrow agent shall promptly invest all escrowed principal and income for the Contractor and/or according to the terms of the escrow agreement.

- D. Submit three copies of AIA Form G702 - Application and Certificate for Payment for the retainage only to be withheld and placed in the escrow account.
- E. Submit with final payment the following fully executed forms:
 - 1. AIA Form G 706 - Contractors Affidavit of Payment of Debts and Claims
 - 2. AIA Form G 706A - Contractors Affidavit of Release of Liens.
 - 3. AIA Form G 707 - Consent of Surety Company to Final Payment.

1.05 WAIVERS OF LIEN

- A. Submit three (3) copies of Partial Waivers of Lien fully with each Application for Payment and Final Waivers of Lien as follows:
 - 1. Prime Contractor's shall submit with each Application for Payment a Partial Waiver of Lien in full amount equal to payment amount requested.
 - 2. Prime Contractor's shall submit with each Application for Payment, Partial Waivers of Lien from their material suppliers, subcontractor(s) and subcontractor's material suppliers for the previous month's payment. The Waivers of Lien shall be executed in amounts equal to the Schedule of Values of the previous payment. The Prime Contractor will not receive payment until this requirement is fulfilled.
 - 3. Prime Contractor's shall submit with Final Application for Payment his Final Waiver of Lien and Final Waivers of Lien from material suppliers, subcontractors and subcontractor's material suppliers.

1.06 PAYMENT FOR MATERIALS STORED

- A. Payments may be made on account for materials or equipment not incorporated in the work, but delivered and suitably stored at the site. Materials may be stored at another location other than the work site if properly identified as the property of the Owner and properly protected. Storage of material at the place of business of the vendor is not acceptable. Such payments shall be conditional upon the submission by the contractor of the following: 1) receipts marked by the supplier as paid; 2) supplier's waiver of lien listing specific materials involved; 3) invoice with copy of canceled check showing payment; or 4) such other evidence of payment as the Owner may require in lieu thereof to establish ownership of all items except those listed as miscellaneous materials below. For materials stored off site the contractor shall provide a Certificate of Insurance listing the materials insured in the Owner's name.

For the aggregate of miscellaneous stored materials for which payment is requested and above proof of payment is not available, a complete list will be provided along with the affidavit of payment for stored materials. Upon certification by the Owner's representative that the listed materials are suitably stored, payment can be made. Miscellaneous materials are defined as pipe, fittings, wire, conduit, etc., normally stored as stock items in contractor's warehouse. For materials stored other than at the construction site, applicable insurance and transportation to the site shall be provided by the contractor.

- B. In no instance shall the payments exceed 95% of the net value of material or equipment stored. As stored materials are incorporated into the work, the value shall be removed from the total value of stored material requested in successive payments. Proof of ownership through one of the above methods will be required for additional materials.

1.07 ALTERNATES

- A. Alternate Construction: In case the Owner accepts quantitative alternates in which certain items or building portions are omitted, the respective Contractors must construct the building and make necessary provisions to permit omitted portions to be added at a future date with minimum difficulty. Provide blind openings. Leave necessary extensions of reinforcing steel. Provide capped tees in pipes and conduits, etc.

In case qualitative alternatives are accepted, any substitute material or items used must harmonize with the intended design. The arrangement of substitute material or items must equal or exceed the quality of those specified in the Base Proposal as nearly as possible.

All cost of evaluating equipment and material proposed under the terms of these Specifications for design, quality and performance compliance incurred by the Architect, must be borne by the Contractor.

The Architect will provide the final decision as to acceptance or rejection of such alternate proposals.

For approval of products other than those specified, Bidders must submit a request in writing at least ten (10) days prior to Bid date and hour. Requests received after this time will not be reviewed or considered regardless of cause. Clearly define requests to describe the product for which approval is desired. Accompany all requests with manufacturer's literature, specifications, drawings, cuts, performance data, and list of references or other information necessary to completely describe the item. Approval by the Architect will come in the form of an Addendum to the Specifications issued to all bidders on record. The Addendum will indicate the additional products which are acceptable for this Project.

All additional costs associated with the acceptance of an alternate in order to accommodate such alternate into the design must be borne by the contractor proposing such alternate, regardless of the type of trade or construction affected.

- B. Voluntary Alternates: The Bidder, at his option, may submit voluntary alternates as may be permitted in other sections of these Specifications or Bid Forms.

In Voluntary Alternates, clearly indicate the amount to be added to or deducted from the base Proposal if material or equipment other than that specified is proposed to be furnished and indicate manufacturer.

1.08 CHANGE ORDERS

- A. The general contractor mark-up on change orders shall not exceed 10% for change orders under \$10,000.00. For change orders exceeding \$10,000.00 the general contractor's mark-up shall not exceed 10% for first \$10,000.00 and shall not exceed 5% for the amount in excess of the first \$10,000.00.
- B. The general contractor's mark-up on change orders shall include and cover all general contractor profit, overhead, supervision, bond cost, record drawing cost, etc.
- C. All change orders shall be substantiated by submission of subcontractor's proposals. Cost breakdowns requested by the Architect must be provided.
- D. Change orders will be verbally approved by the Architect and the Owner on an as needed basis and the paperwork will be processed on a monthly basis. However, on a case by case basis changes may be approved more frequently at the Owner's discretion.

1.09 INSURANCE

- A. Insurance Policy Requirements:
 - 1. All insurance policies required under the terms hereof shall be executed by companies authorized to do business in the State of Indiana and proof of such authority shall be furnished to the Owner prior to the signing of the Contract. All insurance policies shall be in form and all other particulars satisfactory to the Owner.
 - 2. The Prime Contractors shall furnish the Owner with satisfactory proof of carriage of the insurance required and shall not commence work under this Contract until he has obtained all the insurance required under this paragraph and such insurance has been approved by the Owner, nor shall the Contractor allow any Subcontractor to commence work on his subcontract until all similar insurance required of the Subcontractor has been obtained and approved.
- B. Prime Contractors' Insurance:
 - 1. Compensation and Occupational Disease Insurance
 - a. The Contractor shall take out and maintain during the life of this contract, Workmen's Compensation and Occupational Disease Insurance, Employers Liability, for all of his employees employed at the site of the project, in full compliance with the statutes of the project, in full compliance with the statutes of Indiana applicable thereto, and, in case any work is sublet, the Contractor shall require the subcontractor similarly to provide Workmen's Compensation and Occupation disease Insurance for all of the latter's employees unless such employees are covered by the protection afforded by the Contractor. In case any class of employees engaged in hazardous work under this contract at the site of the project are not

protected under Workmen's Compensation statute, the Contractor shall provide and shall cause each subcontractor to provide insurance coverage equal to that provided under the Workmen's Compensation statute for the protection of his employees not otherwise protected.

- b. Workmen's Compensation and Employer's Liability Insurance in amounts sufficient, in the opinion of the Contractor, the Owner, and the Architect, to protect the Owner, the Architect, the Contractor and the Subcontractors from all liability for bodily injury, sickness, or disease (including death resulting at any time therefrom) of any of their employee, including all liability or damage which may arise by virtue of any statute or law in force or which may hereafter be enacted.

2. Public Liability and Property Damage Insurance

- a. Contractor shall effect and maintain during life of this Contract Commercial Public Liability including Personal Injury and Property Damage Liability Insurance (construed as including Contractor's Contingent or Protective Insurance if necessary to protect the Contractor from damage claims arising from any operation under this contract) as shall protect him and any Subcontractors performing work covered by this Contract, from claims for damage for personal injury, including accidental death, as well as from claims for property damage which may arise from operations under this Contract, whether such operations by himself or by any Subcontractor, or anyone directly or indirectly employed by either of them, and the amounts of insurance shall be as follows:

Contractor's liability insurance shall be a \$1,000,000.00 Single Limit Comprehensive General Liability Insurance Policy covering all his operations on an occurrence basis with the following coverages included:

Bodily Injury Liability
Property Damage Liability
Products Liability (including contractual)(Broad Form)

General Contractor agrees to continue Completed Operations coverage for one (1) year after the work is accepted by the Owner. Commercial General Liability shall include coverage on: Premises, Operations, Independent Contractors (Protective Liability), Products and Completed Operations, Contractual Liability as may be assumed and insurable under this contract. There shall be no exclusions for special hazards under Property Damage for "c," collapse caused by grading or excavation: "u," underground property: "x," explosion or blasting.

3. Subcontractor's Public Liability and Property Damage Insurance

- a. Contractor shall require each of his Subcontractors to procure and maintain during the life of his subcontract, Subcontractor's Public Liability and Property Damage Insurance of the type and of the limits specified in Subparagraph 3 above.
4. The Contractor's Commercial General Liability Insurance shall include premises – operations (including explosion, collapse and underground coverage) elevators, independent contractors, products liability,

- completed operations, and blanket contractual liability on all written contracts, all including broad form property damage coverage.
5. The insurance shall name the Owner and Architect as an additional insured and shall be written for the greater of the following limits, or those required by law.
- a. Workers' Compensations
 1. State: Statutory
 2. Applicable Federal Statutory
 3. Employer's Liability \$1,000,000 per Accident
\$1,000,000

Disease, Policy Limit \$1,000,000

Disease, Each Employee
 - b. Comprehensive General Liability (including Premises- Operations; Independent Contractors' Protective; Products and Completed Operations; Broad Form Property Damage)
 1. Bodily Injury: \$1,000,000 Each Occurrence
\$2,000,000 Annual Aggregate
 2. Property Damage: \$1,000,000 Each Occurrence
\$2,000,000 Annual Aggregate
 3. Products and Completed Operations to be maintained for two years after Substantial Completion: \$5,000,000 Aggregate
 4. Property Damage Liability Insurance shall provide X, C, and U coverage
 5. Broad Form Property Damage Coverage shall include Completed Operations.
 - c. Contractual Liability
 1. Bodily Injury: \$1,000,000 Each Occurrence
\$2,000,000 Annual Aggregate
 2. Property Damage: \$1,000,000 Each Occurrence
\$2,000,000 Annual Aggregate
 - d. Personal Injury, with Employment Exclusion deleted: \$2,000,000 Annual Aggregate
 - e. Business Auto Liability (including owned, non-owned, and hired vehicles):
 1. Bodily Injury: \$1,000,000 Each Person
\$1,000,000 Occurrence
 2. Property Damage: \$1,000,000 Each Occurrence
 - f. For all worker's compensation and employer's liability insurance required hereby, Contractor shall require wavier of subrogation for itself and for all subcontractors, or others performing Work on the Project pursuant to the terms of Contractor's Contract with Owner.
 - g. In addition to the above, each Prime Contractor will be required to verify that he carries an Umbrella or Blanket Excess Liability insurance coverage in an amount not less than \$2,000,000.00
 - h. All risks of Physical Loss (including Fire and Extended Coverage). The General Contractor at his own expense shall provide fire and extended coverage insurance protection for materials and equipment belonging to the Contractor which is not to be worked into the building, and the Owner assumes no responsibility for fire and extended coverage or loss on such scaffolding, equipment or materials which are not be worked into the building. During the entire construction period, the General Contractor shall provide extinguishers of the type for the intended protection as approved

by NFPA and OSHA and shall provide such extinguisher in each construction shed and temporary office, as well as in other locations are reasonably required, and all other fire protection reasonably required, to properly protect the project, and to comply fully with the requirements of insurance underwriters for the project and municipal county and state authorities.

C. Owner Furnished Insurance

1. Owner shall effect and maintain a Special Perils Building Risk Insurance upon all work to one hundred percent (100%) of the insurable value thereof, including all items of labor and materials connected therewith in or adjacent to the structure, materials in place or to be used as part of the permanent construction. This insurance does not cover any tools owned by mechanics, any tools, equipment, scaffolding, stagings, towers, forms, etc., rented by the Prime Contractor. This insurance shall be extended to include vandalism. Each Prime Contractor will be named as an additional insured.
2. The Owner shall furnish the Contractor, if so requested, copies of the Owner Insurance policies.
3. The Owner and Contractor waive all rights against each other for damages caused by fire or other perils to the extent covered by insurance provided under this paragraph, except such rights as they may have to the proceeds of such insurance held by the Owner as trustee. The Contractor shall require similar waivers by Subcontractors and Sub-subcontractors.
4. The Owner as trustee shall have power to adjust and settle any loss with the insurance unless one of the parties in interest shall object in writing within five days after the occurrence of loss to the Owner's exercise of this power; and if such objection be made, arbitrators shall be chosen as provided in Paragraph 4.5 of General Conditions. The Owner as trustee shall in that case, make settlement with the insurers in accordance with the directions of such arbitrators. If distribution of the insurance proceeds by arbitration is required, the arbitrators will direct such distribution.
5. The Architect shall be listed as co-insured on the Builder's Risk Policy.

END OF SECTION

SECTION 01 3100

PROJECT MANAGEMENT AND COORDINATION

1.01 COORDINATION

- A. The General Contractor shall have full responsibility to coordinate and expedite all phases of the work of all Contractors notwithstanding the fact that the Owner may take bids and award separate Contracts on some divisions of work. The Contractors must give sufficient notice of their work schedule to other contractors so they may have ample time to install their work.

Each and every contractor and subcontractor must afford all other contractors and subcontractors reasonable opportunity for the introduction and storage of their material and execution of their work, and properly connect and coordinate his work with theirs, and employ as far as possible such methods and means in carrying out his work as will prevent any interruptions or interference with any other Contractor's or subcontractor's work. Any defects as may develop in any other Contractor's work after the execution of this work and which could not be ascertained before this work commenced is the responsibility of the original contractor who developed the work which became defective.

- B. Equipment: Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Layout of Work: Thoroughly examine the construction documents and Specifications carefully checking the figured dimensions, before commencing work and report to the Architect if any error, discrepancy or defect appears. Unless otherwise directed by the Architect, the location and arrangement of the various parts of the installations must be as indicated on the construction documents. Each Contractor is responsible to make any changes necessary to pass immovable obstructions without additional cost to the Owner. Under no circumstances is any size to be decreased or any radical changes to be made in any part of the installation without the written consent of the Architect.

Each Contractor must lay out his own work. Locations, lines and grades, pipe and conduit lines, valves and other appurtenances for which no figured dimensions or elevations are given are considered approximate only. Set the Actual locations as directed at the time of the installation.

- D. Mechanical and Electrical Construction documents: In addition to the Architectural Construction documents issued together with the Mechanical and Electrical Construction documents, all contractors must pay particular attention to the Mechanical and Electrical Construction documents with respect to the locations of ducts, chases, pipes, conduits, panels, fixtures, etc., as they relate to the General Construction items, such as floors, walls, partitions and ceilings.

Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on construction documents. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs. In finished areas except as otherwise

indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

- E. Substantial Completion: Coordinate completion and clean-up of work of separate Sections in preparation for Substantial Completion.
- F. Owner Occupancy: After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.
- G. Damage to Other Contractors: Any Contractor or subcontractor claiming damages from another Contractor or other subcontractor, or Owner on account of delay, negligence, or carelessness of other Contractors or subcontractors must make claim for same in writing at the time the damages are incurred, and within five (5) days, deliver such written claims to the Architect, to the Owner, and to the party at fault, so that such claim may be arbitrated by the Architect. Failure to act as above will render such claim null and void.
- H. Trade Regulations: The Contractors agree to accord with such lawful agreements as it may have either individually, or as a member of any employer's association with trade unions, and to work in harmony with such labor unions and the representatives thereof for both his own employees and subcontractor's employees. The Contractor shall likewise take all steps to settle any differences that might arise between employees or groups thereof or trade unions as to work to be performed by any employee or member of any union.
- I. Acceleration of Work: If in the Architect's judgment, it becomes necessary during the execution of the work to accelerate any of the work of any Contractor, the Architect can direct any contractor as follows:
 - 1. Cease work at any point and transfer men to other point or points directed and execute such portions of contracted work in advance of other parts.
 - 2. Promote the progress of any work as a whole and enable other Contractors to hasten, properly engage and carry on their work.
 - 3. Temporarily omit such portions of any work as necessary for the advancement of the work of other contractors and then go back thereafter and execute the work left out at such a time the Architect directs. All expense involved in transfer or going back must be borne by the respective contractors who are required to cease work, transfer their men and execute portions of their work in advance of other parts to promote the progress of the work as a whole.
- J. Anchor Bolts, Sleeves, Etc.: Furnish any required anchor bolts for any apparatus to be installed. Respective Contractors are to set to template those apparatus including anchor bolts, etc.
- K. Where pipes, ducts, or conduits pass through walls, floors or roof, install one inch (1") or larger sleeves than required opening, consisting of sheet metal or steel pipe. Extend sleeves flush with the inside face. Provide firestopping in all openings in fire rated walls.

1.02 FIELD ENGINEERING

- A. Grades, Lines and Levels: The Contractors verifies all grades, lines, levels, and dimensions indicated on the construction documents, and must report all inconsistencies before commencing work.

The Contractors must provide and maintain well-built batter boards at corners. Establish and safeguard benchmarks in at least two (2) widely separated places. As work progresses, establish benchmarks at each level and establish exact locations of partitions on rough floors as a guide to trades. Provide protection to preserve all benchmarks, reference points and lines and stakes. In the case of willful or careless destruction, the Contractor is charged with the resulting expense and responsibility for any mistakes that may be caused by unnecessary loss or disturbance.

- B. Verification of Level: Data on the construction documents regarding present elevation is given solely for the assistance of Contractors developing their proposals for the cost of the work. The Owner and the Architect do not guarantee the data given. Contractors are expressly directed to verify all levels by personal inspection at the site and govern themselves accordingly.
- C. Field Measurements: Each Contractor or subcontractor must obtain their own lines and grades and assume all responsibility for their accuracy. They must reconcile all measurements and conditions on the site of the proposed work.

1.03 ALTERATION PROJECT PROCEDURES

- A. Materials: As specified in product Sections; match existing products and work for patching and extending work.
- B. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
- C. Remove, cut, and patch work in a manner to minimize damage and to provide a means of restoring products and finishes to original condition.
- D. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.
- E. Where new work abuts or aligns with existing, perform a smooth and even transition. Patched work to match existing adjacent work in texture and appearance.
- F. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
- G. Where a change of plane of 1/4 inch or more occurs, submit recommendation for providing a smooth transition for Architect review.
- H. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- I. Finish surfaces as specified in individual product Sections.
- J. Sand existing floors as required to prepare them ready to receive new finish flooring/carpeting.

1.04 CUTTING AND PATCHING

- A. All Contractors must notify the other trades of the location and size of openings and/or provide sleeves for openings in construction required for their work within

sufficient time as work progresses. If notified in sufficient time and/or provided with sleeves, the Contractor shall provide openings and/or install sleeves for such openings. If the Contractor is not notified in sufficient time to provide openings or install sleeves each contractor is responsible for cutting and patching in the openings for their work.

- B. Cutting and patching shall be performed by the proper trades or crafts necessary for the material involved, but the cost of same shall be borne by the Contractor requiring the cutting and patching.
- C. Patching shall mean the restoration of a surface or item to its original condition to match the existing adjoining surfaces unless otherwise indicated, noted, detailed or specified.
 - 1. When patching involves painting, special coating, vinyl fabric or other applied finish, the entire surface affected (i.e., wall or ceiling) shall be refinished as a part of this requirement.
- D. Cutting and patching includes cleaning of all surfaces soiled by this work.
- E. Submit written request in advance of cutting or altering elements which affects structural integrity of element.
- F. Identify any hazardous substance or condition exposed during the Work to the Architect.
- G. Do not field cut metal deck with cutting torches without permission of the Architect.

1.05 PRECONSTRUCTION CONFERENCE

- A. The Architect will schedule a preconstruction conference.
- B. Attendance Required: Owner's representatives, Architect, General Contractor and all other contractors as requested by the architect.
- C. Agenda:
 - 1. Submission of list of Subcontractors for approval, list of Products for approval, schedule of values, progress schedule and critical work sequencing.
 - 2. Designation of personnel representing the parties in Contract, and the Architect.
 - 3. Relation and coordination of prime contractors.
 - 4. Submittal of shop drawings, project data and samples.
 - 5. Procedures and processing of field decisions, submittals and Change Orders.
 - 6. Scheduling.
 - 7. Use of premises by Owner and Contractor.
 - 8. Major equipment deliveries and priorities.
 - 9. Owner's requirements.
 - 10. Construction facilities and controls provided by Owner.
 - 11. Temporary utilities provided by Owner.
 - 12. Security and housekeeping procedures.
 - 13. Safety and First-Aid Procedures.
 - 14. Procedures for maintaining record documents.

1.06 PROGRESS MEETINGS

- A. The Architect shall schedule and administer progress meetings.
- B. The General Contractor and all subcontractors active on the project are required to attend progress meetings with the owner's representative and architect every week, or at more frequent intervals if conditions require same, during the entire life of the project for the purpose of expediting the work and considering other matters pertaining thereto.
- C. Architect's Duties:
 - 1. Notify contractors of regular and called meeting 4 days in advance of meeting date.
 - 2. Record minutes; include significant proceedings and decisions.
 - 3. Type and distribute minutes of meetings to the Owner and Prime Contractors.
- D. Meeting Agenda:
 - 1. Review of Work progress.
 - 2. Field observations, problems, and decisions.
 - 3. Identification of problems which impede planned progress.
 - 4. Review of submittals schedule and status of submittals.
 - 5. Review of off-site fabrication and delivery schedules.
 - 6. Maintenance of progress schedule.
 - 7. Corrective measures to regain projected schedules.
 - 8. Planned progress during succeeding work period.
 - 9. Coordination of projected progress.
 - 10. Maintenance of quality and work standards.
 - 11. Effect of proposed changes on progress schedule and coordination.
 - 12. Other business relating to Work.
- E. Location: General Contractors field office or as indicated in notice.

1.07 PREINSTALLATION CONFERENCES

- A. When required in individual specification Sections the Contractor shall schedule and coordinate a Pre-installation Conference at the work site prior to commencing work of the Section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section or as requested by the architect.
- C. Notify Architect three (3) days in advance of meeting date.
- D. Review conditions of installation, preparation and installation procedures, and coordination with related work.

END OF SECTION

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SECTION 01 3300

SUBMITTALS

1.01 GENERAL

- A. The contractors are fully responsible for and required to provide all submittals in a timely manner to avoid delaying construction. Contractors are requested to provide submittals electronically as much as possible.
- B. The Architect shall be held harmless for the contractor's failure to provide submittals, provide them in a timely manner or for their accuracy.

1.02 SUBMITTAL PROCEDURES

- A. The Contractor shall prepare, review and stamp with their approval all shop drawings and other submittals and submit them electronically whenever possible to the Architect for all products and equipment to be incorporated into the project.
- B. The Contractor shall submit all samples and other submittals that cannot be submitted electronically to the Architect for all products and equipment to be incorporated into the project.
- C. Identify Project, Contractor, Subcontractor or supplier; pertinent Drawing sheet and detail number(s), and specification Section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.
- E. Coordinate submission of related items and schedule submittals to expedite the Project.
- F. Contractor must identify on the submittals variations from the Contract Documents, specified Products or system limitations which may be detrimental to successful performance of the completed Work.
- G. Revise and resubmit submittals as required, identify all changes made since previous submittal.
- H. The contractor shall distribute copies of reviewed submittals to concerned parties and instruct parties to promptly report any inability to comply with provisions.

1.03 SUBCONTRACTOR'S LIST

- A. Each contractor submitting a prime bid shall submit a complete list of all subcontractors to be awarded contracts on the project within 24 hours of bid due date and time. The list shall list only one subcontractor for each work category. The contractor's bid may be rejected if the subcontractor's list is not submitted as requested. The successful bidder's award of subcontractor's contracts shall not deviate from the subcontractor's list as submitted unless approved by the Owner.

1.04 SCHEDULE OF VALUES

- A. Each successful bidder shall submit their Schedule of Values for approval in a format similar to AIA Form G703 - Application and Certificate for Payment Continuation Sheet within 15 days of execution of construction contract.
- B. The Schedule of Values shall be executed under provisions of Specification Section 01 2600 – Contractor Considerations, Item 1.03 "Schedule of Values".

1.05 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit to the Architect and the Owner within 10 days after date of Owner-Contractor Agreement an initial Progress Schedule.
- B. Revise and resubmit as required.
- C. Submit revised schedules with each Application for Payment, identifying changes since previous version.
- D. Submit a horizontal bar chart with separate line for each section of Work, identifying first workday of each week.
- E. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, duration and critical activities.
- F. Indicate estimated percentage of completion for each item of Work at each submission.

1.06 PROPOSED PRODUCTS LIST AND SUBMITTAL LOG

- A. Within 10 days after date of Owner-Contractor Agreement, submit a Submittal Log as well as a complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards for approval.

1.07 SHOP DRAWINGS

- A. Submit Shop Drawings for all manufactured products and all shop of field fabricated items.
- B. Shop Drawings shall mean drawings indicating in detail all pertinent information of the item being depicted.
 - 1. Advertising brochures will not be accepted as Shop Drawings.
 - 2. Erection and setting drawings and schedules are considered Shop Drawings and shall be submitted along with detailed Shop Drawings.
 - 3. Shop Drawings and schedules shall repeat the identification shown on the contract drawings; sheet number, detail number, room number and specification section and article number.
 - 4. Shop drawings shall be submitted only on sheets 8-1/2" x 11" or of a size corresponding to the construction documents.

5. Note variances from the Contract Documents. Failure to do so will void any claim by the contractor against the Owner based upon submittals being approved by the Architect.
- C. Shop Drawings, Product Data and Samples submitted to the Architect by the Contractor shall bear the Contractor's approval stamp indicating that: 1) he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents, and 2) there are no material changes or deviations from the contract documents. Failure of the contractor to accurately review Shop Drawings which results in additional review by the Architect may result in back charge to the contractor for the Architects additional review time.
 - D. Submit one copy of all submittals. The Architect will return one copy of the approved shop drawings to the Contractor and Owner. All copies submitted electronically will be returned electronically. The Architect will retain one copy. Submit shop drawings to Architect a minimum of (15) fifteen days prior to date contractor requires them back and note date that contractor requires approved Shop Drawings returned on contractor transmittal.
 - E. Architect's review of shop drawings is for design only and is subject to all conditions of the contract documents. This review is not for quantities or dimensions. The contractor is responsible for all dimensions to be confirmed and correlated at the job site; for information that pertains solely to the fabrication processes or to techniques of construction; and for coordination of the work of all trades. Any additional cost incurred by the contractor resulting from failure of the contractor to field verify dimension are solely the responsibility of the said contractor.
 - F. Architect's Drawings: Copies of the Architect's CADD drawings may be obtained from the Architect for use by the General Contractor and their direct subcontractors solely for the purpose of coordination and expediting of work for shop drawings or layout work and not for any other purpose.

1.08 PRODUCT DATA

- A. Submit product data for all manufactured items.
- B. Product data includes manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.
 1. Clearly mark each copy to identify pertinent materials, products or models and contract document identification; sheet number, detail number, room number and specification section and article number.
 2. Submit only pages, which are pertinent.
 3. Show dimensions and clearances required for maintenance and service.
 4. Show performance characteristics, capacities and reference standards.
 5. Show wiring and piping diagrams, controls and finishes.
 6. Provide manufacturer's preparation, assembly, and installation instructions.
 7. Note variances from the contract documents including manufacturer's recommended changes to sequencing and to piping and control diagrams.
 8. Supplement manufacturers' standard data to provide information unique to this Project.
- C. Submit one copy of all submittals. The Architect will return one copy each of the approved shop drawings to the Contractor and Owner. All copies submitted electronically will be returned electronically. The Architect will retain one copy. Submit shop drawings to Architect a minimum of (15) fifteen days prior to date

contractor requires them back and note date that contractor requires approved Shop Drawings return on contractor transmittal.

1.09 SAMPLES

- A. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- B. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Architect's selection.
- C. Include identification on each sample, with full Project information.
- D. Submit the number or samples specified in individual specification Sections one of which will be retained by Architect/Engineer.
- E. Reviewed samples which may be used in the Work are indicated in individual specification Sections.

1.10 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.
- B. Identify conflicts between manufacturers' instructions and Contract Documents.
- C. Architect will take no action on these submittals.

1.11 MANUFACTURER'S CERTIFICATES

- A. When specified in individual specification Sections, submit manufacturers' certificate to Architect for review, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect.
- D. Architect will take no action on these submittals.

END OF SECTION

SECTION 01 4500

QUALITY CONTROL

1.01 QUALITY ASSURANCE/CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply fully with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform work by persons qualified to produce workmanship of specified quality.
- F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.02 REFERENCES

- A. Conform to reference standard by date of issue current on date of Contract Documents.
- B. Obtain copies of standards when required by Contract Documents.
- C. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.03 FIELD SAMPLES

- A. Install field samples at the site as required by individual specifications Sections for review.
- B. Acceptable samples represent a quality level for the Work.
- C. Where field sample is specified in individual Sections to be removed, clear area after field sample has been accepted by Architect.

1.04 MOCK-UP

- A. Assemble and erect specified items, with specified attachment and anchorage devices, flashings, seals, and finishes.
- B. Where mock-up is specified in individual Sections to be removed, clear area after mock-up has been accepted by Architect.

1.05 INSPECTION AND TESTING LABORATORY SERVICES

- A. Owner will employ and pay for services of an Independent Testing Laboratory acceptable to Architect, to perform specified services and testing.
 - 1. Contractor shall cooperate with the laboratory to facilitate the execution of its required services.
 - 2. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract.
- B. The Testing Laboratory will perform inspections, tests, and other services specified in individual specification Sections and as required by the Architect.
- C. Five copies of written reports will be promptly submitted by the Testing Laboratory to the Architect, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents. Each report shall include:
 - 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 of 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.
- D. The Testing 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.
 - 3. Perform any duties of the Contractor.
- E. Contractor's Responsibilities:
 - 1. Cooperate with laboratory personnel, provide access to Work, to manufacturer's operations.
 - 2. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.
 - 3. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other material mixes which require control by the testing laboratory.
 - 4. Furnish copies of products test reports as required.
 - 5. Furnish incidental labor and facilities:
 - a. To provide access to work to be tested.
 - b. To obtain and handle samples at the Project site or at the source of the product to be tested.
 - c. To facilitate inspections and tests.
 - d. For storage and curing of test samples.

6. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.
 - a. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractors negligence.
7. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's convenience.
8. Employ and pay for the services of a separate, qualified, independent testing laboratory to perform additional inspections, sampling and testing required when initial tests indicate work does not comply with Contract Documents.

1.06 MANUFACTURERS' FIELD SERVICES AND REPORTS

- A. When specified in individual specification Sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance of equipment as applicable, and to initiate instructions when necessary.
- B. Individuals to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- C. Submit report in triplicate within 30 days of observation to Architect for review.

END OF SECTION

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SECTION 01 5000

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1.01 GENERAL

- A. The General Contractor shall be responsible for arranging for and providing all construction facilities and temporary controls as specified herein and as required for the proper and expeditious prosecution of the work unless specified otherwise. The General Contractor shall pay all costs for such facilities and controls unless otherwise specified, until date of substantial completion of project.

1.02 TEMPORARY ELECTRICITY

- A. Electric service is existing: connect to existing power service. Power consumption shall not disrupt owner's need for continuous service. Owner will pay cost of energy used. Exercise measures to conserve energy.
- B. Provide temporary power distribution at 120/240 volt, single phase, 3-wire, 60 cycle, A.C. The termination of power distribution shall be at a central location. Terminations shall be provided for each voltage supply complete with circuit breakers; disconnect switches and other devices as required to protect the existing power system. Convenience outlets for fractional horsepower tools such as saws, drills, etc., and extension cords shall be located at convenient points on each floor or in each working area in such quantity as to permit 50-foot maximum extension cords to be used. Each outlet shall have two 120 volt, 20 ampere, 3-wire grounded duplex receptacles.
- C. If subcontractors require special electric power for facilities beyond that provided for herein for such items as large pumps, welding machines, special hoists, etc., they shall arrange and pay for the installation of such facilities and arrange for the payment of any additional cost thereof.
- D. All temporary equipment and wiring for power and lighting shall be in accordance with the applicable provisions of the governing codes. All temporary wiring shall be maintained in a safe manner and utilized so as not to constitute a hazard to persons or property.
- E. When the permanent electrical power and lighting systems are in operating condition, they may be used for temporary power and lighting for construction purposes, provided that the Contractor (1) obtains the approval of the Architect, and (2) assumes full responsibility for the power and lighting systems used.

1.03 TEMPORARY LIGHTING

- A. A temporary lighting system shall be furnished, installed and maintained by the General Contractor as required to satisfy minimum requirements for safety and security. The General Contractor shall provide temporary lighting. The General Contractor shall pay all costs of energy used for temporary lighting. The Owner shall pay if connected to existing. The temporary lighting system shall afford general illumination in all building areas in which work is being performed under the Contract and shall supply not less than that required by current OSHA Standards. Subcontractors requiring higher light levels for their work must provide the additional lighting.

- B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- C. Maintain lighting and provide routine repairs.
- D. Permanent building lighting may be utilized during construction.

1.04 COLD WEATHER PROTECTION

- A. Cold Weather protection is the period of rough construction and up to the time when the work is entirely closed in.
- B. This work includes protection of all work exposed to the elements against adverse dampness and cold, by covering, enclosing, heating of materials including work under construction, and providing suitable working conditions for all persons employed on the work. This cold weather protection is provided by EACH Prime Contractor at their own expense.

1.05 TEMPORARY HEAT AND VENTILATION

- A. Temporary heat is considered the period when heat is required from the time the work is entirely enclosed until the permanent heating system is sufficiently installed and ready for operation.
- B. The General Contractor shall provide temporary heating and ventilation. The General Contractor shall pay all costs for energy used.
- C. Provide temporary heating for protection when necessary to prevent freezing within the building, to dry out the building and to provide suitable working conditions for the installation and curing of materials. A temperature of not less than 50° F., nor more than the maximum design temperatures are to be maintained throughout the building continuously twenty-four hours a day.
- D. Temporary heating shall be by smokeless portable space heaters of type approved by Underwriters' laboratories, Factory Mutual, the Fire Marshall or other governing authority, properly vented. The fuel for such heaters shall be paid for by the General Contractor. Any surfaces, interior or exterior, damaged by the use of these space heaters shall be replaced by new materials or be refinished to the satisfaction of the Architect without additional cost to the Owner. Salamanders are not permitted for temporary heat.
- E. The Mechanical Contractor must provide installation of heating equipment as soon as possible. Install connections, controls and other arrangements to permit the most effective use of the heating system, or parts thereof. The Mechanical Contractor is responsible for operating the permanent heating system for the purpose described. The General Contractor pays all costs of electric power and operation in connection therewith. Such use does not relieve the Mechanical Contractor of his responsibility to turn over the system to the Owner in perfect condition on completion of the Project, nor does it shorten the stipulated guarantee period.
- F. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and temporary filters are in place. Provide maintenance and regular replacement of filters and worn or consumed parts.

- G. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.06 TELEPHONE SERVICE

- A. The General Contractor shall provide cell phone accessibility for their onsite Project Manager.

1.07 TEMPORARY WATER SERVICE

- A. Water service is existing: connect to existing water source for construction operation. Water consumption shall not disrupt owner's need for continuous service. Owner will pay all cost of water used. Exercise measures to conserve energy.
- B. Provide potable water for drinking and construction purposes for all parts of the work. Minimum temporary water supply shall consist of one riser with a 3/4 inch hose bibb at each floor.
- C. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.
- D. It is understood that if parts of the permanent water systems are used as temporary facilities, the Contractor must (1) obtain approval of the Architect, (2) assume full responsibility for systems used, including cleaning and restoration, (3) remove all temporary facilities upon completion.

1.08 TEMPORARY SANITARY FACILITIES

- A. The General Contractor shall provide suitable and adequate temporary toilet facilities for entire work force of all contractors on site. The number and type of such facilities shall conform to labor work rules, governing codes and health requirements. Unless otherwise required, portable chemical toilets shall be serviced twice weekly, service to include emptying tanks, recharging with a germicidal and deodorizing solution and scrubbing entire interior with a germicidal solution.
- B. As soon as plumbing is installed in building, temporary fixtures may be provided and portable toilet facilities removed from the premises. The number and type of temporary fixtures connected to permanent piping shall conform to labor work rules and governmental regulations. The Contractor shall furnish and install temporary fixtures.
- C. All temporary fixtures shall be removed at completion of job and new permanent fixtures installed. All temporary and permanent toilet rooms used by workmen shall be kept in clean and sanitary condition by the General Contractor.
- D. It is understood that, if temporary toilet fixtures are used in lieu of portable units, the General Contractor must (1) obtain approval of the Architect, (2) assumes full responsibility for systems used including cleaning and restoration, (3) remove all temporary fixtures and install permanent fixtures at completion.

1.09 TEMPORARY FIRE PROTECTION

- A. The General Contractor shall prohibit all lighting of fires about the premises.
- B. Smoking and tobacco products are not allowed on the property.

- C. The General Contractor will provide the general temporary fire protection requirements. Subcontractors will be responsible for their own specialty requirements. Permanent fire protection equipment used for fire protection during construction shall be the responsibility of the installing contractor.
- D. No debris or waste materials shall be burned at the construction site.
- E. It shall be the responsibility of the General Contractor to notify the Architect in advance of the work when welding or other fire hazardous work is to be performed so that proper precautionary measures may be taken to prevent fire.
- F. Stove heaters in temporary offices and sheds shall be properly installed to protect combustible walls, floors and roof.
- G. Salamander heaters or similar forms of uncontrolled heaters shall not be used except with the special permission of the Architect and then only when each salamander is maintained under constant supervision.
- H. Gasoline shall be kept and handled from approved safety cans.

1.10 CONSTRUCTION AIDS

- A. Each Contractor and Subcontractor shall provide all their own temporary ladders, ramps, runways, stairs, scaffolding, staging, temporary enclosures, hoists, rubbish chutes, etc., as may be required for performance of the Work.
- B. All construction aids shall comply with Federal, State and local laws and regulations.
- C. Temporary Enclosures:
 - 1. The General 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 existing materials and equipment. Construction shall be of framing and plywood sheet materials and visqueen with closed joints and sealed edges at intersections with existing surfaces.
- D. Temporary Hoists: Each Contractor shall provide his own cranes, hoists, towers, and other lifting devices necessary for the proper and efficient movement of his materials. Provide operating personnel for equipment as required. Provide equipment with proper guys for bracing and other safety devices as required by Federal, Local and State codes. Remove towers and hoisting equipment when they are no longer needed, or as directed.
- E. Trash: The General Contractor will be responsible for providing trash dumpsters and/or receptacles if required. The General Contractor will be responsible for collecting and depositing his debris in such trash receptacles. The General Contractor will be responsible for coordination of trash removal. Trash and debris shall not be allowed to accumulate. Subcontractors at the direction of the General Contractor, shall collect and remove their own liquid waste and solid waste from the job site at periodic intervals so as not to hinder the overall progress of construction.

1.11 BARRIERS

- A. Each Prime Contractor shall provide and maintain required barricades, protection and warning lights in good condition until the completion of the part of the Work

requiring such protection and then remove same. Each Contractor shall be responsible for all acts and operations of his employees or subcontractors including the neglect or failure to take proper safety precautions, and for all damages to persons or property in consequence of neglect or failure to take the necessary or required precautions.

- B. All barriers shall comply with Federal, State, and local laws and regulations.
- C. The General Contractor shall limit his material and equipment storage, work preparation and management activities to area indicated on the Construction Documents, and he shall move his equipment and materials when so directed by Architect. No material or equipment shall be stored on adjoining or adjacent property.
- D. If it becomes necessary at any time during the execution of the work to move materials temporarily located and to be used in the final construction, the Contractor furnishing said materials, when so directed by the Architect, must move them or cause them to be moved. Include the cost of moving these materials in the Contract Sum for the work involved.
- E. The General Contractor shall provide a 6' high chain link temporary construction fence with gates as needed around the entire project site.

1.12 WATER CONTROL

- A. Grade site to drain. Maintain excavations free of water. Provide, operate and maintain pumping equipment and or temporary swales as may be required.
- B. Protect site from puddling or running water. Provide silt and water barriers per local codes as required to protect site from soil erosion or as required by the local government authority.

1.13 TEMPORARY CONTROLS

- A. The General Contractor shall conform to the requirements of Federal, State and local codes and authorities with regard to noise, dust, pest and pollution control.
- B. Materials and equipment shall be properly stored in accordance with the manufacturer's recommendations and in limited quantities so as not to overload the construction.
- C. Materials shall be adequately covered, protected, and secured to avoid being blown around.

1.14 TRAFFIC REGULATIONS AND TEMPORARY DRIVES

- A. The General Contractor shall be responsible for conforming to local regulations governing load limits of vehicles.
- B. The General Contractor shall be responsible for regulating his traffic around the site in accordance with local regulations including parking and flagmen.
- C. The General Contractor shall provide and maintain all necessary temporary crushed stone drives and parking areas as required for construction.

- D. All temporary drives shall be removed by the General Contractor upon project completion or as the General Contractor deems necessary.

1.15 PROTECTION OF INSTALLED WORK

- A. The installing contractor is responsible to provide protection for his/her work and shall provide special protection where specified in individual specification Sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas.

1.16 SECURITY

- A. Provide security and facilities to protect work, and existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.17 PARKING

- A. Parking areas shall be designated by the Owner or Architect.

1.18 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Remove waste materials, debris, and rubbish from site and dispose off-site.

1.19 FIELD OFFICE

- A. The General Contractor shall provide for a Field Office: weather-tight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture, drawing rack and drawing display table. Provide space for project meetings, with table and chairs to accommodate 6 persons.

1.20 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities and materials prior to Substantial Completion inspection.

- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

1.21 PROVISIONS FOR CONTRACTOR EMPLOYEES

- A. It is required that all construction employees comply with the following rules.
 - 1. Construction employees to use only their own toilet facilities.
 - 2. No employees are to eat in the occupied premises.
 - 3. There is to be no smoking within the building.
 - 4. All construction personnel will conduct themselves in an unimpeachable manner while on the construction site, including proper language, etc.
 - 5. No radios, TV's or musical instruments at site unless approved by owner.
 - 6. No drinking of alcoholic beverages.

1.22 SITE SIGNAGE

- A. Unless specified otherwise, there will be no signs posted at the job site except as called for on the drawings or in the specifications or as required by applicable codes and regulations. Placement of contractor signage shall only be allowed at the review and discretion of the Owner.

END OF SECTION

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SECTION 01 6600

PRODUCT STORAGE AND HANDLING REQUIREMENTS

1.01 PRODUCTS

- A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- C. Provide interchangeable components of the same manufacturer, for similar components.

1.02 TRANSPORTATION AND HANDLING

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.03 STORAGE AND PROTECTION

- A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.
- B. For exterior storage of fabricated products, place on sloped supports, above ground.
- C. Provide off-site storage and protection when site does not permit on-site storage or protection.
- D. Cover all products to be installed within building with impervious sheet covering. Provide ventilation to avoid condensation.
- E. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- G. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

1.04 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

- B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: For approval of products other than those specified, Bidders must submit a request in writing at least ten (10) days prior to Bid date and hour. Requests received after this time will not be reviewed or considered regardless of cause. Clearly define requests to describe the product for which approval is desired. Accompany all requests with manufacturer's literature, specifications, drawings, cuts, performance data, and list of references or other information necessary to completely describe the item. All requests must indicate in detail all deviations of proposed products from those specified. Approval by the Architect will come in the form of an Addendum to the Specifications issued to all bidders on record. The Addendum will indicate the additional products which are acceptable for this Project.

All additional costs associated with the acceptance of an alternate in order to accommodate such alternate into the design must be borne by the contractor proposing such alternate, regardless of the type of trade or construction affected.

END OF SECTION

SECTION 01 7400

CLEANING AND WASTE MANAGEMENT

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work includes: The following is required of each contractor unless otherwise specified.
 - 1. Each contractor:
 - a. Maintain premises and adjacent properties free of waste, debris and rubbish caused by construction operations.
 - b. At completion of work, or at such other times as directed by the Architect, remove all waste, debris, rubbish, tools, equipment, machinery and surplus materials. Clean all sight-exposed surfaces; leave work clean and ready for occupancy.
 - c. At the completion of his work, each Contractor must remove all his own tools, scaffoldings, and surplus materials and must leave work area "broom clean". In the case of dispute over who does the cleaning, the Owner may remove the rubbish and charge the cost to the several Contractors as the Architect determines to be just.
- B. When any work is completed and prior to final cleaning, the respective equipment manufacturers or Contractors shall carefully adjust all parts of their equipment and systems.

1.02 SAFETY REQUIREMENTS

- A. Standards: Maintain project in accordance with established safety and insurance standards.
- B. Hazards Control:
 - 1. Store volatile wastes in covered metal containers and remove from premises daily.
 - 2. Prevent accumulation of wastes which create hazardous conditions.
 - 3. Provide adequate ventilation during use of volatile or noxious substances.
- C. Conduct cleaning and disposal operations to comply with Federal, State and local anti-pollution laws.
 - 1. Rubbish and waste materials shall not be burned or buried on project site.
 - 2. Volatile wastes such as mineral spirits, oil or paint thinner shall not be disposed of into storm or sanitary drains.
 - 3. Wastes shall not be disposed of into streams or waterways.

1.03 SUBMITTALS

- A. Manufacturer's recommendations for cleaning specified products.
- B. Proposed cleaning agents for those products whose manufacturers do not recommend a cleaning agent.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Select and use all cleaning materials and equipment with care to avoid scratching, marring, defacing, staining or discoloring surfaces cleaned.
- B. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 GENERAL

- A. Execute cleaning to ensure that building(s), grounds and public properties are maintained free from accumulations of waste materials and rubbish.
- B. Wet down material and rubbish to lay dust and to prevent blowing dust.
- C. Twice weekly, during progress of work, clean site and public properties and dispose of waste materials, debris and rubbish.
- D. Provide on-site transportable cart containers for collection of waste, materials, debris and rubbish as required.
- E. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off Owner's property.
- F. Vacuum clean interior building areas when ready to receive finish painting, and continue vacuum cleaning on an as-needed basis until building is ready for Substantial Completion or occupancy.
- G. Handle materials in a controlled manner with as few handlings as possible. Materials shall not be thrown from heights.
- H. Schedule cleaning operation so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.
- I. Mechanical Contractor shall replace all filters upon final acceptance of building by Owner.

- J. Mechanical Contractor shall clean ducts, blowers and coils, if air handling units were operated during construction without proper filters or if ductwork became contaminated.

3.02 FINAL CLEANING

- A. Final cleaning shall be by General Contractor.
- B. Employ experienced workmen, or professional cleaners, for final cleaning.
- C. In preparation for Substantial Completion, or occupancy, conduct final inspection of sight-exposed interior or exterior surfaces, and of concealed spaces.
- D. Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from sight-exposed interior and exterior finished surfaces; polish surfaces so designated to shine finish.
- E. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.
- F. Broom clean paved surfaces; rake clean other surfaces on grounds.
- G. Remove snow and ice from access to building(s).
- H. Replace damaged glass, remove dirt, paint, excess putty, etc., from inside and outside of glass. Clean both sides of glass thoroughly. Take precaution not to damage glass during cleaning.
- I. Vacuum all carpeted areas and remove all stains.
- J. Mop clean all vinyl tile flooring and concrete floors to receive carpeting.
- K. Clean all vinyl and carpet type wallcoverings as required.
- L. Remove all weeds from disturbed soil caused by construction upon completion of project.

END OF SECTION

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SECTION 01 7500

STARTING AND ADJUSTING

1.01 STARTING SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or other conditions which may cause damage.
- D. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of responsible Contractors' personnel in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

1.02 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of Substantial Completion.
- B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- C. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.
- D. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at equipment location.
- E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

END OF SECTION

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SECTION 01 7700

CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 USE OF COMPLETED PORTIONS OF THE WORK

- A. Upon completion of the entire work the Owner may take over the buildings for occupancy and occupy and use same thereafter. Furthermore, if any spaces in the buildings are sufficiently completed that they can be occupied and used by the Owner in advance of completion of other unfinished work on the buildings and the Owner's occupancy or use of such spaces would not unduly interfere with the Contractor's subsequent work of the job, the Owner shall be allowed to occupy and use such space or spaces pending completion of the entire work.
- B. It shall be understood however, that the Owner's occupancy or use of such spaces in the buildings shall not constitute the Owner's acceptance of any work or materials nor to relieve the Contractor from his obligations or responsibilities under the contract.
- C. In the event the Owner occupies space or spaces in the buildings pending completion of the entire work as provided, the Contractor shall cooperate with the Owner in making available for the Owner's use such building services as heating, lighting, telephone, etc., for the space or spaces so occupied and if the equipment required to furnish such services not entirely completed at the time the Owner desires to occupy the aforesaid space or spaces the Contractor shall make every effort to complete same as soon as possible to the extent that the necessary equipment can be put into operation or use. In each case where the Owner takes over space in the buildings for occupancy or use, the Owner shall give the Contractor notice in writing of his taking over the space of spaces involved.

1.02 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect's inspection.
- B. Provide submittals to Architect that are required by governing or other authorities.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- D. Apply for and secure an occupancy certificate from the local governing body and submit to the Owner.

1.03 ADJUSTING

- A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.04 PROJECT RECORD DOCUMENTS

- A. Maintain on site, one set of the following record documents; record actual revisions to the Work:

1. Contract Drawings.
 2. Specifications.
 3. Addenda.
 4. Change Orders and other Modifications to the Contract.
 5. Reviewed shop drawings, product data, and samples.
- B. Store Record Documents separate from documents used for construction.
- C. Record information concurrent with construction progress. Progress payments will not be approved if the Record Documents are not kept current with construction.
- D. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and Modifications.
- E. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 3. Field changes of dimension and detail.
 4. Details not on original Contract Drawings.
- F. Delete Architect title block and seal from all documents.
- G. Submit one (1) set of prints to Architect with claim for final Application for Payment.
- H. The contractor shall provide Record Drawings on disc in current AutoCad format for the entire project.
- I. Contractor must maintain Record Drawings current with the construction process in order to receive monthly progress payments.

1.05 OPERATION AND MAINTENANCE DATA

- A. Submit one (1) set prior to final inspection, bound in 8-1/2 x 11 inch text pages, three D side ring capacity expansion binders with durable plastic covers. Provide an electronic copy on a flash drive as well.
- B. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.
- C. Internally subdivide the binder contents with permanent page dividers, and logically organized.

1.06 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.

- B. Deliver to Project site and place in location as directed; obtain receipt prior to final payment.

END OF SECTION

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SECTION 03 1000

CONCRETE

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Formwork, shoring, bracing, and anchorage.
- B. Concrete reinforcement and accessories.
- C. Cast-in-place concrete.
- D. Setting anchor bolts for structural steel, furnishing and placing dowels for concrete pads, ties, and housekeeping pads/bases for mechanical and electrical equipment.
- E. Cooperate with other trades in allowing them reasonable time and convenience to set sleeves, inserts and other accessories which must be in a position before concrete is placed.
- F. Furnish and install ADA conforming ramps with "detectable/tactile warning surface tile" shall be 24" in depth in lengths appropriate for the application. Tile shall be equal to cast-in-place Armor-tile, TufTile or Ada Solutions at all sidewalks meeting paved drives, at sidewalks meeting drives that lead to building entrances and at handicapped parking spaces as directed by the Architect and as shown on the drawings. Provide radius tile as shown on drawings. Coordinate locations with Architect.

1.02 QUALITY ASSURANCE

- A. Standard Specifications, listed below, latest editions, shall govern concrete work of this project, and are made a part of this Specification by reference.
 - 1. Recommended Practice for Hot Weather Concreting (ACI-305).
 - 2. Recommended Practice for Winter Concreting (ACI-306).
 - 3. Building Code Requirements for Reinforcing Concrete (ACI-318).
 - 4. Recommended Practice for Field Evaluation of Compressive Test Results of Field Concrete (ACI-214).
 - 5. Specifications for Structural Concrete for Buildings (ACI-301).
 - 6. Concrete Reinforcing Steel Institute (CRSI).
 - 7. Recommended practice for Concrete Form Work (ACI-347).
- B. ASTM Standards, (latest editions), shall apply to specified materials, as listed herein.
- C. When the outside temperature is below 40 degrees F., all work shall be in accordance with "Recommended Practice for Cold Weather Concreting," ACI 306. When the outdoor temperature is above 80 degrees F., work shall be in accordance with "Recommended Practice for Hot Weather Concreting," ACI 305.
- D. Walks and curbs on public property shall comply with all laws, rules and regulations of governmental authorities having jurisdiction over such work.

1.03 TESTS

- A. To facilitate testing, the Contractor shall:
 - 1. Furnish necessary labor to assist testing agency in obtaining and handling samples at job site.
 - 2. Advise the testing agency in advance of operations to allow for the assignment of testing personnel and testing.
- B. ASTM Standards, (latest editions), shall apply to testing and analysis of concrete.
- C. Testing laboratory shall make the following inspections and test:
 - 1. Test materials for compliance or review available test reports.
 - 2. Verify Contractor's mix designs in accordance with ACI 318.
 - 3. Perform tests on placed concrete in accordance with ACI 301 and following:
 - a. Perform compression strength test for each 100 cubic yards of concrete, or fraction thereof on specimens taken at point of a discharge from the truck immediately before placing. Make a minimum of one strength test for concrete placed in one day. A set of specimens for a test shall consist of three standard 6 x 12 cylinders. Test one cylinder at 7 days and two cylinders at 28 days. The set of cylinders shall be picked up 24 hours after casting and shall be delivered to testing laboratory for further curing and for testing.
 - b. Three additional concrete cylinders shall be made during a placement, which requires temporary heating. These cylinders shall be left in the enclosure in same environment as concrete placed. One cylinder shall be tested at 3 days, one at 7 days and the third at 28 days to verify adequacy of temporary heating system.
 - c. Perform slump tests in accordance with ASTM C143. Furnish slump cone at the site. Perform a minimum of one slump test for each strength test.
 - d. Test of air content for normal weight concrete in accordance with ASTM C 173, or ASTM C 231. Furnish and maintain equipment for testing air content at the site. Perform a minimum of one air content test for each strength test.
- D. If foregoing tests indicate concrete strength below that required or visual defects indicate concrete of poor quality has been placed, additional tests shall be made and concrete repaired as directed by the Architect at the expense of the Contractor.

1.04 SUBMITTALS

- A. Submit shop drawings of reinforcing steel under provisions of Division 1.
- B. Indicate reinforcement sizes, spacings, locations and quantities of reinforcing steel, and wire fabric, bending and cutting schedules, splicing, and supporting and spacing devices. Conforming to "Manual of Standard Practice for Detailing Reinforced Concrete Structures", ACI 318.
- C. Submit Manufacturer's Literature: Material description and application or installation instructions for forming compound, curing compound, vapor barrier, grout, floor hardener, and sealer.

- D. Submit for every truckload of transit mixed concrete the manufacturer's delivery receipt. Receipt to include the following:
1. Customer's name.
 2. Customer's order, job no.
 3. Ticket no.
 4. Job name and address.
 5. Date.
 6. Truck no.
 7. Times, loaded, arrived, emptied.
 8. Slump.
 9. Quantity.
 10. Mix no.
 11. Description.
 12. Yards ordered.
 13. Yards shipped.
 14. Identify concrete test cylinders by serial number.
- E. Submit concrete mix data

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver, handle and store material at the job site in such a manner as to prevent damage. Packaged material shall be in original containers with seals unbroken and labels intact until time of use. Wrapped or bundled material shall bear the name of the manufacturer and the product. All damaged or otherwise unsuitable material when so ascertained shall be immediately removed from the job site.
- B. Properly label all bars with weatherproof tags to facilitate identification.
- C. Store reinforcing steel on supports above ground level. Keep covered with tarpaulins if there is any delay in use.

PART 2 PRODUCTS

2.01 FORM MATERIALS

- A. Conform to ACI 301.
- B. Plywood Forms: Douglas Fir species; solid one side; sound undamaged sheets with inconspicuous joints. Use on unfinished surfaces.
- C. Lumber: #2 common lumber, tongue and groove, min. 3/4" thickness. Use on surfaces to be backfilled.
- D. Steel Forms: Stiffened to support weight of concrete with minimum deflection and present a smooth surface and not discolor concrete. Use on unfinished surface.
- E. Tubular Column Type: Round, spirally wound laminated fiber material; inside surface treated with release agent.
- F. Form Ties: Removable or Snap-off metal. Ties shall not be closer than 1" from the surface of the concrete or leave a hole greater than 1" in diameter on the face of the concrete.
- G. Form Oil: Non-staining and subject to approval.

2.02 REINFORCING STEEL

- A. Reinforcing Steel: ASTM A615, 60 KSI yield grade billet steel deformed bars; uncoated finish.
- B. Welded Steel Wire Fabric: Plain type, ANSI/ASTM A185; in flat sheets; uncoated finish.
- C. Bar Accessories: Provide bar supports and other accessories necessary to hold bars in proper position while concrete is being placed.

2.03 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150 for normal Portland cement Type 1, and high early strength Portland cement Type III, if approved by Architect. Use the same brand of Portland cement throughout the entire job unless a change is authorized in writing.
- B. Fly Ash: ASTM C 350.
- C. Air-Entraining Portland Cement: ASTM C 260.
For normal air-entraining - Type 1A
For high-early strength - Type IIIA
- D. Aggregate: ASTM C 33, for use in stone concrete, except as specified below:
 - 1. All aggregates when subjected to the magnesium sulfate soundness tests (ASTM C 88) shall not lose more than 15% by weight.
 - 2. Fine Aggregate: Shall be either natural or artificial hard, clean sand and when tested by laboratory sieves shall meet the following requirements:

<u>Sieve Size</u> (Cumulative)	<u>Percent Retained</u>
No. 4	0 to 5
No. 8	10 to 20
No. 16	20 to 40
No. 30	40 to 70
No. 50	70 to 80
No. 100	92 to 98

The fineness modulus shall vary between 2-1/2 and 3.

- 3. Course Aggregate: Crushed stone or gravel, having clean, hard uncoated particles and when tested by laboratory sieves shall meet the following requirements:
 - a. Maximum size 1-1/2" for footings, slabs on fill and reinforced slabs of 8" or greater thickness.

<u>Sieve Size</u> (Cumulative)	<u>Percent Passing</u>
1-1/2"	95 to 100
3/4"	35 to 70
3/8"	10 to 30

- b. Maximum size 3/4" for all other concrete. Aggregates used in Foundation walls, retaining walls, Spandrel Beams, to be sand blasted shall be Gap Graded.
- 4. Aggregates used in Architectural concrete shall come from the same source throughout the job, unless a change is approved in writing.
- E. Mixing Water: Clean, free from oils or other injurious materials and subject to approval.
- F. Furnish the manufacturer's certificates of mill tests for all cement.

2.04 ADMIXTURES

- A. Air-Entrainment Admixture: ASTM C260. Air-Entraining agents to be added to normal Portland cement or to air-entraining Portland cement which do not meet requirements specified for air content shall be subject to approval and shall not appear at the job site or at the batching plant until approval in writing has been given.
- B. Integral Waterproofing Agents: ASTM C494. Water proofing agents and other admixtures used to produce a better workability and density of concrete shall be the product of a reputable manufacturer used in strict accordance with the manufacturer's directions and shall be subject to approval.
- C. Water Vapor Reducing Admixture: For all new interior concrete slabs on grade provide concrete with one of the following approved products with a lifetime warranty:
 - a. Vapor Lock 20/20 admixture manufactured by Specialty Products Group
 - b. Barrier One High Performance Admixture manufactured by Barrier One, Inc.
 - c. "ISELogik Industries, MVRA900.
 - d. BONEdry Pro Admix manufactured by Bone Dry Products.
 - e. Or approved equal products offered by Concure or Moxie International.

2.05 ACCESSORIES

- A. "Detectable/tactile warning surface tile" shall be 24" in depth in lengths appropriate for the application. Tile shall be cast-in-place Armor-tile, TufTile or Ada Solutions and shall be cut as required to create segmented radii's as shown on drawings.
- B. Bonding Agent: Film-forming, freeze-thaw resistant compound suitable for brush or spray application. Epoxy type, 100 percent solids "Euco Epoxy #452 (dry surface), #460 (dry or damp surface)", (The Euclid Chemical Company); "Sikadur Hi-Mod Mortar" (dry or damp surface), (Sika Chemical Co.) or approved equal.
- C. Patching and Surfacing Compound: Epoxy type, 100 percent solids, "Euco Epoxy #452 Mortar" (dry surface), #460 Mortar" (dry or damp surface), (The Euclid Chemical Company); "Sikadur Lo-Mod Mortar" (dry or damp surface), (Sika Chemical Co.) or approved equal.

D. Non-Shrink Pre-Mixed Grout:

1. Metallic Type: "Firmix" (The Euclid Chemical Company); "Masterflow 713" (Master Builders); "Ferrolith G-NC" (Sonneborn-Contech) or approved equal.
2. Non-Metallic Type: "Euco N-S Grout" (The Euclid Chemical Company); "SonogROUT" (Sonneborn-Contech) or approved equal.

E. Floor Sealer: Sonneborn Son-o-sil: except under floors scheduled for terrazzo will be wet cured.

F. Anti-spalling Compound: "Euco Linseed Oil Compound" (Euclid Chemical Co.).

G. Vapor Barrier: Per specification 07 2616 Below Grade Vapor Retarders

H. Hardener: Exposed concrete floors only, apply "Lapidolith" (L. Sonneborn Sons, Inc.) or approved equal, in not less than 3 coats in strict accordance with manufacturer's specifications. Furnish manufacturer's standard bonded guarantee that the floors will be hard and dustproof.

I. Form Release Agent: Colorless material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete.

J. Integral Concrete Color Pigment: Goodtake Concrete & Cement Color Pigment – Iron Oxide Powder.

2.06 JOINTS

A. Construction Joints

1. Locate and install construction joints, which are not shown on the Drawings, so as not to impair the strength and appearance of the structure, as acceptable to the Architect.
2. Place construction joints at the end of all pours and at locations where placement operations are stopped for a period of more than 1/2 hour, except where such pours terminate at expansion joints.
3. Construct joints as shown, or if not shown, use standard metal keyway section form.
4. Provide keyways at least 1-1/2" deep in all construction joints in walls and between walls and footings.
5. Place construction joints perpendicular to the main reinforcement. Continue all reinforcement across construction joints.
6. Locate construction joints in interior slabs-on-ground, so as to divide the slab into areas not in excess of 1000 sq. ft. (maximum distance of 40 ft. in any direction), unless otherwise accepted by the Architect. Conform to slab placement diagrams or pattern layout for placement. Locations of all construction joints in slabs on ground must be approved by the Architect.

B. Expansion Joints

1. Expansion Joint Filler: Semi-rigid, closed-cell polypropylene foam equal to Nomaflex ASTM D 8139.
2. Provide expansion joints abutting concrete curbs (except in integral walk and curb), catch basins, manholes, inlets, structures and other fixed objects.

3. Set and secure continuous expansion joint strips where edge of slab abuts vertical surfaces.
 4. Locate expansion joints at 30' o.c. for walks and curbs, unless otherwise shown.
 5. Extend joint fillers full-width and depth of joint, flush with finished surface. Furnish joint fillers in one-piece lengths for the full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together. Form top edge of filler to conform to top profile of concrete.
 6. After concrete has set grind down expansion joint material in order to caulk. Caulk all expansion joints with polyurethane sealant.
- C. Control Joints in Exterior Slabs on Ground and Walks
1. Provide control joints in slabs on ground to form panels or patterns as shown or as approved by the Architect.
 2. Form control joints with steel trowel to a depth of 1".
 3. All control joint configurations must be approved by the Architect.
- D. Control Joints in Interior Slabs on Grade
1. Control joints shall be produced by saw cuts 1" deep using power cutter as soon as concrete has cured sufficiently to carry the machine weight.
 2. Locations of all control joints shall conform to drawings and/or must be approved by the Architect.

2.07 CONCRETE MIX

- A. Mix concrete in accordance with ASTM C94 and ACI 211. Concrete mixing, measuring and delivery equipment shall be certified by the National Ready Mixed Concrete Association. Methods shall be subject to Architect's approval and in accordance with ACI 304:
1. Site-Mixed Concrete: Used only if specifically approved by Architect.
- B. Furnish Architect with copy of mixing order for every delivery of concrete to job site.
- C. The concrete shall be adjusted to produce the required rate of hardening for varied climatic and job site conditions.
- D. Concrete:
1. All concrete other than interior slabs shall be six (6) bag cement mix with a minimum compressive strength of 4000 psi in 28 days. Interior slabs shall be five (5) bag cement mix with minimum compressive strength of 3000 psi in 28 days. All exterior concrete poured after October 1st and before April 1st shall be 7 bag cement mix with a minimum compressive strength of 5000 psi in 28 days.
 2. Slump: 4"-6"
 3. The Architect or testing laboratory shall have the right to reject any concrete which arrives at job site in excess of specified slump. No water shall be added to design mix unless approved by the architect. Slump shall be determined in accordance with ASTM 143.

- E. High-early-strength concrete: may be used for any portion of the work but only with prior written approval. The 7-day compressive strength of this type of concrete shall be at least equal to the minimum 20-day compressive strength of standard concrete made with normal Portland cement as specified herein. All provisions of these specifications except for curing shall be applicable to such concrete.
- F. Add air entraining agent to mix for concrete exposed to freeze-thaw cycling. Total air content shall be 6 percent plus or minus 1 percent.

PART 3 EXECUTION

3.01 FORMWORK ERECTION

- A. The design, engineering and construction of the formwork shall be the responsibility of the Contractor and shall be done in accordance with ACI 347.
- B. Forms shall conform to shape, lines and dimensions shown on the Drawings, be designed to resist the pressure and weight of the concrete, be properly tied and braced or shored so as to maintain position and shape and be sufficiently tight to prevent leakage of mortar. Forms shall be designed and constructed to facilitate easy removal without damage to exposed surfaces, and to provide smooth concrete surfaces free of off-sets.
- C. Before reinforcing steel is set, wood forms shall be coated with an approved non-staining form oil, or wet with water (except in freezing weather). Metal forms shall be coated with approved non-staining rust preventive form oil. Stained forms shall not be used.
- D. Provide temporary openings to facilitate cleaning and inspection immediately before depositing concrete.
- E. Place bulkheads where end of days' work requires a joint in a wall or a beam. Reinforcing steel shall extend through the bulkhead. All joints shall be keyed for 1/2 of the member thickness unless otherwise directed. Location of bulkheads shall be as approved by the Architect.
- F. Positive means of adjustment (wedges or jacks) of shores and struts shall be provided and all settlement shall be taken up during concrete placing operations. Brace securely against lateral deflections.
- G. Do not apply form release agent to reinforcing steel or where concrete surfaces receive special finishes or applied coatings which may be affected by agent.
- H. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
- I. Removal of forms and shoring shall be accordance with ACI 318.

3.02 REINFORCEMENT

- A. It is the contractor's responsibility to provide proper clearances between the steel reinforcing and the concrete forms for proper placement of concrete and coverage of the steel. The absolute minimum clearance is 1½". If the contractor feels that it is too difficult to accomplish this within the specified sizes of concrete piers, footings, walls, etc. they have at their discretion, upon approval of the Architect, to increase the size of the formwork.**

- B. Place reinforcement according to the approved placement drawings. Use sufficient bar supports, ties, anchors and other accessories to hold all bars securely in place.
- C. Reinforcing steel shall be cleaned of oil, grease, scale, rust, or other coatings which may impair the bond.
- D. Welded wire fabric reinforcement shall conform to ASTM A185. Fabric reinforcement shall have end and side laps of one mesh and wired together.
- E. Reinforcements shall be adjusted to fit the sleeves, inserts and openings, using additional bars where required around openings.
- F. Place, support, and secure reinforcement against displacement. Provide additional reinforcement at construction joints.
- G. Do not place concrete until the reinforcement has been approved by the Architect.

3.03 PLACING CONCRETE

- A. Notify Architect minimum 24 hours prior to completion of formwork and reinforcing steel to allow for visual observation of formwork and reinforcing.
- B. Contractor is subject to hourly back charges from the Architect if the formwork and reinforcing is not complete and ready for visual observation or is in substantial non-conformance with the contract documents causing additional visits to the project site by the Architect.
- C. Install vapor barrier under interior floor slabs on fill. Lap joints minimum 6 inches. Do not disturb vapor barrier while placing reinforcement.
- D. Placing Concrete: Place immediately after mixing, and in no case more than 45 minutes after water has been added. Deposit in uniform, horizontal layers not more than 24" deep, work around all reinforcing and in corners of the forms. Properly spade and puddle by the use of rods, shovels and hand spades, and agitate by means of internal and external vibrations to obtain the densest possible concrete.
- E. All concrete work which does not conform to the requirements of the Contract Documents, including strength, tolerances and finishing, shall be corrected as directed by the Architect at the Contractor's expense, without extension of time therefore. The Contractor shall also be responsible for the cost of corrections to any other part of the work affected by or resulting from corrections to the concrete work.
- F. Concrete shall not be placed until the forms and reinforcing for the whole unit to be placed have been completed, cleaned and approved by the Architect. No reinforcing shall be "floated into position". The formwork shall be free from debris, ice, snow and water. Concrete shall not be placed on frozen ground.
- G. Chutes: Use chutes for placing concrete with a drop of more than 5 ft. Continue depositing of concrete until the completion of the section or unit and in no case suspend the pouring of a section, once started, for more than 30 minutes.
- H. When placing slab concrete from buggies: dump concrete into face of concrete in place.

- I. When placing concrete in top of narrow form: discharge concrete into hopper and feed into flexible drop chute.
- J. Roughen, clean, and moisten construction joints before placing concrete. Apply bonding compound and place new concrete after bonding compound becomes tacky.
- K. Construct thickened concrete pads to support non-load bearing partitions.

3.04 FLOOR SLABS

- A. Place floor slabs in checkerboard pattern, indicated on Drawings.
- B. Separate exterior slabs on fill from vertical surfaces with joint filler. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface.
- C. Pitch floors to floor drains in smooth flat planes from walls and high points to drains and as shown on the drawings. Floors which do not pitch positively to drains through the space shall be rejected, i.e. small circular troweled recesses directly around floor drains are not acceptable.
- D. Finish surfaces as scheduled.
- E. Treat curbs and walks with two coats of Anti-Spalling compound hereinbefore specified.

3.05 TOLERANCES

- A. Provide tolerance to floor slabs according to ACI 301. Pitch to drains 1/4" per foot nominal.

3.06 SCHEDULE OF FINISHES

A.	Interior:	Finish	Hardener	Sealer
	Exposed Concrete - Slabs	Hard Trowel	Yes	Yes
	Below Resilient Floor, Carpet, Painted	Hard Trowel	No	No
B.	Exterior	Finish	Hardener	Sealer
	Walks	Brush Finish	No	Yes
	Curbs and Stairs	Float Finish	No	Yes

3.07 FINISHES

- A. Screeding: All slabs shall be struck off with a template worked off forms, screed strips or pipe, accurately set by instrument grade. Unless otherwise indicated, slabs shall be finished level to a tolerance not to exceed + 1/8" in ten feet (10'). Slabs to be crowned, cambered, or sloped to drains shall be finished with comparable precision. Templates used to strike off air-entrained concrete shall be metal, or metal shod, to prevent tearing off the surface. Light moistening of the concrete surface will be permitted only with air-entrained concrete to facilitate operation of finishing tools.
- B. Floating: One floating, closing all holes in the surface, will be considered sufficient where concrete is held down below finish floor level. Directly after screeding, while

concrete is still plastic, slab surfaces shall be floated with wood, cork, or Kelly Float. High spots shall be cut down and low areas filled to produce a true grade with sufficient mortar brought to top for a final finish; overworking shall be avoided. Free water bleeding to surface during floating and after floating shall be removed before any finishing operations are continued.

- C. Float Finish: Second swirl floating after surface has partially hardened. Surface shall have coarse sandy texture but free of conspicuous welts and ridges. Tool joints on edges.
- D. Hard Trowel Finish: The initial troweling shall be delayed as long as practical to avoid troweling while concrete is too soft. All water sheet shall have disappeared from surface; dry cement and sand shall not be used to take up surface moisture. The first troweling shall be just sufficient to produce a smooth surface. Final troweling shall be done with a tilted trowel and heavy pressure after concrete has become hard enough to give a ringing sound under the trowel and shall produce a smooth, plane surface (unless cambered) free of defect. Troweling shall be accomplished with a mechanical trowel except in areas inaccessible to such tools where hand troweling shall be used.
- E. Brush Finish: Following outlines for hard trowel finish, areas so scheduled shall have surface lightly brushed each direction using a fine soft bristled brush.
- F. Tie holes shall be filled and pour joints, voids, honeycomb and other defective areas shall be patched in all formed concrete. All projections shall be removed, damages repaired and offsets leveled. Patching shall be done soon after forms are removed.

3.08 CURING AND PROTECTION

- A. Cure and Protect Concrete in Accordance with ACI 301
- B. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperature and maintain without drying at a relatively constant temperature for a period of time necessary for hydration of cement and proper hardening.
 - 1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting; keep continuously moist for not less than 72 hours.
 - 2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days and in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
- C. Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by membrane-forming curing, and by combinations thereof, as herein specified.
 - 1. Provide moisture curing by following methods:
 - a. Keep concrete surface continuously wet by covering with water.
 - b. Continuous water-fog spray.
 - c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges with 4" lap over adjacent absorptive covers.

2. Provide moisture-cover curing as follows:
 - a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Provide membrane curing to slabs as follows:
 - a. Apply membrane-forming curing compound to concrete surfaces as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas, which are subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - b. Do not use membrane curing compounds on surfaces which are to receive concrete overlays and/or additional toppings.

END OF SECTION

SECTION 03 4113

PRECAST CONCRETE HOLLOW CORE ROOF SLABS

PART 1 GENERAL

1.01 DESCRIPTION

- A. Workmanship quality shall be in accordance with Industry Standards as set forth by the Prestressed Concrete Institute.
- B. Scope - furnish and install precast concrete roof slabs equal to Strescore and as shown on the drawings. Include caulking between slab edges and perimeter.
- C. Reinforcing shall be provided in the top portion of the slabs to limit the overall camber of the slabs to 1/2" maximum.
- D. Provide all steel hangers for openings.

1.02 QUALITY ASSURANCE

- A. Acceptable Manufacturer: The Strescore Co., Inc. or approved equal.
- B. Design Basis: American Concrete Institute "Building Code Requirements for Reinforced Concrete" (ACI 318) and PCI Design Handbook, current edition.
- C. Manufacturing and testing shall be in accordance with Pre-stressed Concrete Institute requirements.

1.03 SUBMITTALS

- A. Shop drawings shall show setting plan, reinforcement, slab designation, design loads, connection details and all openings.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Portland Cement: ASTM C150.
- B. Aggregates: normal weight: ASTM C33.
- C. Minimum compressive strength:
 - 1. At transfer of pre-stress, obtain 3500 p.s.i.
 - 2. At 28 days of curing, obtain 5000 p.s.i.
- D. Reinforcement:
 - 1. Wire - ASTM A-416 grade 250K or 270K.
 - 2. Bars - ASTM A-615 grade 40 or 60.
- E. Bearing Strips:
 - 1. Tempered hardboard masonite.
 - 2. Plastic Korolath.

F. Grout: Install 1:3 cement grout at keyways.

3.01 ERECTION

A. Set bearing strips where required.

B. Set slabs level and square keeping units tight and at right angles to bearing walls.

C. Bend rods extending from grout key down into concrete block cells and grout in place.

D. Cooperate with other trades permitting insertion of anchors, hangers, electrical outlets, etc.

E. Weld slabs to supporting steel as shown on Plan as required.

3.02 CLEANING

A. Neatly and fully finish and remove all surplus material and rubbish attributed to this work.

END OF SECTION

SECTION 04 0513

MASONRY MORTARING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Mortar for masonry.

1.02 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 1.
- B. Store and protect products under provisions of Division 1.
- C. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.03 ENVIRONMENTAL REQUIREMENTS

- A. Cold Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

1.04 QUALITY ASSURANCE

- A. Comply with ASTM C270, proportion specifications.
- B. All mortar shall be tested in accordance with UBC Standard 24-22.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Portland Cement: ASTM C150, Type I.
- B. Masonry Cement: ASTM C91.
- C. Hydrated Lime: ASTM C207.
- D. Quicklime: ASTM C5, non-hydraulic type.
- E. Sand: ASTM C144, Clean, free from soluble salts and organic matter, graded from fine to coarse, compatible with the thickness of joints in which used.
- F. Water: Clean and potable.

2.02 ADMIXTURES

- A. Do not use admixtures of any kind or type without the written approval of the Architect.

2.03 MORTAR MIXES

- A. Mortar for Load Bearing Walls and Partitions: ASTM C270, Type S, utilizing the Proportion Method to achieve 1800 psi strength in 28 days.
- B. Mortar for Non-load Bearing Walls and Partitions: ASTM C270, Type N, utilizing the Proportion Method to achieve 750 psi strength in 28 days.

2.04 MORTAR MIXING

- A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270.
- B. Do not use anti-freeze compounds to lower the freezing point of mortar.
- C. If water is lost by evaporation, retemper only within two hours of mixing.
- D. Use mortar within two hours after mixing at temperatures of 80 degrees F, or two-and-one-half hours at temperatures under 50 degrees F.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install mortar in accordance with ASTM C780.

END OF SECTION

UNIT MASONRY SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete masonry units.
- B. Reinforcement, anchorage, and accessories.
- C. Flashing.
- D. Thermal Air/Water Barrier Wall Systems.

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Section 05 1200 - Structural Steel: Placement of anchor bolts, setting plates and bearing plates set in masonry. Steel lintels built into masonry work, which do not require bearing plates.
- B. Section 07 6200 - Flashing and Sheet Metal: Placement of reglets for flashings.
- C. Section 07 5423 – Thermoplastic Sheet Roofing: Fully adhered. Placement of flashing devices.

1.03 QUALITY ASSURANCE

- A. Wall Construction: It is the intent of this Contract that all masonry work, shall be sound, straight, true and first class and complete in every respect.
- B. Contractor shall warrant the exterior walls to be free from leakage due to any natural cause for a period of one year from date of final payment of the work, and he shall within such period, at his own expense, upon written notification by the Architect, pursue such approved remedial measures as may be necessary to correct any conditions of leakage and damage incident thereto that may develop. The Contractor in signing this contract, accepts the above conditions. In so doing he also agrees either that the materials and methods specified herein are such as to insure the results to be as required or that he will, at no expense to the Owner, furnish such additional or alternative items of labor and materials (or both) as may be necessary to accomplish the stated intent of the Contract, provided that no deviation from the specified and approved materials and methods shall be undertaken without the prior approval of the Architect.

1.04 SUBMITTALS

- A. Submit product information for all masonry reinforcement and accessories.
- B. Submit mortar product information and test results.
- C. Submit CMU product information and test results.
- D. Submit samples of face brick units to illustrate color, texture and extremes of color range.

1.05 QUALIFICATIONS

- A. Installer: Company specializing in performing the work of this Section with minimum 5 years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 1.
- B. Store and protect products under provisions of Division 1.
- C. Accept units on site. Inspect for damage.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Cold Weather Requirements: IMIAC - Recommended Practices and Specifications for Cold Weather Masonry Construction.

1.08 SEQUENCING AND SCHEDULING

- A. Coordinate work under provisions of Division 1.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Hollow Load Bearing Block Units: ASTM C90, Grade N, Type I - Moisture Controlled; normal weight.
- B. Solid Load Bearing Block Units: ASTM C145, Grade N, Type I - Moisture Controlled; normal weight.
- C. Structural Glazed Tile Units: ASTM C126
- D. Hollow Non-Load Bearing Block Units: ASTM C129, Type I - Moisture Controlled; normal weight.
- E. Concrete Brick Units: ANSI/ASTM C55, Grade N, Type I - Moisture Controlled; normal weight of same Grade, Type, and Weight as block units.
- E. Masonry Units: Nominal modular size of 8" x 16" face dimensions in thickness as called for on the plans. Provide special units for 90 degree corners, bond beams, lintels and bullnosed corners.
- G. All concrete masonry units shall be manufactured in the same plant.
- H. All exposed corners and window sills of concrete block units shall be manufactured "bullnose" type. Grinding of corners will not be acceptable.
- I. All exterior concrete masonry shall be painted concrete block color by Architect.

2.02 REINFORCEMENT AND ANCHORAGE

- A. Single Wythe Joint Reinforcement: Ladder type; cold-drawn steel hot-dip galvanized after fabrication, No. 9 gauge side rods with No. 9 gauge cross ties; manufactured by "Dur-O-Wall" or approved equal; in widths suitable to wall thickness laid in every second block course or 16" o.c. vertically.
- B. Multiple Wythe Joint Reinforcement: Rectangular Adjustable Duro-O-Wall - Ladur-Eyes hot dip galvanized after fabrication, No. 9 gauge side rods; No. 9 gauge cross ties.
- C. Reinforcing Steel: ASTM A615, 60 ksi yield grade, deformed billet bars, unprotected finish.
- D. Rigid steel strap anchors shall not be less than 1-1/4" x 3/16" with ends turned up not less than 2".
- E. Dovetail-type anchors or wire ties, for use in embedded slots or inserts, shall be galvanized and shall not be less than 16 gauge for anchors, and not less than 9 gauge for wire ties.

2.03 FLASHINGS

- A. IPCO Wall Flashing: Self sticking rubberized asphalt laminate with polyethylene with pre-manufactured end dams.

2.04 ACCESSORIES

- A. Preformed Control Joints: Rubber material conforming to ASTM D2000 2AA805 and of Durometer 80 when tested according to ASTM C2240. Provide with corner and tee accessories and fused joints.
- B. Joint Filler: Closed cell rubber; oversized 50 percent to joint width; self-expanding.
- C. Mortar Net: Install mortar net of appropriate depth to fill air space above all through wall flashings.
- D. Weep Vents: Hohmann & Barnard QV – Quadro-Vent
- E. Cleaning Solutions: Non-acidic, not harmful to masonry work or adjacent materials.

2.05 THERMAL AIR/WATER BARRIER WALL SYSTEM

- A. Masonry Veneer on CMU Walls: Cavity Wall Insulation System shall be Ultra Wall System - Dow Styrofoam Brand Ultra CM insulation in sizes as shown on the plans or approved equal and shall serve as a moisture barrier system and masonry veneer anchoring system as well.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Verify items provided by other Sections of work are properly sized and located.

- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.
- D. Beginning of installation means installer accepts existing conditions.

3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied to other Sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Lay concrete masonry units in running bond. Course one unit and one mortar joint to equal 8 inches. Form concave mortar joints.

3.04 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.
- D. Remove excess mortar as Work progresses.
- E. Interlock intersections and external corners.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform jobsite cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- I. Isolate masonry partitions from vertical structural framing members with a control joint.
- J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.
- K. Fill cores or cells of concrete blocks with concrete or cement grout, under structural bearing points. When not otherwise called for, fill cells of concrete block for three courses below and two block courses wide under all concentrated structural loads.
- L. The tops of walls and partitions shall be covered at the end of each day's work, using waterproof reinforced paper or canvas weighted down.

3.05 WEEPS AND VENTS

- A. Install weep vents in veneer at 24 inches on center horizontally, above through-wall flashing, above shelf angles and at bottom and tops of walls.

3.06 CAVITY WALL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep holes.
- B. Build inner wythe ahead of outer wythe to receive cavity insulation and air/vapor barrier adhesive.
- C. Install board insulation in cavity walls horizontally between wall reinforcement.
- D. Seal all horizontal and vertical joints in insulation with foam board adhesive.

3.07 REINFORCEMENT AND ANCHORAGES

- A. Install horizontal joint reinforcement 16 inches o.c. vertically.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 24 inches each side of opening.
- C. Place joint reinforcement continuous in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches. Extend minimum 16 inches each side of openings.
- E. Embed wall ties in masonry back-up for bonding veneer at maximum 16 inches oc vertically and 16 inches oc horizontally. Place at maximum 3 inches oc each way around perimeter of openings, within 12 inches of openings.
- F. Secure wall ties to stud framed back-up and embed into masonry veneer at maximum 16 inches oc vertically and 16 inches oc horizontally. Place at maximum 3 oc each way around perimeter of openings, within 12 inches of openings.
- G. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.

3.08 MASONRY FLASHINGS

- A. Install flashing over all steel lintels for openings in exterior walls of building. Install flashing under all masonry and stone sills.
- B. Extend flashings under or through veneer, turn up minimum 8 inches through wall. Seal to concrete and seal to sheathing over framed back-up.
- C. Lap end joints minimum 6 inches and seal watertight. Use flashing manufacturer's recommended adhesive and sealer.
- D. Turn ends of flashing up and seal at lintels and window sills.

3.09 LINTELS

- A. Install lintels over window openings, door openings, duct openings and other openings as indicated on the Drawings.
- B. Maintain minimum 4 inch bearing on each side of opening.

3.10 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control and expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Size control joint in accordance with Section 07 9200 for sealant performance.
- D. Form expansion joint as detailed on the Drawings.
- E. Caulk control and expansion joints as per Section 07 9200.
- F. Contractor shall install expansion joints in exterior walls at a minimum of 30'-0" o.c. or as shown on the drawings in accordance with accepted masonry guidelines and practices and approved by the Architect or as detailed on the drawings.

3.11 BUILT-IN WORK

- A. As work progresses, build in metal door and glazed frames, fabricated metal frames, wood nailing strips, anchor bolts, bearing plates, miscellaneous steel and all other items furnished by other Sections.
- B. Build in all steel lintels not requiring steel bearing plates. Steel lintels furnished under Section 05 1200.
- C. Build in items plumb and level or as required for proper bearing.
- D. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- E. Do not build in organic materials subject to deterioration.
- F. Build in flashing at junction of roofs and vertical surfaces as indicated. Flashings shall penetrate masonry walls not less than 1-1/2".

3.12 TOLERANCES

- A. All work shall be laid plumb, level and true. The work shall be properly conducted for keeping the tools and mortar boards and other equipment in good order and free from unnecessary accumulation of mortar. The work shall be maintained level all around the building as far as practicable, but where necessary to run up part of the working advance of the remainder the courses shall be racked back; toothing will not be permitted.

1. The following specific requirements shall be closely followed:

- a. All masonry shall be laid up in workmanlike manner in conformance with the best standards. Bed joints shall be properly filled to provide bearing to utilize the full structural value of each unit and with full head joints.
- b. Unless otherwise shown or specified, all brick facing and blockwork shall be laid up in standard running bond.
- c. Except as otherwise specified, all masonry facing shall be bonded to back-up with wire mesh reinforcing.
- d. Where indicated and where required, provide chases for pipes and conduits and grooves or reglets to receive flashing.

3.13 CUTTING AND FITTING

- A. Cut and fit for chases, pipes, conduit, sleeves and grounds. Coordinate with other Sections of work to provide correct size, shape, and location.
- B. Obtain Architect approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.14 CLEANING AND CAULKING

- A. Clean work area under provisions of Division 1.
- B. Remove excess mortar and mortar smears.
- C. Replace defective mortar. Match adjacent work.
- D. Provide caulking as per Section 07 9200 as required to insure weather tightness where exterior masonry joins with other building materials.
- E. Clean soiled surfaces with cleaning solution.
- F. Use non-metallic tools in cleaning operations.

3.15 PROTECTION OF FINISHED WORK

- A. Protect finished installation under provisions of Division 1.
- B. Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

END OF SECTION

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SECTION 05 1200

STRUCTURAL STEEL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. All structural steel normally falling under definition of structural steel as set forth in latest edition of AISC Code of Standard Practice.
- B. All steel items reasonably implied but not specifically mentioned on Drawings or specified herein to render work secure and complete. This includes all connections and erection accessories.

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Anchor bolts, setting plates and bearing plates set in concrete or masonry.
- B. Steel lintels built into masonry work not requiring steel bearing plates.

1.03 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, and locations of structural members, openings, attachments, and fasteners.
 - 2. Connections and Connections not detailed.
 - 3. Indicate welded connections with AWS A2.0 welding symbols. Indicate net weld lengths.
- C. Shop Drawings shall have been thoroughly checked by fabricator before being submitted for review. Review is precautionary measure only and shall not relieve fabricator of full responsibility of correctness of all materials, sizes, dimensions and details.
- D. In case structural sections or details indicated on Drawings cannot be readily obtained, substitution of sections or details of equal strength which conform to requirements of design may be made only if approved.
- E. Fabrication shall not proceed until shop drawings have been reviewed. Fabrication, assembly and erection shall conform to reviewed shop drawings.

1.04 QUALITY ASSURANCE

- A. Comply with AISC Manual, Ninth Edition, 1989.
 - 1. "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings".
 - 2. "Code of Standard Practice for Steel Buildings and Bridges" including Commentary.
 - 3. "Specifications for Architecturally Exposed Structural Steel".
 - 4. "Specifications for Structural Joints Using ASTM A325 or A490 Bolts".

- B. "General Requirements for Delivery of Rolled Steel Plates, Shapes, and Bars for Structural Use", ASTM A6.
- C. "Specifications for Assembly of Structural Joints Using High Strength Steel Bolts" as approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
- D. Perform work in accordance with A.W.S. Code for Arc and Gas Welding on building construction.

1.05 QUALIFICATIONS

- A. Fabricator: Company specializing in performing the work of this Section with minimum 5 years documented experience.
- B. Erector: Company specializing in performing the work of this Section with minimum 5 years documented experience.
- C. Design connections not detailed on the Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Indiana.

1.06 FIELD MEASUREMENTS

- A. Verify that field measurements are as shown on Drawings prior to fabrication.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Structural Steel Members: ASTM A992.
- B. Steel Pipe: ASTM A53, Type E, or S, Grade B.
- C. Steel Tubing: ASTM A500.
- D. Bolts, Nuts, and Washers: ASTM A325 and A490.
- E. Anchor Bolts: ASTM F1554 GR 36.
- F. Welding Materials: The electrodes or flux specified in AISC Table 1.17.2A and B shall be used in making complete penetration groove welds designed on the basis of the allowable stresses for the base metal, as provided in AISC Table 1.5.3. The electrodes and flux as listed in Table 1.5.3 may be used in making fillet welds and partial penetration groove welds.
- G. Shop and Touch-Up Primer: FS TT-P-86, Type II, except for Architecturally Exposed Structural Steel which after Commercial Blast Cleaning, SSPC-SP6-63, shall receive one coat rust inhibitive primer compatible with finish coat.
- H. Welded Stud Shear Connectors: Nelson granular flux filled studs as manufactured by the Nelson Stud Welding Division of Gregory Industries, Inc., Lorain, Ohio, or an approved equal.

2.02 FABRICATION

A. General:

1. Material shall be properly marked and match-marked where field assembly so requires. The sequence of shipments shall be such as to expedite and minimize the field handling of material.
2. Members to be milled shall be completely pre-assembled in the shop before shipping to assure proper fit.
3. Beams, girders and trusses shall be cambered upward as shown on Drawings.
4. Allowance for draw shall be made in all tension bracing.
5. All wall bearing beams shall have wall anchors, except as otherwise shown.
6. Take field measurements as required to verify and supplement dimensions shown on Drawings.
7. Provide anchor bolts and embedded plates for anchoring structural steel to supporting concrete and masonry. Furnish as soon as possible detailed plans showing exact locations of all bolts to be built into concrete or masonry. Furnish templates as required.

B. Connections:

1. Unless otherwise shown, connections for beams with uniform loads shall be selected by the fabricator to support half the total uniform load capacity tabulated in the AISC tables for allowable loads on beams for the given shape, span, and steel specification of the beam size specified.
2. Connections shall be Framed Beam Connections that conform to Table I of the AISC Manual of Steel Construction unless Table II connections are required in which case such reactions shall be given on the Drawings.
3. Standard welded framed beam connections of equal value that conform to Table III or IV of the AISC Manual may be substituted for bolted connections, subject to review.
4. The length of any connection shall not be less than half of the T distance of the beam web.
5. Connections and details are subject to Architect's review.
6. Field connections shall be bolted, unless otherwise shown on Drawings. Field welded connections shall be used only where specifically shown on Drawings or with Architect's approval.
7. Shop connections may be riveted, welded or bolted with high strength bolts at contractor's option. All shear connections shall be welded or bolted with high strength bolts.
8. Unless otherwise shown on Drawings, A325 bolts, Type X connections shall be used for field connections.
9. All connections not specifically shown shall fully develop critical load for member being connected.
10. Bolts where used shall have lock washers under nuts and no threads shall bear on parts being connected.
11. Bearing ends of columns and trusses shall be milled or sawed for true bearing on base and bearing plates. Rough bearing ends shall not be used.

C. Welding:

1. All welders shall be certified, by an approved testing laboratory, to make groove and fillet welds in the positions in which they will be carrying out welding. Certifications shall be by tests as prescribed in "Structural Welding

Code" of the American Welding Society and shall be submitted prior to any welding operations.

2. Butt welds on exterior exposed surfaces and where shown on Drawings shall be ground flush.
3. Built-up sections assemble by welding shall be free of warpage, and all axes shall have true alignment.
4. Welds not shown or specified shall be continuous fillet welds, using not less than the minimum fillet as specified by AWS.
5. Welded shear connectors shall be automatically end welded in the shop or field. Studs shall be welded on centers shown on Drawings and in accordance with the recommendations of the manufacturer.

D. Shop Painting:

1. All steel shall be thoroughly cleaned, all rust and mill scale removed as outlined in the Structural Steel Painting Council Specification for Power Tool Cleaning (SSPC-SP3) and shall receive one shop coat of paint, 2-3 mil dry film thickness, except areas up to 2 in. of field welds and contact surfaces using high strength friction-type bolts. No unpainted areas shall be left to preserve shop marks.
2. After erection, all abrasions, rivet and bolts heads, and surfaces left unpainted for welding shall be painted with one coat of specified paint.
3. Steel to be welded, or encased in concrete shall not be painted.
4. Architecturally Exposed structural Steel shall receive a Commercial Blast Cleaning, SSPC-SP6-63, and receive one coat of rust inhibitive primer compatible with finish coat.

2.03 FINISH

- A. Shop prime structural steel members except items to be galvanized. Do not prime surfaces that will be field welded, in contact with concrete, and high strength bolted.
- B. Clean and field prime field welded surfaces and high strength bolted areas and bolts after erection.
- C. Provide hot dipped galvanized coating after fabrication for all steel exposed to the outside elements and all steel embedded in exterior masonry walls.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means erector accepts existing conditions.

3.02 ERECTION

- A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- B. After erection, clean and prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

- C. Material stored at the job site shall not exceed design loads on structures so the members will not be distorted or otherwise damaged; and shall be protected against corrosion or deterioration.
- D. Other contractors shall be consulted to obtain necessary template and other information required to establish number, size and location of holes or items necessary for attachment of blocking, windows, purlins, etc.
- E. The Contractor shall be responsible for the accurate setting and leveling of all bearing plates and/or setting plates and anchors. Bearing plates or setting plates shall be leveled on steel wedges or shims or as otherwise detailed and then grouted in place (included in another Section). The location of the anchors shall be checked before the steel fabrication or erection is started. Bearing plates for steel joists shall be located not more than 1/2" from the face of the wall.
- F. No welding or riveting of permanent connections shall be executed until as much of the structure as will be stiffened by the welding or riveting has been properly aligned.
- G. Drift pins shall not be used to enlarge unfair holes in main material. Holes that must be enlarged to admit rivets or bolts shall be reamed.
- H. Cutting and altering of member in the field shall not be permitted. Errors in shop work, which prevent erection, shall not be corrected until the method has been reviewed by the Architect.
- I. Unless otherwise shown, all structural fillet welds shall be in accordance with Table 1.17.5A and B AISC Specifications, latest edition and shall meet all requirements of the Structural Welding Code AWS.
- J. Field high tensile bolts shall be installed as specified in "Specification for Structural Joints using ASTM A-325 or A-490 Bolts" as approved by Research Council on riveted and bolted structural joints, unless otherwise specified, or shown on Drawings.
- K. All members shall be cut neat, square and should be erected true and flush without twists and open joints. Light drifting to draw holes together may be used. Reference should be made to codes and specifications listed in this Section under Quality Assurance, which govern all phases of fabrication, details and erection and workmanship.
- L. All steel exposed to view shall be free of surface imperfections and ground off to true surfaces. Exposed welds shall be ground smooth.

3.03 ERECTION TOLERANCES

- A. Tolerances shall be within AISC Guidelines.

END OF SECTION

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SECTION 06 1000

ROUGH CARPENTRY

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Rough carpentry.
- B. Blocking in wall and roof openings.

1.02 QUALITY ASSURANCE

- A. Rough Carpentry Lumber: Visible grade stamp, of agency certified by National Forest Products Association (NFPA).
- B. When applicable, fabricate casework and site made finish carpentry items in accordance with recommendations of Quality Standards of Architectural Woodwork Institute (AWI).

1.03 SUBMITTALS

- A. Submit shop drawings under provisions of Division 1 for finish carpentry, custom casework, and counters.
- B. Submit samples under provisions of Division 1 of standard colors and patterns of plastic laminate for Architect's selection.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver shop fabricated carpentry items until site conditions are adequate to receive the work. Protect items from weather while in transit.
- B. Store indoors, in ventilated areas with a constant, minimum temperature of 60 degrees F, maximum relative humidity of 25 to 55 percent.

PART 2 PRODUCTS

2.01 ROUGH CARPENTRY MATERIALS

- A. Lumber:
 - 1. Lumber for furring, blocking, framing and grounds for all permanent work throughout, unless specifically noted or specified, shall be construction grade Spruce-Pine-Fir for sizes 0" to 2" thick, and up to 6" wide. Moisture content shall not exceed 19%.
 - 2. Lumber 2" to 4" thick and wider than 6" shall be No. 2 grade Spruce-Pine-Fir unless noted otherwise on drawings. Moisture content shall not exceed 19%.
- B. Nails, Spikes and Staples: Galvanized for exterior locations, high humidity locations and treated wood; plain finish for other interior locations; size and type to suit application.

- C. Bolts, Nuts, Washers, Lags, Pins and Screws: Standard grade steel; sized to suit application; galvanized for exterior locations, high humidity locations and treated wood; plain finish for other interior locations.
- D. Fasteners: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolts or power activated type for anchorage to steel.
- E. Caulking: Per specification Section 07 9200 – Joint Sealants.

2.02 WOOD TREATMENT

- A. Wood Preservative: American Wood Preservers Bureau, Quality Mark.
- B. Pressure Treated Materials: American Wood Preservers Bureau Standards, Wolmanized, Penta or equal and arsenic free.
- C. Wood in contact with cementitious materials, roofing and related metal flashings shall be pressure treated.

PART 3 EXECUTION

3.01 FRAMING, FURRING, STRIPPING AND BLOCKING

- A. Install and coordinate all required wood blocking with other trades.
- B. Construct members of continuous pieces of longest possible lengths.

END OF SECTION

SECTION 06 2000

FINISH CARPENTRY

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Finish carpentry, including but not limited to installation of all doors, frames and hardware, toilet accessories, millwork, casework, and all counters.

1.02 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver shop fabricated carpentry items until site conditions are adequate to receive the work. Protect items from weather while in transit.
- B. Store indoors, in ventilated areas with a constant, minimum temperature of 60 degrees F, maximum relative humidity of 25 to 55 percent.

PART 2 PRODUCTS

2.01 CARPENTRY MATERIALS

- A. Nails, Spikes and Staples: Galvanized for exterior locations, high humidity locations and treated wood; plain finish for other interior locations; size and type to suit application.
- B. Fasteners: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolts or power activated type for anchorage to steel.
- C. Caulking: Top grade clear silicone caulking.

1.02 FINISH CARPENTRY

- A. Hardwood Lumber: Graded in accordance with AWI; maximum moisture content of 8 percent; species as called for on the drawings, premium grade.
- B. Nails: Size and type to suit application.
- C. Bolts, Nuts, Washers, Lags, Pins and Screws: Size and type to suit application.

1.03 WOOD TREATMENT

- A. Wood Preservative: American Wood Preservers Bureau, Quality Mark.
- B. Pressure Treated Materials: American Wood Preservers Bureau Standards, Wolmanized, Penta or equal and arsenic free.
- C. Wood in contact with cementitious materials, roofing and related metal flashings shall be pressure treated.
- D. Ensure finish carpentry materials requiring stain or paint finish do not exceed 8 percent moisture content before applying fire retardant or wood preservative treatment.

1.04 FABRICATION

- A. Fabricate finish carpentry items in accordance with recommendations of AWI. Shop fabricate items where possible.
- B. Use exposed fastening devices or nails only when unavoidable.

PART 3 EXECUTION

3.01 INSTALLATION OF FINISH CARPENTRY ITEMS

- A. Set and secure finish carpentry items in place rigid, plumb, and square.
- B. Use purpose designed fixture attachments for mounted components.
- C. Workmanship in connection with all finished carpentry shall conform to the AWI standards and shall be acceptable to the Architect. Woodwork shall have a fine smooth finish and shall be free from machine or tool marks, abrasions, raised grain etc., on exposed surfaces.
- D. Joints shall be tight and so formed as to conceal shrinkage. Shop miters 4" or more from heel to point shall be glued and feathered, locked or splined. Tenons and dowels shall be made to a driving fit. Dowels shall be of hardwood and at least two shall be used in each joint. Shop joints shall be made with waterproof glue or hot glued under pressure as to avoid the use of nails as much as possible. Where nails and screws are necessary, they shall be concealed.
- E. Finish woodwork of every sort shall be put up plumb or level, straight and true, and shall not be installed until the building is dry as directed by the Architect. All work shall be fitted and scribed to other finished work in a careful manner so as not to injure the surface. All nailing shall be blind nailed wherever possible, but where not possible, the nailing shall be so located and driven as not to be conspicuous in the finish.
- F. For interpretation in this contract, the term "concealed surface" shall mean those surfaces facing a wall, floor or ceiling or an item of millwork permanently fixed in position where such surfaces are entirely enclosed and not subject to view under any conditions. All other surfaces, inside and outside cabinets, desks, etc., as well as all surfaces of removable cabinets (except bottom surfaces of cabinets without legs) shall be considered exposed.
- G. Back surface and edges of woodwork against concrete, masonry or metal shall be back primed before installation, one coat of approved prime paint.
- H. Install hardware, fixtures and accessories supplied under other Sections for installation. Install items in accordance with manufacturer's instructions.
- I. Ensure that mechanical and electrical items affecting this Section of work are properly placed, complete, and have been inspected by the Architect prior to commencement of installation.

END OF SECTION

SECTION 07 2100

THERMAL PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Board insulation at perimeter foundation walls and as shown on the drawings.

1.02 COORDINATION

- A. Coordinate work under provisions of Division 1.

1.03 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product Data: Provide data on product characteristics, performance criteria and limitations.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - INSULATION MATERIALS

- A. Board Insulation:
 - 1. Dow "Styrofoam"
 - 2. UC Industries - "FoamulaR"
 - 3. Diners Foam Products "Certifoam"
 - 4. Kingspan Insulation LLC – Greenguard XPS Type IV
- B. Substitutions: Under provisions of Division 1.

2.02 INSULATION MATERIALS

- A. Board insulation shall be extruded Polystyrene minimum R-5/inch thickness in sizes as shown on the plans.
- B. Insulation Fasteners: Type and size to suit application as recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify site conditions under provisions of Division 1.
- B. Verify that substrate, adjacent materials, and insulation boards are dry and ready to receive insulation.

3.02 INSTALLATION

- A. Install insulation in accordance with insulation manufacturer's instructions.
- B. Provide appropriate fastening to insure all insulation remains secure and in place

3.03 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Division 1.
- B. Do not permit Work to be damaged prior to covering insulation.

END OF SECTION

SECTION 07 5423

THERMOPLASTIC SHEET ROOFING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Fully adhered PVC roof system to include fully adhered rigid insulation with tapered saddles.
- B. Flashings.

1.02 SYSTEM DESCRIPTIONS

- A. Roof system is a single ply PVC membrane fully adhered to two layers of fully adhered rigid insulation fully adhered to the concrete roof deck.

1.03 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Warranty: Submit a copy of the manufacturer's warranty prior to commencement of any work.
- C. Product Data: Provide membrane and all accessories.
- D. Manufacturer's Installation Instructions: Indicate special precautions required for seaming the membrane.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

- A. Membrane Manufacturer: Company specializing in sheet roof membranes with 5 years' experience.
- B. Applicator: Company specializing in installation of sheet roofing membranes with 5 years documented experience, approved by membrane manufacturer.
- C. Roof manufacturer's representative must make site inspections during the installation in order to assure compliance with the manufacturer's standards.
- D. Work of this Section to conform to NRCA Roofing and Waterproofing Manual and manufacturer's instructions.

1.05 REGULATORY REQUIREMENTS

- A. Underwriters Laboratories, Inc. (UL): Class A Fire Hazard Classification.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site under provisions of Division 1.

- B. Under provisions of Division 1, store materials in weather protected environment clear of ground and moisture. Protect foam board from direct sunlight exposure if required.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Comply with manufacturer's restrictions.

1.08 PREINSTALLATION CONFERENCE

- A. Convene one week prior to commencing work of this Section under provisions of Division 1.
- B. Review conditions of installation, installation procedures, and coordination required with related work.

1.09 GUARANTEE

- A. Roofing contractor shall guarantee and maintain all roofing, flashing, accessories, and insulation for a period of five (5) years in a leak-free condition at no cost to the Owner. This period shall extend from the date of final acceptance of the building by Owner. Provide warranty under provisions of Division 1.
- B. New Roof: Roofing manufacturer shall furnish a thirty (30) year "no dollar limit" guarantee for all new roofing material in accordance with the manufacturer's warranty for wind speed of 90 m.p.h. This warranty shall provide for replacement of any failed product at no cost to the owner for materials and labor. Provide warranty under provisions of Division 1. Warranty will be signed by Roofing Contractor and Roofing Manufacturer.
- C. Roofing manufacturer shall furnish a thirty (30) year warranty on the roof membrane materials. Provide warranty under provisions of Division 1.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS – MEMBRANE

- A. Sarnafil 80 mil PVC textured thermoplastic membrane.
- B. Substitutions: The above listed roof systems are acceptable on the Base Bid. Contractors wishing to submit bids using other manufacturers or other systems must bid those systems or manufacturers as a Voluntary Alternate and state the manufacturer and system that they are bidding.

2.02 MEMBRANE MATERIALS

- A. Membrane: Membrane shall be compatible with all materials it comes in direct contact with.
- B. Flexible Flashings: As recommended by membrane manufacturer.
- C. Special Flashings: As recommended by membrane manufacturer.

2.03 INSULATION MATERIALS

- A. Rigid Insulation: Shall be in thicknesses as shown on the drawings and compatible with all components of roof system and shall be approved by the membrane manufacturer. Insulation shall be Polyisocyanurate with R=10 for 1 1/2" thickness.

2.04 ADHESIVE MATERIALS

- A. Surface Conditioner: As recommended by membrane manufacturer.
- B. Membrane Adhesives: As recommended by membrane manufacturer.
- C. Insulation Adhesive: As recommended by insulation manufacturer.
- D. Thinner and Cleaner: As recommended by adhesive manufacturer, compatible with sheet membrane.

2.05 ACCESSORIES

- A. Sealants: As recommended by membrane manufacturer.
- B. Reglet Strip Devices: As recommended by membrane manufacturer.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify existing insulation and cover board are dry. Do not roof over wet materials.
- B. Fully adhere the tapered rigid insulation to the concrete decks.
- C. Verify roof openings and penetrating elements through roof are solidly set; wood cant strips, wood nailing strips, and reglets are in place. Verify deck is supported and secured.
- D. Do not apply roofing materials to damp, frozen, dirty, dusty, or deck surfaces unacceptable to manufacturer or applicator.
- E. Verify deck surfaces are dry and free of snow or ice.
- F. Beginning installation means acceptance of existing surfaces.

3.02 MEMBRANE INSTALLATION

- A. Install membrane roofing in strict accordance with manufacturer's instructions.
- B. Roll out membrane. Work out air bubbles, wrinkles, and fishmouths. Firmly press sheet into place without stretching.
- C. Shingle joints on sloped substrate in direction of drainage.
- D. T-joints require .060 Sarnafil membrane patches.
- E. Seal to adjoining surfaces.

- F. Continue membrane up vertical surfaces as required by membrane manufacturer. Extend membrane across all wood plates at copings or under metal copings to outside edge.
- G. Install flashings. Seal watertight to membrane.
- H. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or moving.
- I. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.
- J. All membrane overlaps shall be hot-air welded. The membrane shall be clean and dry prior to hot-air welding.
- K. A minimum of 4" (10.2 cm) wide overlap is required when hand-welding details.

3.03 PROTECTION

- A. Protect finished installation under provisions of Section 01500.
- B. After installation, close off area to prevent unauthorized traffic.

3.04 CLEAN UP

- A. Remove debris and unused materials from site. Leave area clean and ready for use.

END OF SECTION

SECTION 07 6200

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 WORK INCLUDED

- A. All sheet metal work as called for on the drawings.

1.02 SYSTEM DESCRIPTION

- A. This Contractor shall coordinate his work with that of the roofing contractor to insure that all work is properly installed to insure against leakage.
- B. In all cases, all work shall be done in such a manner as to guarantee neat appearance, proper anchorage, weather-tightness, and to provide for adequate expansion and contraction.
- C. This Contractor shall fully guarantee the weather-tightness of all his work.

1.04 QUALITY ASSURANCE

- A. Applicator: Company specializing in sheet metal flashing work with 5 years minimum experience.
- B. This work shall be included in the roofing warranties specified.

1.05 SUBMITTALS

- A. Submit product data under provisions of Division 1.
- B. Submit samples under provisions of Division 1.
- C. Provide full sized sample of metal flashing illustrating typical material, finish, joints and seams.

1.06 STORAGE AND HANDLING

- A. Store products under provisions of Division 1.
- B. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation.
- C. Prevent contact with materials during storage which may cause discoloration, staining, or damage.
- D. Protect from direct sunlight as required by manufacturer.

1.07 GUARANTEE

- A. Roofing contractor shall guarantee and maintain all sheet metal work for a period of five (5) years in a leak-free condition at no cost to the Owner. This period shall extend from the date of final acceptance of the building by Owner.

- B. Roofing manufacturer shall furnish a minimum ten (10) year guarantee for all roof flashing materials in accordance with the manufacturer's warranty. If the standard warranty exceeds ten (10) years for that manufacturer's product, then the standard warranty shall be provided. This warrantee shall provide for replacement of any failed product at no cost to the Owner for materials and labor. Provide warranty under provisions of Division 1.
- C. Provide thirty (30) year warranty on paint finish failures due to fading, checking, peeling, blistering and chalking after date owner accepts entire project.
- D. Provide warranties and guarantees under provisions of Division 1.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

- A. Pre-coated Galvanized Steel: ASTM A525, G 90; 24 gauge hot dipped galvanized core steel, commercial quality, extra smooth primed and finished one side with Kynar 500 FSF resin-based coating applied over an epoxy primer. An acrylic washcoat of .3 to .4 mil dry film thickness is applied to the reverse side. The pre-painted finished side shall be coated with a liquid applied factory installed strippable film.

2.03 ACCESSORIES

- A. Fastener: Size and type to suit application. Finish exposed fasteners same as flashing.
- B. Anchorage Devices: SMACNA Requirements; type as recommended by fabricator.
- C. Sealant: As recommended by sheet material manufacturer.

2.04 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest practical lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Fabricate corners from one piece with minimum 18 inch long legs; seal with sealant.
- E. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip or as shown on Drawings.
- F. Fabricate flashings to allow toe to extend 2 inches over roofing. Return and brake edges.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.
- B. Verify membrane termination and base flashings are in place, sealed, and secure.
- C. Verify that surfaces are ready to receive work.
- D. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

- A. Field measure site conditions prior to fabricating work.

3.03 INSTALLATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.
- C. Insert flashings into reglets to form tight fit. Secure in place as required. Seal flashings into reglets with sealant.
- D. Secure flashings in place using concealed fasteners. Use exposed fasteners only in locations approved by Architect.
- E. Apply plastic cement compound between metal flashings and felt flashings.
- F. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- G. Conform to drawing details included in SMACNA manual. All metal work shall conform to SMACNA standards.
- H. Join lengths with seams sealed watertight. Flash and seal gutters to downspouts and accessories.

END OF SECTION

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SECTION 07 7233

ROOF HATCHES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Roof Hatch, Safety Post and Safety Railings.

1.02 QUALITY ASSURANCE

- A. Manufacture fire rated access doors and frames to conform to UL requirements.

1.03 SUBMITTALS

- A. Submit product data under provisions of Division 1.
- B. Include sizes, types, finishes, scheduled locations, and details of adjoining work.
- C. Submit manufacturer's installation instructions under provisions of Division 1.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Bilco
- B. J.L Industries
- C. Larsons
- D. Milcor
- E. Substitutions: Under provisions of Division 1.

2.02 PRODUCTS

- A. Roof Hatch - Equal to Bilco Thermally Broken Roof Hatch Type (size)-50-TB in size as called for on the drawings with painted aluminum finish with pad lockable latch and interior curb.
- B. Safety Post - Bilco Type LU Ladder Safety Post.
- C. Safety Railing – Equal to Bilco Bil-Guard 2.0 Safety Railing System.

2.03 FINISH

- A. Painted Aluminum from standard colors.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify rough openings are correctly sized and located.

B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

A. Secure rigidly in place in accordance with manufacturer's instructions.

END OF SECTION

SECTION 07 9200

JOINT SEALANTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Preparing substrate surfaces.
- B. Sealant and joint backing.

1.02 REFERENCES

- A. ASTM C790 - Use of Latex Sealing Compounds.
- B. ASTM C834 - Latex Sealing Compounds.
- C. ASTM C919 - Use of Sealants in Acoustical Applications.
- D. ASTM C920 - Elastomeric Joint Sealants.
- E. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.
- F. SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification.

1.03 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, color availability.
- C. Samples: Submit two samples illustrating sealant colors for selection.
- D. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, perimeter conditions requiring special attention.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform acoustical sealant application work in accordance with ASTM C919.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years' experience.
- B. Applicator: Company specializing in performing the work of this section with minimum five years' experience approved by manufacturer.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.07 COORDINATION

- A. Coordinate work under provisions of Division 1.
- B. Coordinate the work with all sections referencing this section.

1.08 WARRANTY

- A. Provide five year warranty under provisions of Division 1.
- B. Warranty: Include coverage for installed sealants and accessories which fail to achieve air tight seal, water tight seal and exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.01 SEALANTS

- A. Acrylic Latex: ASTM C920; Single component, non-staining, non-bleeding, non-sagging; color as selected.
 - 1. AG-20 + Silicone manufactured by Pecora
 - 2. Acrylic Latex 834 manufactured by Tremco, Inc.
 - 3. Soliolac manufactured by Sonneborn.
- B. Polyurethane Sealant: ASTM C920, Grade S, Class 25; single component, chemical curing, non-staining, non-bleeding, capable of continuous water immersion, use non-sagging type typical, use self-leveling type at surfaces subject to traffic type; color as selected.
 - 1. Masterseal NP-1
 - 2. Sikaflex 15LM
- C. Silicone Sealant: ASTM C920, single component, chemical curing, non-sagging, non-staining, non-bleeding; color as selected.
 - 1. 790 manufactured by Dow Corning Corp.; Ultraglare 4000 manufactured by General Electric Co.; Spectrem 1 manufactured by Tremco, Inc.
 - a. Elongation Capability 50 - 100 percent
 - b. Service Temperature Range -40 to 450 degrees F
(-40 to 121 degrees C)
 - c. Shore A Hardness Range 15 to 35

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install sealant in accordance with manufacturer's instructions.
- B. Measure joint dimensions and size materials to achieve required width/depth ratios.

- C. Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.
- D. Install bond breaker where joint backing is not used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave unless otherwise detailed.

3.02 CLEANING

- A. Clean work under provisions of Division 1.
- B. Clean adjacent soiled surfaces.

3.03 PROTECTION OF FINISHED WORK

- A. Protect finished installation under provisions of Division 1.
- B. Protect sealants until cured.

3.04 SCHEDULE

A. Exterior Sealants

1. Door and window frame perimeters – Polyurethane Sealant.
2. All joints and openings with dissimilar materials – Polyurethane Sealant.
3. Expansion joints in a vertical plane and masonry control joints – Polyurethane Sealant.
4. Unit masonry joints at lintels – Polyurethane Sealant.
5. Sheet metal joints, flashing, reglets – Polyurethane Sealant.

B. Interior Painted Caulks

1. Door and window frame perimeters - architectural grade acrylic latex.
2. All joints and openings with dissimilar materials - architectural grade acrylic latex.
3. Vertical expansion joints and masonry control joints – architectural grade acrylic latex.
4. Unit masonry joints at lintels – architectural grade acrylic latex
5. Window sills – architectural grade acrylic latex.

C. Interior Non-Painted Caulks

1. Door and window frame perimeters – silicone.
2. All joints and openings with dissimilar materials – silicone.
3. Vertical expansion joints and masonry control joints – silicone.
4. Unit masonry joints at lintels – silicone
5. Window sills – silicone.

END OF SECTION

SECTION 08 1100

STANDARD STEEL DOORS AND FRAMES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Fire rated rolled steel doors, panels, and frames.

1.02 QUALITY ASSURANCE

- A. Conform to requirements of SDI-100 and SDI-118.
- B. Fire rated door and frame construction to conform to all applicable codes and regulations.
- C. Installed frame and door assembly to conform to NFPA 80 for fire rated class indicated in Schedule, on drawings.

1.03 REGULATORY REQUIREMENTS

- A. Conform to applicable codes for fire rated frames and doors.

1.04 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Division 1.
- B. Indicate frame configuration, anchor types and spacings, location of cutouts for hardware, reinforcement, and finish.
- C. Indicate door elevations, internal reinforcement, closure method, and cut outs for glazing and louvers.
- D. Submit manufacturer's installation instructions under provisions of Division 1.

1.05 DELIVERY, STORAGE AND PROTECTION

- A. Protect products under provisions of Division 1.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Curries
- B. Mesker
- C. Ceco
- D. Steelcraft
- F. Substitutions: Under provisions of Division 1

2.02 INTERIOR DOORS

- A. Doors shall be 707 type as manufactured by Curries Co., Mason City, Iowa.
- B. Doors are to be manufactured of the finest quality 18 gauge cold rolled stretcher leveled steel. All doors shall be of full flush construction. Doors shall be reinforced and stiffened.
- C. Both lock and hinge rail edge of the door may have an exposed hairline seam (707S). Lock rail shall be one piece full height 14 gauge pressed channel, formed and tapped for hinges.
- D. Top and bottom of door shall have 16 gauge steel closure channels. Doors shall have beveled (1/8" in 2") lock edge.
- E. All doors shall be bonderized and finished as standard with one coat of baked-on prime coat paint.
- F. Minimum hardware reinforcement shall consist of: Closers-12 gauge channel (5" X 16"), Overhead Holders-12 gauge channel (5" X 24"), Rim Panics-14" gauge channel (5" X 18"), Butts and Locks are previously specified herein, Checks and Pivots-7 gauge X template requirements.

2.03 INTERIOR FRAMES

- A. Frames shall be as manufactured by Curries Co., Mason City, Iowa. Frames to be fabricated of cold rolled steel of gauge. All frames 3'-8" and over shall be 14 gauge. Frames under 3'-8" wide shall be 16 gauge.
- B. All joints to be die-mitered with integral tabs for reinforcement and interlocking of the jambs to the head. Frames shall be set-up and welded.
- C. Frames shall be thoroughly degreased and cleaned of all imperfections before painting. All frames shall receive a factory baked-on coat of rust inhibitive primer.
- D. Frames to be mortised, reinforced and drilled and tapped for all mortise finish hardware. Frames to be reinforced and drilled and mounted hardware with drilling and tapping to be done in the field by the erection contractor. Provide metal plaster guards for all mortised cutouts.
- E. Minimum requirements for hardware reinforcement are to be as follows: Hinge Reinforcing-7 gauge X 1 5/8" X 10", Lock Strike Reinforcing-14 gauge X Template Requirements, Closer Reinforcing-12 gauge X contour of head X 16".

2.04 ACCESSORIES

- A. Glazing Stops: Rolled steel channel shape, mitered corners; prepared for countersink style tamperproof screws.
- B. Rubber Silencers: Resilient rubber.

2.05 FABRICATION

- A. Fabricate frames as welded unit type. For application as shown on Drawings.

- B. Fabricate frames and doors with hardware reinforcement plates welded in place.
- C. Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly into frame head, flush with top.
- D. Prepare frame for silencers. Provide three single rubber silencers for single doors on strike side, and two single silencers on frame head at double doors without mullions.
- E. Fabricate frames for masonry wall coursing with 4 inch head member or as called for on Drawings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install door frames in accordance with SDI-105.
- B. Install doors and frames in accordance with manufacturer's specifications.
- C. Coordinate with wall construction for anchor type and placement.
- D. Coordinate installation of glass and glazing.

3.02 ADJUSTING AND CLEANING

- A. Adjust hardware for smooth and balanced door movement.

END OF SECTION

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SECTION 08 3313

PACKAGED ROLLING COUNTER DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Packaged Rolling Counter Doors.

1.2 REFERENCES

- A. ASTM A167-99 Standard Specifications for Stainless and Heat-Resisting Chromium Nickel Steel Plate, Sheet and Strip.
- B. ASTM B221-04A Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.

1.3 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product Data: Manufacturer's specifications and technical literature.
- C. Shop Drawings: Drawings of openings, showing locations of guide anchors and other supports.
- D. Sample: 12X12 inches including end construction.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in installation with five years' experience.
- B. Submit manufacturer's operation and maintenance data under provisions of Division 1.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Overhead Door Corporation, Dallas Texas.
- B. Wayne-Dalton Corporation, Mt. Hope, OH
- C. Raynor, Dixon, Illinois
- D. Substitutions in accordance with provisions of Division 1.

2.2 ROLLING COUNTER DOORS

- A. Rolling Counter Doors: Uninsulated interlocking slat curtain, upward rolling, running in side guides. Model #657 as supplied by Overhead Door Corporation.
 - 1. Operation: Crank up.
 - 2. Design Wind Load: 20 psf.
 - 3. Material (All Exposed Components): Stainless steel; No.4 finish.
 - 4. Slat Profile: Flat, roll-formed.
 - 5. Slat Width: 2 inches.
 - 6. Slat Thickness: 22 gauge.

7. Slat Wind Locks: Metal; every other slat, both ends.
8. Curtain Bottom Bar: Stainless steel tubular bottom bar with neoprene astragal.
9. Weatherstripping and Seals:
 - a. Bottom Bar: Neoprene
 - b. Hood: Internal neoprene baffle.
 - c. Guides: Surface vinyl weatherstripping.
10. Mounting: As indicated on drawings.
11. Supporting Brackets: Minimum 3/16 inch thick steel plate.

2.3 COMPONENTS

- A. Frame shall be 16-gauge #4 finish stainless steel jambs, head and fascia with 14-gauge stainless steel sill.
- B. Door Supports: Coil door on pipe shaft of sufficient size to carry door load with deflection not greater than 0.03 inches per foot (2.5 mm per meter) of door span.
 1. Brackets: Enclose ends of coil and support pipe shaft; steel plate, minimum 3/16 inch thick, with permanently lubricated sealed ball bearings.
 2. Counterbalance: Helical torsion springs of high-grade oil tempered steel, evenly balancing door at every point in travel with 25 percent safety factor.
 3. Anchor springs to pipe shaft using cast iron anchors designed to eliminate concentration strain and allow equal adjustment of all springs simultaneously using a charging wheel.
 4. Ends of pipe sealed with steel or cast iron plugs
 5. Push-Up Doors: Maximum 25 pound lift effort.
- C. Hoods: Enclosing curtain coil, pipe shaft, and counterbalance, concealing them from view from both sides.
 1. Sheet metal of same material as curtain; 24 gauge stainless steel.
 2. Flange attachment to top header, with rolled bottom edge; provide intermediate supports as required.
 3. Shape: Square.
- D. Manual Operation and Locking Mechanisms:
 1. Manual Slide Bolts: Located on bottom bar, operable from inside.
- E. Countertop shall be 300 series 14 gauge stainless steel with #4 finish.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Before beginning work, verify that openings have been properly prepared.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install doors plumb, level, and operating smoothly without binding.

END OF SECTION

SECTION 08 3323

INSULATED ROLLING SERVICE DOORS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Electric operated overhead insulated rolling doors.
- B. Alternates:

1.02 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Wind Loading: Supply doors to withstand up to 20 psf (950 Pa) wind load.
 - 2. Cycle Life:
 - a. Design doors of standard construction for normal use of up to 20 cycle per day maximum.

1.03 SUBMITTALS

- A. Reference Division 1 Submittal Procedures; submit the following items:
 - 1. Product Data.
 - 2. Shop Drawings: Include special conditions not detailed in Product Data. Show interface with adjacent work.
 - 3. Quality Assurance/Control Submittals:
 - a. Provide proof of manufacturer ISO 9001:2000 registration.
 - b. Provide proof of manufacturer and installer qualifications - see 1.4 below.
 - c. Provide manufacturer's installation instructions.
 - 4. Closeout Submittals:
 - a. Operation and Maintenance Manual.
 - b. Certificate stating that installed materials comply with this specification.

1.04 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer Qualifications: ISO 9001:2000 registered and a minimum of five years experience in producing doors of the type specified.
 - 2. Installer Qualifications: Manufacturer's approval.

1.05 DELIVERY STORAGE AND HANDLING

- A. Under provision of Division 1.
- B. Follow manufacturer's instructions.

1.06 WARRANTY

- A. Standard Warranty: Two years from date of shipment against defects in material and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Manufacturer: Cornell Iron Works, Inc., Crestwood Industrial Park, Mountaintop, PA 18707. Telephone: (800) 233-8366, Fax: (800) 526-0841. Underwriters Laboratories, Inc. (UL), ISO 9001:2000 Registered.
- B. Model: ESD20
- C. Substitutions: Under provisions of Division 1.

2.02 MATERIALS

- A. Curtain:
 - 1. Slat Material: No. 6F, (Listed Exterior/Interior):
 - a. Galvanized Steel/Galvanized Steel: 24/24 gauge, Grade 40, ASTM A 653 galvanized steel zinc coating.
 - 2. Bottom Bar: Reinforced extruded aluminum interior face with full depth insulation and exterior skin slat to match curtain material and gauge.
 - 3. Fabricate interlocking sections with high strength nylon endlocks on alternate slats each secured with two 1/4" (6.35 mm) rivets. Provide windlocks as required to meet specified wind load.
 - 4. Exterior Slat Finish:
 - a. GalvaNex™ Coating System and phosphate treatment followed by baked-on polyester powder coat, color as selected by Architect from manufacturer's standard color range, minimum 32 colors; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better.
 - 5. Interior Slat Finish:
 - a. GalvaNex™ Coating System and phosphate treatment followed by baked-on polyester powder coat, color as selected by Architect from manufacturer's standard color range, minimum 32 colors; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better.
 - 6. Bottom Bar Finish:
 - a. Exterior Face: Match slats.
 - b. Interior Face: Powder coat to match slats.
- B. Guides: Fabricate with minimum 3/16 inch (4.76 mm) aluminum angles. Provide windlock bars of same material when windlocks are required to meet specified wind load. Top of inner and outer guide angles to be flared outwards to form bellmouth for smooth entry of curtain into guides. Provide removable guide stoppers to prevent over travel of curtain and bottom bar. Top 16 1/2" (419.10 mm) of coil side guide angles to be removable for ease of curtain installation and as needed for future curtain service.
 - 1. Finish:
 - a. Steel: Phosphate treatment followed by baked-on polyester powder coat, color as selected by Architect from manufacturer's standard color range, minimum 32 colors; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better.

2.

- C. Counterbalance Shaft Assembly:
 - 1. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot (2.5 mm per meter) of width.
 - 2. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs (110 N). Provide wheel for applying and adjusting spring torque.
- D. Brackets: Fabricate from minimum 3/16 inch (5 mm) steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.
 - 1. Finish:
 - a. Phosphate treatment followed by baked-on polyester powder coat, color as selected by Architect from manufacturer's standard color range; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better.
- E. Hood: 24 gauge stainless steel with reinforced top and bottom edges. Provide minimum 1/4 inch (6.35 mm) steel intermediate support brackets as required to prevent excessive sag.
 - 1. Finish:
 - a. GalvaNex™ Coating System and phosphate treatment followed by baked-on polyester powder coat, [color as selected by Architect from manufacturer's standard color range, minimum 32 colors] [custom color as selected by Architect]; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better.
- F. Weatherstripping:
 - 1. Bottom Bar, Motor Operated Doors: Weather/sensing edge with neoprene or rubber astragal extending full width of door bottom bar.
 - 2. Guides: Replaceable vinyl strip on guides sealing against fascia side of curtain.
 - 3. Lintel Seal: Nylon brush seal fitted at door header to impede air flow.
 - 4. Hood: Neoprene/rayon baffle to impede air flow above coil.

2.03 ACCESSORIES

- A. Locking: Keyed to Owner's existing system.
- B. Masterkeyable cylinder operable from side of bottom bar. Keyed to new door hardware.
- C. Operator and Bracket Mechanism Cover: Provide 24 gauge galvanized steel sheet metal cover to enclose exposed moving operating components at coil area of unit. Finish to match door hood.

2.04 OPERATION

- A. Provide electric opener and wall mounted keypad switch.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings.
- B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.
- C. Commencement of work by installer is acceptance of substrate.

3.02 INSTALLATION

- A. General: Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports.
- B. Follow manufacturer's installation instructions.

3.03 ADJUSTING

- A. Following completion of installation, including related work by others, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion.

3.04 CLEANING

- A. Clean surfaces soiled by work as recommended by manufacturer.
- B. Remove surplus materials and debris from the site.

3.05 DEMONSTRATION

- A. Demonstrate proper operation to Owner's Representative.
- B. Instruct Owner's Representative in maintenance procedures.

END OF SECTION

SECTION 08 4200

ALUMINUM ENTRANCES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Aluminum doors and frames and glazed lights.
- B. Glass and infill panels
- C. Anchors, brackets and attachments.
- D. Door hardware including weather-stripping and thresholds excluding cylinder in lock.
- E. Perimeter sealant.

1.02 PERFORMANCE

- A. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170° F without causing detrimental effects to system or components.
- B. Design and size members to withstand dead loads and live loads caused by pressure and suction of wind as calculated in accordance with applicable codes.
- C. Limit mullion deflection to 1/200, or flexure limit of glass with full recovery of glazing materials, whichever is less.
- D. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture within system, to exterior.
- E. Limit air infiltration through assembly of 0.06 cu ft/min/sq ft of assembly surface area, measured at a referenced differential pressure across assembly of 0.3 inches water gage.
- F. System to accommodate, without damage to system or components, or deterioration of perimeter seal: Movement within system: movement between system and perimeter framing components: dynamic loading and release of loads: and deflection of structural support framing.

1.03 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Division 1.
- B. Include system and component dimensions; components within assembly; framed opening requirements and tolerances; anchorage and fasteners; glass and infills; door hardware requirements; and affected related work.
- C. Submit manufacturer's installation instructions under provisions of Division 1.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver and handle system components under provisions of Division 1.

- B. Store and protect system components under provisions of Section Division 1.
- C. Provide wrapping to protect prefinished aluminum surfaces.

1.05 WARRANTY

- A. Provide one-year manufacturer's warranty under provisions of Division 1.
- B. Warranty: Cover complete system for failure to meet specified requirements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Special-Lite shall be used as manufacturer on the Base Bids all other manufacturers shall be bid as Voluntary Alternates.

2.02 MATERIALS

- A. Drawings and specifications are based upon systems as manufactured Special-Lite. All new exterior doors shall be Special-Lite SL-17 with FRP panels. Color by Architect.
- B. Extrusions: 6063-T5 alloy and temper (ASTM b221 alloy G.S. 10A-T5)
- C. Fasteners: Where exposed shall be aluminum, stainless steel, or zinc plated in accordance with ASTM A 164. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from the aluminum.
- D. Glazing Gaskets: Elastomeric extrusions.

2.03 FABRICATED COMPONENTS

- A. Frames: In sizes and profiles as shown on the Drawings, thermally broken with interior portion of frame insulated from exterior portion, flush glazing stops. Frames for interior glazing need not be thermally broken.
- B. Doors: In sizes and profiles as shown on the Drawings with beveled glazing stops.

2.04 GLASS AND GLAZING MATERIALS

- A. Glass and Glazing Materials: As specified in Section 08 8000.
- B. Glass: As called for on the Drawings and in accordance with all applicable codes.

2.05 HARDWARE

- A. Weather-stripping, Sill Sweep Strips, Thresholds, Hinges: Manufacturer's standard type to suit application
- B. Weather-stripping: Non-porous polymeric material.
- C. Threshold: Extruded aluminum, one piece per door opening, ribbed surface. Provide non-reducer type threshold one interior side of threshold where quarry tile is scheduled so it will butt square to tile.

- D. All other hardware: In styles as called for in Door Schedule on Drawings.
- E. Cylinder in lock furnished and installed by Section 08 7100 – Door Hardware.

2.06 FABRICATION

- A. Fabricate doors and frames allowing for minimum clearances and shim spacing around perimeter of assembly, yet enabling installation.
- B. Rigidly fit and secure joints and corners with screw and spline. Make joints and connections flush, hairline, and weather proof.
- C. Develop drainage holes with moisture pattern to exterior.
- D. Prepare components to receive anchor devices. Fabricate anchorage items.
- E. Arrange fasteners, attachments, and jointing to ensure concealment from view.
- F. Prepare components with internal reinforcement for door hardware.

2.07 FINISHES

- A. Finishes shall be in accordance with the door and window schedules on the Drawings.
- B. Hardware finishes shall match frame finish
- C. FRP panel color selection shall be by the Architect.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section
- B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

- A. Install doors, frames, glazing and hardware in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely attach frame assembly to structure.
- C. Align assembly plumb and level, free of warp and twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- D. Install sill flashings.
- E. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- F. Install hardware using templates provided.

- G. Install glass in accordance with Section 08 8000, using exterior dry method of glazing.
- H. Install perimeter type sealant, backing materials, and installation requirements in accordance with Section 07 9200.
- I. Adjust operating hardware.
- J. Repair all scratches or marks to match factory finish.

3.03 CLEANING

- A. Remove protective material from prefinished aluminum surfaces.
- B. Wash down exposed surfaces using a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Hardware for aluminum entrances and hollow steel doors.
- B. Thresholds.
- C. Gasketing.
- D. All hardware as specified on Door Schedule.

1.02 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

- A. Furnish templates to door and frame fabricators.

1.03 COORDINATION

- A. Coordinate work of this Section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware.

1.04 QUALITY ASSURANCE

- A. Manufacturers: Companies specializing in manufacturing door hardware with minimum 5 years-experience.
- B. Hardware Supplier: Company specializing in supplying commercial door hardware with 5 years' experience.

1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable codes for requirements applicable to fire rated doors and frames.

1.06 SUBMITTALS

- A. Submit schedule, shop drawings, and product data under provisions of Division 1.
- B. Indicate locations and mounting heights of each type of hardware.
- C. Provide product data on specified hardware.
- D. Submit manufacturer's certificate under provisions of Division 1 that fire rated hardware meets or exceeds specified requirements.

1.07 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Division 1.
- B. Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 1.
- B. Store and protect products under provisions of Division 1.
- C. Package hardware items individually. Label and identify package with door opening code to match hardware schedule.
- D. Deliver keys to Owner by security shipment direct from hardware supplier.
- E. Protect hardware from theft by cataloging and storing in secure area.

1.09 WARRANTY

- A. Provide 1-year warranty under provisions of Division 1.
- B. Provide manufacturer's standard warranty under provisions of Division 1.

1.10 MAINTENANCE MATERIALS

- A. Provide special wrenches and tools applicable to each different or special hardware component.
- B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 PRODUCTS

2.01 ACCEPTABLE SUPPLIERS - PER DOOR SCHEDULE ON PLANS

- A. Locksets – Schlage, Sargent
- B. Closers – LCN
- C. Hinges - Stanley, McKinney, Hager
- D. Stops, Holders, Flush Bolts: Glynn-Johnson, Ives.
- E. Exit Devices - Von Duprin, Sargent
- F. Gasketing/Weatherstripping: Pemco.
- G. Substitutions: Under provisions of Division 1.

2.02 KEYING

- A. Match Owner's existing keying system.
- B. Day keyed and Master keyed, coordinate with Owner's existing keying system.
- C. Supply 2 keys for each lock.

2.03 FINISHES

- A. Finishes are identified in the Door Schedule on the Drawings.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.
- B. Verify that power supply is available to power operated devices.
- C. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions.
- B. Use the templates provided by hardware item manufacturer.
- C. Conform to ANSI A117.1 for positioning requirements for the handicapped.

END OF SECTION

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SECTION 09 5300

SUSPENDED ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish all materials, labor and equipment necessary to install all suspended acoustical ceilings as called for on the Drawings or herein specified.

1.02 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacture of ceiling suspension system and ceiling tile with 5 years minimum experience.
- B. Installer: Company with 5 years minimum experience approved by manufacturer.

1.03 SUBMITTALS

- A. Provide product data on metal grid system components, and acoustic units.
- B. Submit manufacturer's installation instructions under provisions of Division 1.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Maintain uniform temperature of minimum 60 degrees F, and humidity of 20 to 40 percent prior to, during, and after installation.

1.05 SEQUENCING/SCHEDULING

- A. Coordinate all work with the HVAC work above the new ceilings being performed by others.
- B. Do not install acoustical ceilings until dust generating activities have terminated, and overhead work is completed, tested, and approved.

1.06 EXTRA STOCK

- A. Supply two unopened cartons of each tile used to the Owner.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - SUSPENSION SYSTEM

- A. Chicago Metallic.
- B. Armstrong.
- C. United States Gypsum.
- E. Substitutions: Under provisions of Division 1.

2.02 SUSPENSION SYSTEM MATERIALS

- A. Grid: Product: Rockfon Chicago Metallic 1260 Aluminum Cap 15/16" Flat White. ASTM C635, intermediate duty,
- B. Accessories: Stabilizer bars, clips, splices and edge moldings required for suspended grid system.
- C. Support Channels and Hangers: Steel; size and type to suit application, to rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1/360.
- E. Angle Moldings: Match grid materials.

2.03 ACCEPTABLE MANUFACTURERS - ACOUSTIC UNITS

- A. As called for on drawings.
- B. Substitutions: Under provisions of Division 1.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that existing conditions are ready to receive work.
- B. Verify that layout of hangers will not interfere with other work.
- C. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

- A. Install system in accordance with ASTM C636 and manufacturer's instructions.
- B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.
- C. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.
- D. Hang system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- F. Center system on room axis leaving equal border units according to reflected ceiling plan.
- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Do not eccentrically load system, or produce rotation of runners.

- I. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions. Field rabbet tile edge. Where bullnose concrete block corners and round obstructions occur, provide preformed closers to match edge molding.
- J. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.
- K. Install acoustic units level, in uniform plane, and free from twist, warp and dents, or as shown on the Drawings.

3.03 CLEAN-UP

- A. Remove and dispose of all debris from work area and leave in clean workmanlike manner.

END OF SECTION

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SECTION 10 1116

MARKERBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish all material, labor, and equipment necessary to complete all markerboards as shown on the Plans and herein specified.

1.02 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Division 1.
- B. Indicate on shop drawings, wall elevations, dimensions, joint locations, special anchor details and all accessories.
- C. Submit samples under provisions of Division 1.
- D. Submit manufacturer's installation instructions under provisions of Division 1.

1.03 MAINTENANCE DATA

- A. Submit maintenance data under provisions of Division 1.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Markerboards: Basis for this Specification: "Claridge" LCS No. 24-216-A.
- B. Acceptable Manufacturers with Equal Products:
 - 1. Greensteel.
 - 2. Lemco.
- C. Substitutions: Under provisions of Division 1.

2.02 MATERIALS

- A. Markerboards shall have porcelain enamel finish, minimum 24 ga. enamel grade steel sheet, laminated to core with .015" aluminum sheet backing bonded to core. Writing surface shall comply with "Recommended S-104 for Porcelain Enameled Chalkboards" by Porcelain Enamel Institute, Inc.
- B. Panel Core: 1/2 in. Duracore.
- C. Panel Backing: Aluminum Sheet .015 in. thickness.
- D. "Shadow Line" trim shall be extruded anodized aluminum 6063-T5 Alloy with satin finish chalk trays, joining, jamb and head pieces as required with combination map, display and grip strip feature rail.

- E. Provide "Hang-Tight Rail System" along entire length of the top rail of the markerboard with one combination map hook and paper holder for each 3 feet of rail but not less than 2 per markerboard.
- F. Provide display rail with one combination holder for each 3 feet of rail and not less than 2 per rail.
- G. Provide 1 flag holder per markerboard.
- H. Provide 12 LCS markers and one felt eraser per markerboard.
- I. Colors by Architect.
- J. Sizes as specified on Plans.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that surfaces and internal wall blocking are ready to receive work, and opening dimensions are as indicated on shop drawings.
- B. Beginning of installation means acceptance of existing surfaces.

3.02 INSTALLATION

- A. Install boards in strict accordance with manufacturer's instructions.
- B. Establish top of rail height above finished floor as directed by the Architect and/or Owner.
- C. Secure units level and plumb.

3.03 CLEANING

- A. Clean board surfaces in accordance with manufacturer's instructions.
- B. Cover board surfaces with protective cover, taped to frame.
- C. Remove protective cover at Date of Substantial Completion.

END OF SECTION

SECTION 10 2113

PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Furnish all labor, materials, and equipment necessary to complete all toilet compartment and partition work as shown on the Plans and herein specified.

1.02 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Division 1.
- B. Indicate on shop drawings, partition plan and elevation views, dimensions, details of supports, and door swings.
- C. Provide product data on panel construction, hardware, and accessories.
- D. Submit manufacturer's installation instructions under provisions of Division 1.
- E. This contractor shall furnish a certificate of compliance attesting that the steel used conforms to the specified requirements.

1.03 WARRANTY

- A. Provide manufacturer's standard warranty.

PART 2 PRODUCTS

2.01 DESCRIPTION

- A. Floor mounted overhead braced toilet compartments.
- B. Floor mounted overhead braced ADA compliant toilet compartments.

2.02 ACCEPTABLE MANUFACTURERS

- A. ASI Global Partitions
- B. Sanatec Industries, Inc.
- C. Stranton Products
- D. Substitutions: Under provisions of Division 1.

2.03 MATERIALS

- A. Doors, panels and pilasters shall be 1" thick with homogeneous color throughout, constructed from High Density Polyethylene (HDPE) resins. Partitions shall be fabricated from polymer resins compounded under high pressure, forming a single component section which is waterproof, nonabsorbent and has a self-lubricating surface that resists marks from pens, pencils, markers and other writing instruments. All plastic components shall be covered with a protective plastic masking.

2.04 CONSTRUCTION

- A. Doors, panels and pilasters shall be 1" thick with all edges rounded to a 1/4" radius.
- B. Doors and dividing panels shall be 55" high and mounted at 14" above the finished floor. An aluminum heat sink may be fastened to the bottom edges (optional).
- C. Pilasters shall be 82" high (standard) and fastened into a 3" high pilaster shoe with a stainless steel, one-way sex bolt.
- D. Must meet all ADA regulations.

2.05 HARDWARE

- A. Door hardware shall be as noted:
 - 1. Hinges shall be 8" and fabricated from heavy-duty extruded aluminum (6463-T5 alloy) with a bright dip anodized finish with wrap-around flanges, surface mounted and through bolted to doors and pilasters with stainless steel, one-way sex bolts. Hinges operate with field adjustable nylon cams. Cams can be filed set in 30" increments.
 - 2. Door strike/keeper shall be 6" long and made of heavy-duty extruded aluminum (6436-T5 alloy) with a bright dip anodized finish, with wrap-around flanges that are at least 5/32" wall thickness, and secured to the pilasters with stainless steel, one-way sex bolts. Bumper shall be made of extruded black vinyl.
 - 3. Latch and housing shall be made of heavy-duty extruded aluminum (6463-T5 alloy). The latch housing shall have a bright dip anodized finish, and the slide bolt and button shall have a black anodized finish.
 - 4. Each door shall be supplied with one coat bumper/hook made of chrome plated zamak. Outswing doors shall be supplied with one door pull and one door stop made of chrome plated zamak.
- B. Pilaster shoes shall be 3" high (type 304, 20 gauge) stainless steel, secured to the pilaster with a stainless steel, one-way sex bolt.
- C. Wall brackets shall be continuous type made of heavy-duty aluminum (6463t-5 alloy) with a bright dip anodized finish. Brackets shall be fastened to pilasters and panels with stainless steel, one-way sex bolts.
- D. Headrail shall be made of heavy-duty extruded aluminum (6463T-5 alloy) with anti-grip design and a curtain track integrated into its design. The headrail shall have a bright dip anodized finish and shall be fastened to the headrail bracket by a stainless steel, one-way sex bolt, and fastened to the tops of pilasters with stainless steel, tamper resistant torx screws.
- E. Headrail brackets shall be 16 gauge stainless steel with a satin finish, and secured to the wall with #14 stainless steel screws.
- F. All hardware in ADA accessible compartments must be ADA compliant.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify correct spacing of plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing, where required.
- D. Beginning of installation means acceptance of existing surfaces.

3.02 INSTALLATION

- A. Install partitions secure, plumb, and level in accordance with manufacturers' instructions.
- B. Attach panel brackets securely to walls using anchor devices.
- C. Attach panels and pilasters to bracket with through sleeve tamperproof bolts and nuts. Locate headrail joints at pilaster center lines.
- D. Equip each door with two hinges, one door latch, and one coat hook and bumper.
- E. Install door strike and keeper with door bumper on each pilaster in alignment with door latch.
- F. Adjust hinges to bring doors to rest in partial opening, of approximately 30 degrees. Return outswing doors to close position.
- G. Lubricate hardware for proper operation.

3.03 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors.

3.04 CLEANING

- A. Remove protective maskings. Clean surfaces.
- B. Field touch-up of scratches or damaged finishes will not be permitted.
- C. Replace damaged or scratched materials and with new materials.

END OF SECTION

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SECTION 10 2813

TOILET ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Furnish all labor, materials, and equipment necessary to complete all toilet accessories as called for on the Drawings and herein specified.

1.02 SUBMITTALS

- A. Submit product data under provisions of Division 1.
- B. Provide product data on accessories describing size, finish, details of function, attachment methods.
- C. Submit manufacturer's installation instructions under provisions of Division 1.

1.03 KEYING

- A. Supply keys for each accessory to Owner.

1.04 REGULATORY REQUIREMENTS

- A. Conform to applicable codes for installing work in conformance with ANSI A117.1.

1.05 SEQUENCING AND SCHEDULING

- A. Coordinate the work of this Section with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

PART 2

2.01 MANUFACTURERS - ACCEPTABLE MANUFACTURERS OFFERING EQUAL PRODUCTS HEREIN SPECIFIED:

- A. Bradley
- B. Bobrick
- C. McKinnley Parker
- D. ASI

2.02 PRODUCTS

- A. See toilet accessory schedule on drawings.
- B. Shower Rods: Bobrick B6107 Stainless Steel Finish with flanges as shown on the drawings; provide tamper proof type mounting kits and anchoring devices appropriate for type of wall construction.
- C. Mirrors: Bradley Model 780 mirror in sizes as shown on drawings.

- D. Grab Bars: Bradley Model 8120, Standard Stainless Steel Finish: Size as shown on the Drawings; provide tamper proof type mounting kits and anchoring devices appropriate for type of wall construction.
- E. Substitutions: Under provisions of Division 1.

2.03 FABRICATION

- A. Fabricate all toilet accessories of Type 304 stainless steel, satin finish, unless otherwise noted.
- B. Furnish all fastening devices, including screws, bolts, anchors, and back plates. Match exposed portions of fastening devices with that of accessories.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that site conditions are ready to receive work and dimensions are as indicated on shop drawings.
- B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site at appropriate time for building-in.
- B. Provide templates and rough-in measurements as required.
- C. Verify exact location of accessories for installation.

3.03 INSTALLATION

- A. Provide steel anchor plates, adapters and anchor components required for installation by manufacturer.
- B. Install fixtures, accessories and items in accordance with manufacturers' instructions.
- C. Install plumb and level, securely and rigidly anchored to substrate in accordance ADA Requirements.

END OF SECTION

SECTION 11 3100

RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Cooking appliances, kitchen exhaust ventilation, refrigeration appliances, and laundry appliances.

1.02 SUBMITTALS

- A Comply with Submittal Procedures under provisions of Division 1.
- B Product Data for each type of product.
 - 1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- C Sample Warranties: For manufacturers' special warranties.

1.03 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.04 DELIVERY, STORAGE AND HANDLING

- A Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B Store materials in a clean dry area in accordance with manufacturer's instructions.

1.05 WARRANTY

- A Manufacturer's Warranty: Manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.

PART 2 PRODUCTS

2.01 CLOTHES WASHER AND DRYER

- A Clothes Washer: Commercial hardmount washer-extractor, electric, 60-lb. capacity – Huebsch, HCT060,.
- B Clothes Dryer: Commercial tumble front-load dryer, electric, 75-lb capacity – Huebsch, HT075.

2.02 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.
- C. Examine walls, ceilings, and roofs for suitable conditions where overhead exhaust hoods will be installed.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install appliances according to manufacturer's written instructions.
- B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- D. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

3.03 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 - 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After installation, start units to confirm proper operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

B An appliance will be considered defective if it does not pass tests and inspections.

C Prepare test and inspection reports.

3.04 DEMONSTRATION

A Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances.

END OF SECTION

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SECTION 12 3216

MODULAR LAMINATE CASEWORK, CUSTOM CASEWORK AND SOLID POLYMER FABRICATIONS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish all materials, labor, and equipment necessary to furnish and install all production manufactured modular laminate casework, custom casework and solid surface counters and window sills including all supports, shelving, and filler panels as shown on the Drawings and herein specified.

1.02 STANDARD OF QUALITY

- A. All products shall meet or exceed products as specified and manufactured by Stevens Industries, Inc.
- B. All materials and workmanship shall be guaranteed for one year from the date of installation. Defects reported within the guarantee period will be corrected without charge.

1.03 SUBMITTALS

- A. Comply with Division 1.
- B. Product Data: Submit casework manufacturer's catalog showing casework construction details, and materials and hardware used.
- C. Submit two chip chains of casework manufacturer's standard decorative laminates.
- D. Submit one set of shop drawings showing plan views, elevations, cross-sections, service runs, and all required blocking by others.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver casework and counters only after submittal data is approved and field conditions have been verified.
- B. Deliver casework and counters only after building is secure and dry.
- C. Store materials in a ventilated place, protected from the weather with relative humidity of 60% or less at 75 degrees F.
- D. Protect finished surfaces from soil and damage during handling and installation.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Advanced Cabinet Systems, Marion, IN
- B. Boardworks, Valparaiso, Indiana
- C. Milestone Cabinetry & Millwork
- D. Phil Konrad & Sons, Knox, Indiana

- E. Precision Millwork & Plastics, South Bend, Indian
- F. Precision Wood Products, Mishawaka, Indiana
- G. Stevens Cabinet Co., Inc.
- H. Top Design
- I. Substitutions: Under provisions of Division 1.

2.02 MATERIALS

- A. Decorative laminate casework shall meet or exceed the minimum requirements established by Architectural Woodwork Institute (AWI) Quality Standard 1600/1600B for Reveal Overlay Modular Casework. Specific requirements set forth within this specification shall take precedence over the AWI Standard.
- B. All cabinetry shall be equal to Stevens 1200 Series cabinets as manufactured by Stevens Cabinet Co., 704 W. Main, Teutopolis, Illinois, 62467 featuring impact resistant 3mm PVC edged full-overlay doors and drawer fronts, cabinet members, and shelves and fully concealed hinge 3 way adjustable with contour pull.
- C. Cores shall be particleboard of at least 45-pound density and meet or exceed ANSI A20B.1, Grade 1-M-2. All shall be of balanced construction; that is: both faces are surfaced with a melamine laminating material.
- D. End Panels shall be 3/4" thick.
- E. Bottoms and Tops shall be:
 - 1. For base and tall cabinets 3/4", and
 - 2. Wall mounted cabinets 1" thick.
- F. Cabinet Backs if unexposed shall be 1/4" thick and if exposed 3/4" thick.
- G. Doors shall be 3/4" thick.
- H. Drawers shall be 5/8" thick 48# fiberboard on both sides and ends and 1/4" thick fiberboard bottom.
- I. Shelves under 36" long shall be 3/4" thick and over 36" long 1" thick except all bookcases and wall cabinets shall have 1" thick shelves. Shelves less than 36" shall have one adjustable shelf, over 36" high shall have one additional adjustable shelf for each additional one foot of height, i.e. 36" two adjustable shelves, 48" three adjustable shelves, etc.
- J. Frame Rails shall be 3/4" thick.
- K. Joiners - corners and edge joints shall be glued and clamped and reinforced using fluted dowels. This shall be typical for end panels, bottoms and tops, drawers, and frame rails.
- L. Drawer bottoms and cabinet backs shall be trapped in grooves cut into sides and ends or top and bottom. Drawers shall also incorporate mechanical fasteners.
- M. Wall mounted cabinets shall also be provided with a laminated support rail mechanically fastened to the upper back for hanging.

- N. End panels shall be one piece of material and for tall and base units shall extend fully to the floor for structural integrity.
- O. Sub-bases shall be 4" high and recessed from the front edge. They shall be mechanically fastened to the cabinetry bottom and ends.
- P. Counters shall be ½" Corian, price group equal to the color "Sahara", glued to ¾" particleboard with side and backsplashes as shown.
- Q. Window sills shall be ½" Corian, price group equal to the color "Sahara", with a 1" thickened front edge and ½" drop.
- Q. Surfaces shall be of the high-pressure plastic laminate type of suitable grade for the intended use. Plastic laminating material shall be equal to premium or standard laminates as manufactured by Wilsonart. Laminating material shall meet appropriate NEMA Standards for fabrication, durability, etc. Minimum thickness shall be .050" for horizontal surfaces and .030" for vertical surfaces. Bonding shall be accomplished by means of pressure and heat.

Interior and concealed faces shall be a neutral "putty" color and exterior and other exposed surfaces shall be selected from the cabinet manufacturer's standard available line. A minimum of three (3) colors plus putty shall be allowed with selection by Architect and Owner.

Edging shall be 3mm PVC edging as typical of the cabinet style. Color shall be selected from the manufacturer's standard colors.

2.03 HARDWARE

- A. Hinges shall be fully concealed 165° hinges with self-closing spring feature, die cast bosses and 3-way adjustability.
- B. Latches shall be spring roller type mounted at the top or bottom edge of the door except doors 48" or more in height shall have latches at top and bottom. Strike plate and roller shall be molded nylon, delrin or similar engineering grade plastic.
- C. Locks shall be disc tumbler type. Lock shall be installed where shown on Drawings. Key locks per the drawings.
- D. Shelf support clips shall be molded nylon capable of engaging 2 holes for each clip. Shelves shall be adjustable at not less than one (1) nor more than two (2) inch intervals.
- E. Pulls shall be molded semi recessed. Color to be almond, grey or black. Pulls shall be accurately and securely mounted. Selection of color and style shall be by Owner.
- F. Drawer Slides shall be steel with ball bearing nylon rollers. Slides shall be of 100-pound capacity.
- G. Hanger Rods shall be plated steel, 1" min. dia. secured by metal or molded sockets.

2.04 FABRICATION

- A. Fabricate casework to ensure durable and rigid unit and to permit plumb and level site installation.
- B. Align adjoining units for site assembly modules, to achieve tight hairline joints.
- C. Prepare units with anchor devices to permit ease of site assembly.
- D. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings. Verify locations of cutouts from on-site dimensions.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Set and secure casework in place rigid, plumb, and level ready to receive counters.
- B. Use purpose designed fixture attachments for wall-mounted components.
- C. Use threaded steel concealed joint fasteners to align and secure adjoining cabinet units.
- D. Carefully scribe casework which abuts other building materials, leaving gaps of 1/32 inch (one maximum). Do not use additional overlay trim for this purpose.
- E. Installers shall leave the casework properly adjusted and operable items shall work smoothly and freely.
- F. Installers shall leave area clean and free of all debris, trash, dust, and ready for occupancy without further attention.

END OF SECTION

SECTION 22 1000

PLUMBING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish all labor materials and equipment necessary to install domestic water service, sanitary sewer service, and storm water service as indicated on the plans and/or hereinafter specified including trenching and backfilling required for below grade piping.
- B. Whether specifically called for or not, all work and systems shall be complete in every respect with this Contractor furnishing all items required to complete the work and leaving same in first class working condition fully guaranteed against defective materials and workmanship.
- C. Whether specifically shown or not, all plumbing and sanitary work shall be done in strict accordance with the governing rules, regulations, building codes and/or rules of the affected utility companies.
- D. Furnish all permits and pay all fees as may be required including any excessive length charges and all federal or state taxes.

1.02 QUALITY ASSURANCE

- A. All work shall be in full accordance with the Indiana Plumbing Code.
- B. All work shall be warranted for a period of one year from Date of Final Acceptance of building.

1.03 DISINFECTION OF WATER DISTRIBUTION SYSTEM

- A. Upon completion of all testing and closure of leaks, water system shall be sterilized in accordance with the requirements of the State Board of Health. Furnish copy of Sterilization Test Results.

1.04 PLUMBING PIPING

- A. Work Included
 - 1. Water pipe and pipe fittings
 - 2. Valves
 - 3. Sanitary sewer piping system
 - 4. Storm sewer piping system
- B. Piping General
 - 1. All piping materials shall be new and of American manufacture. Full lengths of pipe shall be used as much as possible.

C. Domestic Water Piping

1. Water main and building service pipe before meter: Below grade above 2" diameter Ductile Iron Pipe, Class 52 Ductile Iron. All pipe is required to be restrained in accordance to the EBBA Iron restrained joint program. The required joints are to be restrained with assemblies equal to the US pipe fieldlok gasket or mega lug retainer glands. All valves are to be resilient wedge gate valves. All pipes and fittings must be equal to or greater than the standards specified by American Water Works Association. Install all new ductile iron pipe per the local governing water department's recommendations including all required thrust blocks.
2. Below grade 2" in diameter and under and all pipe below grade within the building except water service pipe before meter: Type K soft copper of sizes as shown on plans, with no joints below concrete floor as much as possible. If joint below floor is required, use silver solder.
3. Above grade: Type L hard drawn copper sweated or flanged of sizes as shown of the plans except for water service pipe before meter.
4. Any connection between copper water piping and any ferrous metal piping shall be made with di-electric fitting.

D. Valves

1. All valves shall be equal to Watts – FBV Series ball valves bronze 2 piece.
2. All ball valves for plumbing piping system shall be Watts, NIBCO, Milwaukee.
3. All valves be full port, 100% flow of piping.
4. Each branch from the main piping shall have a valve.
5. Tag all valves for system type (i.e. Hot Water, etc.).

E. Sanitary Sewer Piping

1. Below grade:
 - a. Within building: all sanitary and waste piping within the building and to 5'-0" beyond the building exterior wall shall be PVC Schedule 40
 - b. Beyond building wall: all sanitary and waste piping beyond 5'-0" of the exterior walls shall be PVC Schedule 40 or as required by the local governing body.
2. Above grade: waste and vent lines above grade shall be PVC Schedule 40

F. Storm Piping

1. Below grade within building: PVC Schedule 40

2. Below grade beyond building: PVC Schedule SDR-35 up to 12" diameter piping or as required by the local governing body. Larger than 12" shall be reinforced concrete.
- or
- Hancor Sur Lok 10.8 pipe with smooth interior or as required by the local governing body.
- or
- ADS-N-12 Types or as required by the local governing body.
3. Above grade: PVC Schedule 40.
4. Downspout Boots: Provide PVC downspout boots to transition from the storm pipe to the rectangular downspouts.

1.05 EXCAVATION AND BACKFILLING

- A. This contractor shall do all necessary excavation, trenching and backfilling as required for this work.
- B. Bottom of excavations shall be true to grade so that pipes will be supported on a solid bed of undisturbed earth.
- C. The sides of all trenches shall be properly protected against cave-ins. Trenches shall be of proper width and depth for piping required.
- D. No clay material shall be used for backfilling within building or under any walks or paving.
- E. All backfilling within building or under any walks or paving shall be with clean sand in maximum 6" lifts properly compacted to 95% density and free from any frozen materials.
- F. No piping trenches shall be backfilled until all required tests have been performed and until all inspections have been made.
- G. Contractor shall provide and maintain any barricades or protective devices at any open excavations until properly backfilled to grade.

1.06 INSTALLATION OF PIPING AND EQUIPMENT

- A. Sanitary, Storm Piping and Water Piping
1. Piping must be run so as not to interfere with work of other trades. Where offsets are necessary to avoid other work, same shall be made as directed by the Architect.

2. All changes in direction of soil and waste piping shall be made with long sweep fittings where space permits.
3. Off-sets to be made with 45 degree fittings making due allowance for expansion.
4. Horizontal sewer lines shall pitch a minimum of 1/8" per foot outside building.
5. Provide cleanouts with brass clean-out screw at every turn and angle on all soil and waste piping and install cleanouts every 50 to 60 feet in straight runs, depending on building conditions. Keep cleanouts out of passageways as much as possible.
6. Cleanouts shall also be installed at the base of all risers where they connect to horizontal runs.
7. The plans show the general arrangement of all pipes, ductwork, conduits, fixtures, etc. Contractor shall make all necessary adjustments.
8. The contractor shall examine the drawings and specifications very carefully and notify the Architect by letter of any discrepancies so same can be rectified at an early date.
9. Contractor shall follow the plans as closely as possible for installation of piping.
10. Use proper solvent, cleaner and sandpaper for all PVC fittings and connections, properly twisting all pipe to "set".
11. Furnish to General Contractor all sleeves one pipe size larger for all piping passing through walls or floors and locate height, width and location where sleeve should be placed.
12. Cleanouts
 - a. Cleanouts on sewers under floor shall be made with "Y's". Extension shall be brought up to floor level and capped with brass cleanout screw.
 - b. Cleanouts in finished floors shall be installed in brass cleanout boxes with flush covers of approved type. Use Wade #W-81 OOF., or equal of Zurn, Josam or J.R. Smith. All cleanouts shall be located in readily accessible locations for easy removal. In finished areas covers wall clean outs shall be chrome plated.
 - c. Cleanouts in exterior areas shall be made with "Y's" and extension brought up to grade level and capped with cast iron top brass plug. Cleanout to be Wade #W-8190 or equal of Zurn, Josam or J.R. Smith.
 - d. Furnish and install cleanouts in exterior building sewer lines every 100'.

- e. Furnish and install cleanouts where exterior building sewer lines connect to interior building drain lines.

13. Pipe Hangers

- a. All pipe lines shall be supported on adjustable hangers on not over 8 ft. centers for 1/2" through 1" pipe, 10 ft. centers for 1-1/4" through 3" pipe, and 12 ft. centers for 4" pipe and up.
- b. All vertical pipes shall be supported at least once in each story height with clamps. Riser clamps to be Elcen Fig. #39.
- c. All pipe hangers for hot, cold piping to be insulated shall be Elcen Fig. #12 with Fig. #221 through #226 saddles as required for hot piping. For cold piping use Elcen Fig. #240A saddles.
- d. Beam clamps shall be Elcen Fig. #33.
- e. Size of pipe hanger rods shall be 1/4" pipes up to 2", 3/8" for pipes 2-1/2" to 3", and 1/2" for pipes 4" and larger.
- f. Where supporting copper piping use copper plated clamps, rods and hangers, same as above.
- g. Trapeze hangers shall be Crawford Fig. #45.
- h. Install inserts in concrete construction for each pipe hanger. Single inserts shall be Crawford Fig. #282, group inserts shall be Crawford Fig. #148.
- i. Hangers and inserts shall be as manufactured by Elcen, Crawford, Grinnell or Blaw Knox.

14. Plates

- a. Where pipes pass exposed though finished walls, partitions or ceilings provide chrome plated cover plates, Crane #20. Use Fee and Mason #2840 on pipes projecting above the floor.

15. Vent Lines and Flashing

- a. All vents to extend 12" above the roof line and be provided with regular roof connection to receive flashing made for this purpose.
- b. Flash properly down on roof using 6 lb. sheet lead extending 12" on all sides of pipe and make the connection watertight.
- c. Off-set pipes away from parapet wall to permit flashing 12" from wall.

16. Traps

- a. Each fixture, floor drain, and all pieces of equipment requiring trap except fixtures with integral traps shall be separately trapped.

- b. The traps shall be placed as near to the fixture as possible, and no fixture shall be double trapped.

17. Water Piping

- a. All hot and cold water piping shall pitch up from headers and be so arranged as to be drained in pipe chase. Provide threaded drainage plugs.
- b. Gate valves shall be installed in all branch connections from the hot and cold water mains.
- c. Unions to be installed at all connections to equipment and at all automatic valves.

18. Pipe Cleaning

- a. Water piping: Inside of all lines shall be blown out with compressed air and flushed with detergent solution and rinsed with clean water prior to testing for leaks.
- b. All sewer lines shall be flushed with water and shall flow freely.
- c. Outside of all lines inside of building shall be cleaned to remove all grease, oil, pipe compound, plaster, mortar, etc. after lines have been successfully tested so as to facilitate pipe covering and painting.

19. Pipe Testing

- a. Water piping shall be tested with compressed air at a pressure of 150% normal working pressure or at 100 psi, whichever is greater.
- b. Waste, soil and vent piping shall be tested by capping opening and filling the entire system with water.
- c. All test shall be conducted for a period of 90 minutes or if system tightness is questionable, Architect may request an extended test period at no additional cost to the Owner.
- d. Any defects which develop during all piping test shall be remedied. Send letter in triplicate to the Engineer giving results of all tests.

1.07 PLUMBING FIXTURES

- A. Fixtures shall be new, free from defects and as listed in the Plumbing Fixture Schedule on the plans. All fixtures shall be set plumb, true and secure. Provide all chrome plated traps, supplies and hangers or carriers. Provide data to General contractor for location of all blocking within walls for supports.
- B. The Following Fixtures are as Listed Below
 - 1. Floor drains: Zurn ZN-415 cast iron floor drain. Provide nickel bronze drain in finished areas and rough brass drain and cleanout in unfinished

areas (Janitor's Closets or Storage Rooms). Pitch floor to drains minimum 1/8" per foot. Provide 4" PVC trap below floor drain.

2. Roof drains: Zurn ZC-100-C-EA adjustable roof drain with cast iron strainer properly flashed into roof compatible with roofing membrane system.
3. Hose Bibbs: Zurn A-1300 frost-proof, anti-siphon with nickel bronze cover and backflow preventer.
4. Backflow Preventer: Provide reduce pressure principle backflow preventer. Watts - 909-QT with ball valve shut offs and "Y" strainer.
5. Tempering Valve: Powers high-low manifold mixing and anti-scald valve, sized appropriately for the application by manufacturer with all gauges as required or approved equal by Leonard.
6. Expansion Tank: Provide expansion tank on hot water piping near the water heater sized according to manufacturer's recommendations.

B. Provide submittals as called for in Division 1.

1.08 INSULATION

- A. Provide insulated pipe covers on exposed piping below all wall hung lavatories and sinks per code.
- B. Insulate all horizontal domestic cold water piping above suspended ceilings.
- B. Insulate all domestic hot water piping above concrete floors on grade
- C. Insulate all horizontal and vertical storm water piping and all roof sumps with 1" thick fiberglass with vapor barrier and PVC fittings.
- D. Domestic water pipe insulation shall be 1/2" thick fiberglass with vapor barrier and PVC fittings for water piping 1/2" – 1 1/2" in diameter.
- E. Domestic water pipe insulation shall be 1" thick fiberglass with vapor barrier and PVC fittings for water piping 2" in diameter and above.

1.09 RECORD DRAWINGS

- A. Provide as-built piping layout to Architect for inclusion on his Record Drawings noting any deviations from plans. This must be provided before progress payments are made.

1.10 WARRANTY

- A. Provide minimum 1 year full warranty from date of final acceptance of building.

1.11 CLEAN-UP

- A. This contractor shall remove all debris and wrappings at the end of each day's work and shall keep the areas as neat as possible at all times. Remove all left over materials.

END OF SECTION

SECTION 23 05 00

MECHANICAL MATERIALS AND METHODS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and General Provisions of Contract, including General Conditions and Special Provisions, Division 1, apply to work of Division 23.
- B. This Section is a part of each Division 23 Section as applicable to the work specified therein.

1.02 DESCRIPTION OF WORK:

- A. Extent of mechanical work is indicated on drawings and/or specified in other Division 23 Sections.
- B. Supply labor, equipment, and material required for the complete installation and testing of the Mechanical systems, as shown on the contract documents.
 - 1. Ductwork, piping, and equipment demolition.
 - 2. Packaged rooftop heating, ventilation, and air-conditioning units.
 - 3. Roof-mounted exhaust fans.
 - 4. Ductwork, dampers, grilles, registers, diffusers, louvers, and accessories.
 - 5. Gas-fired suspended unit heaters, flues, and accessories.
 - 6. Installation of new gas-fired unit heaters.
 - 7. Ductwork, piping, and equipment insulation.
 - 8. Temperature control system.
 - 9. Natural gas service, piping, and accessories.
 - 10. Testing, adjusting, and balancing of systems.
 - 11. Other work shown or specified in Division 23 Sections.

1.03 DEFINITIONS:

- A. Phrase "exposed to view" indicates that pipes, ducts, and similar items so referenced, insulated or otherwise, are to remain visible (not concealed) in the completed structure.
- B. Phrases "in concealed spaces" or "not exposed to view" indicate that pipes, ducts, and similar items so referenced, insulated or otherwise, are concealed and not exposed to view and are within furred spaces, above suspended ceilings, in pipe chases, or similar enclosures.
- C. Phrases "unfinished spaces" and "unfinished rooms" refer to areas such as Storage Rooms, Mechanical Equipment Rooms, and similar spaces.
- D. Phrases "finished areas" and "finished rooms" refer to rooms or spaces such as offices, corridors, or similar inhabited areas.
- E. Phrase "piping" refers to all piping systems described within Division 23 specifications.

- F. Wherever the term "--this MECHANICAL DIVISION--" is used, such term means this DIVISION 23 and includes every section in DIVISION 23.
- G. Wherever the term "--provide--" is used, such term means that the mechanical trade shall furnish and install the subject equipment and/or material, or both.
- H. Whenever the term "--install--" is used, such term means that the mechanical trade shall install only the subject equipment and/or material, or both.
- I. Wherever the term "--furnish--" is used, such term means that the mechanical trade shall furnish only the subject equipment and/or material.

1.04 QUALITY ASSURANCE:

- A. Work shall be in complete accordance with codes, rules, or ordinances and regulations of authorities, bodies, associations, governments, etc. having proper and/or legal jurisdiction. Specifically, the following requirements shall be met in their entirety:
 - 1. State, federal, and local rules, regulations, codes, statutes, Life Safety Code, and ordinances.
 - 2. National Fire Protection Association - all applicable requirements.
 - 3. National Board of Fire Underwriters (U.L., Inc., label).
 - 4. National Electric Code - all applicable requirements.
 - 5. Other codes and standards as specifically noted in each Section of the contract documents.

1.05 TESTS AND INSPECTIONS:

- A. Conduct tests and inspections as specified and as required to assure proper installation and operation of systems. Do not allow work to be enclosed or concealed prior to required testing or observation. Where testing or inspections are required to be performed by others, cooperate fully therewith and provide safe access to components and systems as required.

1.06 MATERIALS AND CHANGES:

- A. It is intended that materials or products specified by the name of the manufacturer or the brand or trade name or the catalog reference shall be the basis of the estimate and furnished under the contract unless changed by mutual agreement.
- B. Where there are two (2) or more brands named, the choice of these shall be optional, subject to approval. Costs associated with the choice of equipment shall be covered by the Contractor.
- C. Changes in the work from the contract documents shall not be made unless written authorization for the change has been provided. Claim for an addition to or deduction from the contract sum shall not be valid unless so ordered.
- D. The materials required for the performance of the work shall be new and the best of their respective kinds and of uniform pattern throughout the work.

1.07 LAWS AND ORDINANCES:

- A. Work shall be executed and inspected in accordance with rules, regulations, laws, and ordinances of the local, federal, city, county, and state authorities, and the utility companies serving the area in which the installation is to be made.
- B. If there is a discrepancy between the codes and regulations having jurisdiction over the installation and these contract documents, the codes and regulations shall determine method of equipment used.
- C. If there is anything in the contract documents that will not strictly comply with the above laws, ordinances, and rules, a written request for a clarification shall be submitted before proceeding with that part of the work. No changes in the contract documents shall be made without written consent.
- D. All changes made after the letting of the contract, in order to comply with the applicable codes or requirements of the enforcing inspectors, shall be made without additional cost.

1.08 CERTIFICATES AND FEES:

- A. Give all necessary notices, obtain all necessary permits, and pay all fees in order that the work hereinafter specified may be carried out. Furnish all certificates necessary as evidence that the work installed conforms to the laws and regulations of authorities having jurisdiction. Before final certificates are issued, make changes and alterations required by authorized inspector of an authority having jurisdiction.

1.09 DRAWINGS:

- A. The contract documents are not intended to include work and material required for the full completion of the systems outlined. Contract documents are schematic and indicate the intended systems and their function. Materials, work, or details required for the proper execution and completion of the work described or shown and shall be furnished and installed as a part of this contract, without extra charge.
- B. The contract documents indicate the general location of equipment and the route to be followed by the ductwork and piping which are to be installed. Ductwork, piping, and equipment shall be installed in such a way as to conserve head room and interfere as little as possible with the free use of the space through which they pass. Prepare interference drawings where required or requested.
- C. Consult architectural and structural contract documents for necessary changes or additions to accommodate existing or structural conditions. The location of pipes, ducts, and equipment shall be altered without charge before installation. Obtain written approval before making alteration.
- D. As the work progresses and before installing equipment which may interfere with the interior treatment or use of the building, obtain drawings or instructions for the exact location of such equipment.
- E. Cooperate with other trades so that piping, ductwork, etc. will not interfere with the work.

1.10 COORDINATION:

- A. Lay out work to be installed in coordination with each trade engaged on this project. Cooperate with trades in order to coordinate work and eliminate conflicts between this work and that of other trades. Cooperate with trades to coordinate work to maintain maximum accessibility and serviceability to equipment, dampers, valves, etc.
- B. Be fully responsible for conflicts between this work and that of other trades engaged on this project.
- C. Ductwork, grilles, diffusers, piping, or mechanical equipment which has been installed without checking for interferences and without maintaining maximum accessibility and serviceability shall be modified without additional expense.
- D. Supply, to other trades, equipment to be built-in by them or measurements to allow necessary openings to be left.
- E. Trade priority list shall be as follows unless directed otherwise:
 - 1. Electrical Lighting Fixtures
 - 2. Mechanical Grilles and Diffusers
 - 3. Mechanical Ductwork
 - 4. Electrical Conduit
 - 5. Piping Systems

1.11 JURISDICTION OF WORK:

- A. When it becomes necessary for the complete fulfillment of this work or to furnish labor or materials other than that which is generally accepted by trade agreement or general practice to belong to a particular trade or branch of work, the contractor shall procure to a contractor engaged in the trade or branch of work involved to the end that there shall be no delay to or stoppage of work due to infringement of trade agreements as to jurisdiction.

1.12 WORKMANSHIP:

- A. Only first class workmanship will be accepted - not only as regards to safety, efficiency, durability, etc. - but also as regards to the neatness of detail. Pipe work must be lined up paralleling or at right angles to the building walls. Equipment must be accurately set, plumbed, and leveled, and hanger rods must be in true vertical alignment. In general, the entire work throughout shall present a neat and clean appearance on completion.

1.13 RECORD DRAWINGS:

- A. On a clean set of prints, clearly mark, as the work progresses, changes and deviations from systems, layouts, etc. shown on the contract documents, so that, on completion of the work, there will be a record of the exact location of ductwork, piping, and equipment.

- B. Transfer notes and changes in a neat, clear manner to one (1) complete set of bond documents. Submit one (1) complete set of field documents, two (2) sets of prints, and one (1) electronic file showing complete mechanical contract documents with changes correctly shown for review.

1.14 SUBMITTALS:

- A. Submit detail drawings of each piece of all equipment, ductwork layout, piping layout, etc. All equipment, ductwork, and piping, etc. installed before submission and review of shop drawings is subject to removal and relocation at no additional cost as directed.
- B. Be responsible for fitting this equipment into the space allotted. No additional charges will be allowed for additional ductwork, pipe, or other appurtenances later required by reason of substitution of equipment. Provide detailed shop drawings showing layout within the space, including details of ductwork, piping, etc. for systems under this Division. Be responsible to layout equipment, ductwork, and piping in conjunction with other trades and structure. Be responsible to locate ductwork and piping so as not to interfere with access to equipment, dampers, valves, etc. Be responsible to layout equipment, dampers, valves, etc. for maximum accessibility and as per manufacturer's recommendations. Equipment, piping, ductwork, etc. installed with interference to accessibility is subject to removal and relocation at no additional cost, as directed. Be responsible to provide the proper quantity of valves, equipment, dampers, etc.
- C. Review of shop drawings is rendered as a service only and shall not be considered as a guarantee of measurements, quantities or of building conditions, nor shall it be construed as a release of basic responsibilities under the contract. Equipment, piping, ductwork, etc. installed before submission and review of shop drawings is subject to removal and relocation at no additional cost.
- D. Shop drawings shall be examined prior to submittal. Shop drawings submitted shall be signed or initialed by contractor and shall bear contractor's stamp of approval, evidencing that the shop drawing has been examined and checked to be in accordance with contract requirements. Shop drawings which are submitted, which do not bear such indication or approval, shall be construed as not having been examined, checked, and approved. Reproductions of design drawings submitted as shop drawings will not be acceptable.
- E. Failure to comply with the above mentioned requirements, including failure to indicate approval as indicated above, will be cause for drawings to be returned for resubmission in proper manner.
- F. When the shop drawings show variations from contract requirements because of shop practice or other reasons, specific reference to such variation in the letter of transmittal shall be made in order that, if acceptable, suitable action may be taken for proper adjustment. Otherwise, there will be no relief of the responsibility for executing the work in accordance with contract documents, even though such shop drawings have been reviewed.
- G. Electronic Files:
 - 1. The contractor may request electronic data files containing certain drawing information to assist in the preparation of required shop drawings and/or record drawings. Drawing information available is limited to the contract documents indicating ductwork.

2. The electronic data files will be prepared by the Engineer and are an instrument of service for use solely by the Engineer. Rights of authorship shall be retained by the Engineer. The contractor's permitted use of the electronic data for reference shall not constitute a transfer of ownership nor a sale by the Engineer. The Engineer makes no warranties, express or implied of merchantability or of fitness for a particular purpose. Furthermore, should discrepancies occur between the electronic data files and the printed construction documents, the information contained on the printed construction documents shall govern.
3. The contractor shall agree not to copy, use, reproduce or transmit the information therein contained, in whole or in part, or to suffer such action by others, for purpose other than producing shop drawings or record documents, except with the expressed written permission of the Engineer and further agrees to surrender the same to the Engineer upon demand.
4. The contractor shall agree not to sell, loan, rent or lease information to another person or company other than contractors on this project for the preparation of required shop drawings and/or record drawings for this project. The contractor shall agree to indemnify, hold harmless and defend the Engineer from and against claims or lawsuits, including attorney's fees, which arise or result from the use or distribution of the information provided to the contractor.
5. The contractor shall pay a fee of \$100.00 per sheet for the preparation of these materials.

1.15 SHOP DRAWING SUBMITTALS:

- A. Submittals shall be required for the following items, and for additional items where required for a complete and operational system:
 1. Roof Curbs, Equipment Curb Supports and Flashing.
 2. Roof Pipe Seals.
 3. Roof Pipe Supports.
 4. Vibration Isolation Equipment.
 5. Warranty and Maintenance Schedule.
 6. Owner instruction and System Demonstration Schedule and Agenda.
 7. Operation and Maintenance Manuals.

1.16 EXISTING CONDITIONS:

- A. Visit site and become fully acquainted with the conditions at the building site, as contract for this work shall be based upon furnishing labor and materials required to complete each installation ready for continuous and satisfactory operation. Carefully examine the site to appraise and become familiar with existing piping, ductwork, equipment, etc. affecting working conditions and transportation. Consider same in preparing proposals, as no exceptions will be considered after awarding the contract, nor will extra compensation for work resulting from failure to verify conditions at the site.
- B. Before commencing the work, examine the work of other trades and report at once defect or interference affecting the work under this Division or the guarantee of same.
- C. No extras will be allowed on account of a claim that the extent of the work of this Division was not fully understood.
- D. Verify in field exact location of existing piping, ductwork, equipment, etc. indicated on the contract documents as being demolished, reused, or tied into. Adjust work as required to meet field conditions.

- E. Take measurements at the building and be responsible for the correctness of same and the proper fitting of work.
- F. Adjust work to fit actual job conditions.

1.17 DEMOLITION:

- A. Provide demolition of the existing systems as indicated on the contract documents and as required to complete the installation of the new work.
- B. Unused ductwork, piping, diffusers, registers, fixtures, equipment, etc. not wanted by the Owner shall be removed from the site. Items requested by the Owner shall be stored on site as directed.
- C. Verify exact size, location, and quantities of demolition work in field.
- D. The scheduling of the demolition work shall be coordinated, and temporary materials and/or equipment required to maintain building operation shall be provided at no additional cost.

1.18 OWNER'S OPERATION:

- A. The Owner presently is engaged in his normal business activities at this location and will continue his operations during the work.
- B. The necessity of the Owner maintaining the operation of his business shall be respected. Work, men, material storage, and equipment used shall be conducted so that it will minimize the interference with his operations of that business.
- C. Coordinate phasing of work and provide temporary services (natural gas, etc.), equipment, ductwork, piping, controls, etc. as required for the implementation of work while maintaining services to portions of buildings that are to remain occupied. Provide temporary structures to house services and equipment if necessary. Include necessary costs in bids associated with phasing. No additional cost will be allowed if temporary services were not included in bids.
- D. Provide a minimum of 48 hour notice and obtain authorization from Owner prior to shutdown of systems or service serving occupied portions of the facility.

1.19 USE OF WORK BY OWNER:

- A. The Owner reserves the right of use, or caused to be used, previous to acceptance and final payment, portions of the work which have been observed or tested. The use of such work or equipment shall not be construed, deemed, assumed, or taken as an acceptance of the work in part or as whole.

PART 2 – PRODUCTS

2.01 SUPPORTS:

- A. Supply and erect special structural steel work required for the installation of equipment and other apparatus. Set apparatus at least 4" above floor or to a height indicated on the contract documents. Supply and install anchor bolts and other fastenings. Concrete bases and concrete floating pads, where called for, shall be provided. Concrete bases and pads shall be 4" larger than the base of the apparatus.

2.02 ACCESS DOORS:

- A. Coordinate required size and location of access doors required for services provided under this Division. Access doors in wall or ceilings shall be supplied and installed by this Division.
- B. Access doors shall be of adequate size, not less than 12" x 12" and shall be located to provide for access to concealed equipment dampers, valves, controls, etc. Wherever possible, valves shall be grouped and larger access doors provided.

2.03 SOUND CONTROL:

- A. Piping, ductwork, etc. shall pass through sleeves. Sleeves shall be packed tight with glass fiber or oakum and caulked on both sides with non-hardening sealant, Tremco "Acoustical Sealant" J-M "Duxseal" of GEMCO "Tuff-Bond #12."

2.04 PENETRATIONS:

- A. When penetrations of fire rated floors and/or walls are made, the spaces around the penetrations shall be sealed to prevent the spread of smoke, fire, toxic gas, or water through the penetration neither before, during, or after a fire. The fire rating of the penetration seal shall be at least that of the floor or wall into which it is installed, so that the original fire rating of the floor or wall is maintained.
 - 1. When sealant is injected into a penetration, it shall expand to surround items within the penetration and maintain pressure against the walls of the penetration.
- B. Sealant shall meet fire test and hose stream test requirements of ASTM E119-73 and shall be UL classified as a wall opening protective device. Sealant shall be 3M Fire Barrier 2001 Silicone RTV Foam or equal.

2.05 ROOF CURBS, SUPPORTS AND FLASHINGS:

- A. Roof curbs shall be prefabricated assemblies consisting of heavy gauge galvanized construction with continuous welded corners and seams. Curbs to be internally reinforced and insulated with 1½" thick, 3# rigid fiberglass board insulation and provided with pressure treated wood nailers. Curbs to be stepped to accept roofing insulation and canted or straight (as required for roofing system) to facilitate the roofing flashing. Curbs to be designed for weight of equipment being supported - manufacturer shall provide certified load bearing data.

1. Roof curbs shall be provided where ductwork penetrates the roof, where piping 8" or greater penetrates the roof, where multiple pipes penetrate the roof at one location or where support for roof mounted equipment with ductwork connections is required.
 2. Provide galvanized sheet metal flashing and counterflashing soldered or clamped to ductwork and caulked and sealed to provide weatherproof installation for a ductwork installation.
 3. Provide weatherproof plastic curb cap cover with graduated stepped PVC boots and adjustable stainless steel clamps and counter flashing caps for piping installations.
 4. Roof curbs shall rest on roof deck structural supports. Coordinate with roof warranty requirements. Install as per manufacturer's recommendations.
 5. Vibration Isolating Curbs: Provide a factory fabricated combination roof mounting curb and vibration eliminator base for equipment specified to be provided with vibration isolation. The assembly shall be shipped and installed in one piece. Base shall be insulated and designed so that it can be re-roofed without disturbing the unit. The vibration eliminating portion of the assembly shall be constructed of structural steel and designed to match perfectly with the bottom of the roof top unit. The vibration eliminators shall be so designed to provide a minimum of 90% isolation efficiency with a minimum of 1" deflection. The curb shall be designed to receive factory fabricated counterflashing sections after the unit has been set and leveled on the vibration curb, making the entire assembly weathertight.
 6. Curbs to terminate 18" (minimum) above roof unless noted otherwise. Curbs for outdoor air intake ducts or hoods to be a minimum of 24" above finished roof. Adjust roof curb height as required for roof insulation.
 7. Top of roof curbs are to be level with pitch built into curb to follow pitch of roof.
 8. Roof curb to be manufactured by Pate, RPS, Thycurb, Micrometal or Houston.
- B. Roof pipe seals shall consist of a spun aluminum base having a minimum of 5" roof surface flange, and a stepped PVC boot that is to be secured to the base and to the pipe with adjustable stainless steel clamps.
1. Roof pipe seals shall be provided for individual pipes 6" diameter and under extending through the roof. Install pipe seal as per manufacturer's recommendations.
 2. Pipe seal to be manufactured by Pate, RPS, Thycurb, or Houston.
- C. Roof Supports for equipment, ductwork, natural gas piping (4" and larger) and water piping shall be prefabricated assemblies consisting of heavy gauge galvanized construction with continuous welded corners and seams. Supports to be internally reinforced with bulkheads and spreaders 24 inch on center and shall have factory installed pressure treated wood nailers. Supports to be designed for weight of equipment and material being supported. Manufacturer shall provide certified load bearing data.
1. Roof equipment supports to be provided to support roof-mounted equipment without ductwork connections and to support piping and ductwork routed above roof.
 2. Roof supports shall rest on roof deck structural supports. Supports shall span a minimum of two roof structural members and shall not cantilever more than 12". Install as per manufacturer's recommendations.
 3. Supports to terminate 12" (minimum) above roof unless noted otherwise. Adjust roof support height as required for roof insulation.
 4. Top of roof supports are to be level with pitch built into support to follow pitch of roof.

5. Piping supports to be provided with pipe roller assembly consisting of pipe roller, removable pipe retainer bracket, height adjustable threaded rods and sliding steel base attached to support. Spacing of supports is to be same as spacing of hangers specified for each piping material.
 6. Ductwork supports to be provided with duct slide assembly consisting of sliding duct hanger, height adjustable threaded rods and sliding steel base attached to support.
 7. Roof supports to be manufactured by Pate, RPS, Thycurb, Micrometal or Houston.
- D. Roof pipe supports for natural gas piping (3-1/2" and smaller) to be to be equivalent to Portable Pipe Hanger, Inc. Type PP-10, with roller guide support for single pipes and channel guide support for multiple pipes. Supports to have high density polypropylene plastic base with threaded rods for adjustable height roller. Supports are to sit on top of roofing membrane. Supports are to be installed as per manufacturer's recommendation and to be compatible with and maintain the integrity of the existing or new roof system.

2.06 VIBRATION ISOLATORS:

- A. Provide vibration eliminators and isolation equipment as manufactured by Mason Industries, Peabody Noise Control, Consolidated Kinetics Corporation or Korfund Dynamics Corporation for motors, pumps, air compressors, etc., as indicated on the contract documents or as required.
- B. Make provisions in the installation of work so that noises or vibrations will not be transmitted through foundations, walls, columns, ducts, piping, etc., so as to be objectionable and shall be subject to review. Equipment shall be selected and installed with this in view. If equipment provided exceeds reasonable requirements as to quietness or vibration for its type and use when operating under continuous demand, it shall be altered or replaced without additional costs.
- C. The isolation and vibration eliminator equipment manufacturer shall be totally responsible for the selection of the proper units for their loadings, quantities, etc., and he shall guarantee that each installation and its application shall have a vibration efficiency of 90% or greater. As a minimum, provide types of vibration eliminators as indicated on the contract documents.
- D. Floor Mountings:
 1. Type A Double Deflection Neoprene Mountings: Double deflection neoprene mountings shall have a minimum static deflection of 0.35". Metal surfaces shall be neoprene covered to avoid corrosion and have friction pads both top and bottom so they need not be bolted to the floor. Bolt holes shall be provided for these areas where bolting is required. On equipment such as small vent sets and close coupled pumps, steel rails shall be used above the mountings to compensate for the overhang. Mounting equal to Mason Industries Type ND.
 2. Type B Spring Mountings: Free standing steel springs with neoprene acoustical pads between isolator base plate and supporting surface. Isolators to have leveling bolts. Spring diameter-minimum .8 of spring operating height. Minimum additional spring travel before going solid-50% of rated deflection. Mounting equal to Mason Industries, Type SLF.
 3. Type C Spring Mounting with Vertical Limit Stops: Spring characteristics similar to Type B except with limit stops for wind loading or for maintaining constant elevation if water weight is removed from equipment. Limit stops to be out of contact during normal operation. Mounting equal to Mason Industries Type SLR.

E. Hangers:

1. Type D Neoprene and Spring: Combination spring and double deflection neoprene element in series. Spring characteristics equal to Type B. Spring diameter and hanger box lower hole large enough to permit the hanger rod to swing through a 30° arc before contacting the box. Submittals shall include scale drawings of hanger showing 30° capability. Hanger equal to Mason Industries Type 30N.
2. Type E Precompressed Combination Spring and Neoprene: Combination spring and double deflection neoprene hanger equal to Type D, except precompressed by the manufacturer to the rated deflection to keep piping or equipment at a fixed elevation during installation. Submittals to include scale drawing of hanger showing 30° capability. Hanger equal to Mason Industries Type 30N.
3. Type F Precompressed Spring and Neoprene Cup with Eye Bolt: Vibration hangers shall contain a steel spring located in a neoprene cup manufactured with a grommet to prevent short circuiting of the hanger rod. The cup shall contain a steel sasher designed to properly distribute the load on the neoprene and prevent its extrusion. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30° arc before contacting the hole and short circuiting the spring. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Hangers shall be provided with an eye bolt on the spring end and provision drawing of the hanger showing the 30° capability. Hanger equal to Mason Industries Type W-30.

F. Bases and Supports:

1. Type G Wide Flange or Channel Rails: Steel support members tailored to cradle the equipment with built-in isolator mounting brackets to minimize equipment mounting height. Minimum beam height 1/12 of rail length but not less than 4". Rails equal to Mason Industries Type ICS.
2. Type H Wide Flange or Channel Base: Integral structural steel base tailored to accommodate the equipment, including the motor slide base, with isolator mounting brackets to minimize operating height. Minimum beam height 10% of the longest base dimension but not less than 6". Base equal to Mason Industries Type WF.
3. Type J Inertia Base: Reinforced concrete inertia base tailored to accommodate the equipment, shipped ready to receive the concrete complete with the following:
 - a. Welded steel perimeter frame.
 - b. Pre-located anchor bolt templates.
 - c. Motor slide rails, if required.
 - d. Integral height saving isolator mounting brackets.
 - e. 1/2" rebars welded on 6" centers both ways, 1-1/2" above the bottom.
 - f. Minimum channel depth 1/12 the longest dimension but not less than 6".
 - g. Base equal to Mason Industries Type K.

- G. Type X Horizontal Thrust Restraints: Horizontal thrust restraints consisting of a spring element and neoprene pad as described in Type B. Spring element will be contained in a steel frame designed and preadjusted at the factory to limit maximum motion of 1/4". Restraints will be furnished with one (1) rod and angle brackets for attachment to both the equipment and the ductwork or the equipment and the structure. Restraint equal to Mason Industries Type WB or BC. – EXECUTION

3.01 CUTTING AND PATCHING:

- A. Do cutting and patching of building materials, piping, etc., as required for the installation of this work, but no structural members shall be cut without approval and such cutting shall be done in an approved manner.
- B. Patching of, or repairing of damage to, the work in place shall be done in a neat and workmanlike manner, meeting approval. If operations require cutting of work in place or causes damage which entails repairs of such work, employ mechanics of the particular trade whose work must be cut or which is damaged and shall pay costs of such cutting, patching, or repairs.
- C. Patch existing ceiling, floor, wall and roof openings and surrounding finishes resulting from removal of existing materials and equipment so that finish will match existing in surrounding areas. Openings in masonry walls resulting from removed thermostats are to be covered with a blank stainless steel cover plate.

3.02 PAINTING:

- A. Final painting will be done by other trades, except as noted.
- B. Factory made pieces of equipment, accessories, etc., except pipe, fittings, valves, and hangers, shall be supplied with prime coat finish, except where specified with special factory applied finish, such as baked enamel or chrome plating. Primer shall be touched up where necessary with approved primer.

3.03 EXCAVATION AND BACKFILL:

- A. Excavate and backfill where required. Remove excess backfill material.
- B. Excavations shall be carefully backfilled with clean bank sand and tamped in place in 8" layers.
- C. For methods and materials to be used, adhere to the requirements of the contract documents.
- D. For buried piping, provide 6" of crushed stone or pea gravel bedding on the firm subsoil under the piping and extend the bedding up to the centerline of the pipe.
- E. Excess earth shall be removed from site or deposited on the premises where and as directed.
- F. Do necessary pumping to maintain excavation for mechanical services free of water.

3.04 CLEAN-UP:

- A. Exposed metal surfaces shall be free from grease, dirt, and other foreign material.
- B. Equipment shall be properly protected from damage during the construction period.

- C. Debris resulting from execution of this contract, surplus and discarded material, shall be removed from the premises within three (3) days after the accumulation. Remove plaster from piping, radiation, etc.
- D. On completion of the work, tools, surplus, and waste materials shall be removed and the work left in a clean and perfect manner. During work progress, remove debris and excess materials as directed by the job superintendent.

3.05 TEMPERATURE CONTROL WIRING:

- A. Provide all conduit, wiring, accessories, and wiring connections required for required Temperature Control (TC) installation, unless specifically shown on the Electrical Drawings.
- B. All TC wiring materials and installation methods shall comply with equipment manufacturer recommendations.
- C. Class 2 wiring (24VAC or less) shall be installed in conduit unless otherwise specified. Conduit is not required for Class 2 wiring in concealed accessible locations. Class 2 wiring not installed in conduit shall be supported every 5' from the building structure utilizing metal hangers designed for this application. Wiring shall be installed parallel to the building structural lines. All wiring shall be installed in accordance with local code requirements.
- D. Provide complete testing for all cables used under this Contract. Provide all equipment, tools, and personnel as necessary to conduct these tests.

3.06 ELECTRICAL MOTORS, STARTERS, AND WIRING:

- A. Apparatus supplied shall be complete with electric motors, starting equipment, remote control equipment, speed controls, and thermostat, where required.
- B. Alignment of motors, factory coupled or mounted, and motors field coupled and mounted shall be rechecked after connections have been made and after 48 hours of operation in designed service.
- C. Verify the voltage characteristics of each motor with the contract documents and/or service available. Provide motors, starting equipment, controls, etc. that match the electrical characteristics available in the area of installation.
- D. Provide for each polyphase motor a combination magnetic motor starter with three (3) thermal overloads, two (2) auxiliary contacts, pilot light, and H.O.A. switch. Starters shall be of one (1) manufacturer and as manufactured by Allen Bradley, Square D, Eaton, or ABB.
- E. Manual starters for motors up to and including 1/2 HP shall be equal to Square D 2510FO1 series.
- F. Manual starters for motors over 1/2 HP shall be equal to Square D 2510MCW11 series.
- G. Manual starters and remote control equipment located in finished areas shall be recess mounted and provided with stainless steel coverplates. Remote pushbutton stations shall be miniature type.

3.07 SCAFFOLDING:

- A. Furnish necessary scaffolding, staging, or cribbing required for the completion of the work. Such scaffoldings, etc. shall be removed from the premises when its use is no longer required on the job.

3.08 FINAL COMPLETION:

- A. Clean equipment, restore damaged materials, remove grease, oil, chemicals, paint spots, and/or stains, and generally leave the work in new condition.
- B. Retouch and/or repaint factory painted prime and/or finish coats where scratched or damaged. Whenever retouching will not be satisfactory, complete repainting of equipment until the desired appearance is obtained may be required.
- C. On completion of work, remove from the site tools, equipment, surplus materials, and rubbish pertaining to operations for removal and disposition at no additional cost.

3.09 WARRANTY AND MAINTENANCE:

- A. During the warranty period, the entire system shall be adjusted to maintain the operating conditions specified in the contract documents. Equipment furnished shall be warranted in writing for one (1) year after Substantial Completion has been issued (unless noted otherwise). Warranty shall include equipment, system operation, workmanship, and materials.
 - 1. Equipment or parts proving defective shall be replaced without cost.
 - 2. Visit the building at the 6-month and 11-month warranty period and thoroughly inspect the complete system and make repairs or heating and cooling adjustments to obtain maximum operating economy. At the same time, instruct the maintenance supervisor in its care and operation.
- B. Submit warranty and maintenance site visit schedules for review. In addition to the above, perform two (2) regular service inspections, one (1) at the beginning of the heating season and one (1) at the beginning of the cooling season.
 - 1. During each inspection, provide labor and materials to check, clean, calibrate and lubricate components requiring same.
 - 2. Defective parts shall be replaced, including labor to remove and reinstall with no additional cost.
 - 3. When required, emergency or overtime service shall be provided without additional cost.
- C. Inspection reports shall be countersigned and filed after each inspection. Reports shall list every modification made during inspections.
- D. Provide five (5) year parts and labor warranty on every compressor.

3.10 OWNER INSTRUCTION AND SYSTEM DEMONSTRATION:

- A. Verify completed systems and arrange date agreeable with Owner for a demonstration of completed systems in the project. Demonstrate on a one (1) time basis, at time of completion, to the Owner, the essential features of the mechanical applied systems and their compliance with the contract documents. Show Owner contract documents and relation to function of equipment and corresponding location in the project structure.
- B. Show by start/stop operation, the manner of control, resetting of protective devices, and the replacement of fuses.
- C. Demonstrate temperature control systems and devices, including sequence of controls.
- D. Instruct Owner in operation and maintenance of equipment and controls.
- E. Video record the instruction/demonstration session, label this video as such, and submit for review.
- F. On completion of the work, furnish and deliver special tools that may be required for the proper servicing of equipment furnished for the project.

3.11 OPERATION AND MAINTENANCE MANUALS:

- A. Compile and submit, at completion of the work, two (2) neatly bound booklets containing operation and maintenance instructions for equipment and systems.
- B. The cover of each manual shall state the section of work covered (i.e.: "heating, ventilating, and air conditioning," "air balance," etc.).
- C. Each manual shall contain the following information:
 - 1. Complete written operating and maintenance instructions for each equipment item.
 - 2. Complete parts list for each equipment item.
 - 3. Duplicate valve tag list.
 - 4. Print, shop, and record documents.
 - 5. Certified equipment drawings and/or catalog data. Specific model number of equipment installed shall be clearly noted on catalog data.
 - 6. Emergency operating instructions and/or list of service organizations (including address and telephone numbers) capable of rendering emergency service on 24-hour call.
 - 7. Training session video.
 - 8. Copy of performance warranty.
 - 9. Copy of maintenance warranty.
 - 10. Copies of manufacturers' warranties for equipment.
 - 11. Test and balance reports.
 - 12. Temperature control record documents.

- D. A copy of the temperature control schematic drawing, and other pertinent data as required by local, federal, state, and/or national agencies so governing and as herein specified shall be sealed in a plastic lamination and/or enclosed under a glass front framed panel and mounted on the wall near each respective system.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING AND BALANCING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK:

- A. This section of work includes the furnishing of labor and materials required for the testing, adjusting, and balancing of the mechanical air systems, and measurement of equipment operating conditions.
- B. Review and inspection of mechanical equipment, devices, and appurtenances as the work progresses to verify the system when complete will properly function and allow testing and balancing to proceed, review submittals to insure required testing and balancing equipment, test connections, etc. are provided.
- C. Attend construction meetings on a regular basis, as the work progresses, to report on the status of the installed mechanical system and to report deficiencies witnessed by this contractor. Submit written observation reports after each visit.
- D. In addition to the site visits listed above, this Contractor shall attend monthly mechanical meetings as scheduled below involving the Architect, Engineer, Owner, Contractor, Mechanical Contractor and Sub-Contractors including the temperature control contractor, test and balance contractor, electrical contractor, and others whose work may affect the testing and balancing procedures.
 - 1. Three (3) months prior to the Substantial Completion Date.
 - 2. Two (2) months prior to the Substantial Completion Date.
 - 3. One (1) month prior to the Substantial Completion Date.

1.02 REFERENCES:

- A. AABC MN-1 – AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.
- B. ASHRAE Std. 111 – Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 1988
- C. NEBB (TAB) – Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau; 1998, Sixth Edition.
- D. TABB – TAB Procedural Guide; Testing, Adjusting and Balancing Bureau; latest edition.

1.03 SHOP DRAWING SUBMITTALS:

- A. Submit name of adjusting and balancing agency.

- B. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
1. Prior to commencing work, submit forms or outlines indicating adjusting, balancing, and equipment data required.
 2. Submit draft copies of report for review prior to Substantial Completion. Provide copies for inclusion in operating and maintenance manuals.
 3. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
 4. Include detailed procedures, agenda, sample report forms, and copy of AABC National Project Performance Guaranty prior to commencing system balance.
 5. Test Reports: Indicate data on AAABC MN-1 forms.
 6. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Contractor
 - b. Address of Testing, Adjusting, and Balancing Contractor
 - c. Telephone number of Testing, Adjusting, and Balancing Contractor
 - d. Project Name
 - e. Project Location
 - f. Project Architect
 - g. Project Engineer
 - h. Project General Contractor, Mechanical Contractor, and Temperature Control Contractor
 - i. Project altitude
 - j. Report date
- C. Project Record Documents: Record actual locations of flow measuring stations and rough setting.
- D. Final Test and Balance Reports must be submitted no later than two (2) weeks prior to the indicated Substantial Completion Date. If reports are not submitted as outlined, payments to the Contractor will not be processed.

1.04 QUALITY ASSURANCE:

- A. Perform total system balance in accordance with AABC MN-1, ASHRAE Std. 1111, TABB or NEBB Procedural Standards for Testing, Balancing, and Adjusting of Environmental Systems.
1. Maintain one copy of each document on site.
- B. Perform work under supervision of AABC Certified Test and Balance Engineer experienced in performance of this Work and licensed at the State in which the Project is located.

1.05 TEST AND BALANCE CONTRACTOR:

- A. Work for the testing and balancing of the HVAC air distribution system, as described herein, shall be completed by one of the independent Test and Balance Contractors listed below and specialize in and whose business is limited to the testing and balancing of heating, ventilating, and air conditioning systems:

1. Aaron Engineering Services
5420 W. Roosevelt Rd.
Chicago, IL 60644
2. Mechanical Test & Balance
P.O. Box 1383
Bolingbrook, IL 60440
3. Controlled Environment Testing & Balancing
1350 Remington Road
Schaumburg, IL 60173

1.06 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. Perform TAB after leakage and pressure tests on air distribution systems have been satisfactorily completed.

1.07 WARRANTY:

- A. Guarantee: Provide a guarantee on NEBB or TABB forms stating that NEBB or TABB will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee shall include the following provisions:
 1. The certified TAB firm has tested and balanced systems according to the Contract Documents.

PART 2 – GENERAL

2.01 MATERIALS:

- A. Instruments shall be calibrated and maintained in good working order.
- B. Provide additional balancing devices as required to complete the work.

PART 3 – EXECUTION

3.01 EXAMINATION:

- A. Verify as work progresses that balancing devices, such as test ports, flow-control devices, and manual volume dampers, as required by the Contract Documents, are provided. 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 equipment performance data including fan and pump curves. Related performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in a system.
- E. Examine system and equipment installations as work progresses to verify that they are complete and that testing, cleaning, adjusting, and commissioning have been performed.
- F. Examine HVAC system and equipment installations as work progresses, to verify that indicated manual volume dampers are properly installed and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- G. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing and report.
- H. Examine HVAC equipment to ensure as work progresses and prior to test and balance, that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls are ready for operation.
- I. Examine equipment, as work progresses, for installation and for properly operating safety interlocks and controls.
- J. Examine, as work progresses and prior to Test and Balance, automatic temperature control system (FMS) components to verify the following:
 - 1. Dampers and other controlled devices are operated by the intended controller.
 - 2. Dampers are in the position indicated by the controller.
 - 3. Integrity of dampers for free and full operation and for tightness of fully closed and fully opened positions.
 - 4. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
 - 5. Sensors are located to sense only the intended conditions.
 - 6. Sequence of operation for control modes is according to the Contract Documents.
 - 7. Controller set points are set at indicated conditions.
 - 8. Interlocked systems are operating.
 - 9. Changeover from heating to cooling mode occurs according to indicated values.
- K. Report deficiencies, which are discovered before and during performances of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.
- L. Examine, as work progresses and prior to test and balance, the following:
 - 1. Proper thermal overload protection is being provided and is complete.
 - 2. Duct systems are air tight and clean.
 - 3. Access doors are closed and sealed, and duct end caps are in place.
 - 4. Smoke/fire dampers are being provided as indicated and properly connected to Fire alarm system.
 - 5. Smoke and/or heat detectors are being provided as indicated and connected to the Fire Alarm System.

3.02 TESTING AND START-UP:

- A. After ductwork has been installed, but before ductwork covering has been applied or concealed ductwork has been covered up, test the tightness of joints and the soundness of ducts.
- B. Provide notification of tests, including the inspectors or authorities having jurisdiction. Provide labor and equipment for tests and conduct same.
- C. Perform tests in shifts to allow other trades to proceed in accordance with building progress.
- D. Perform tests as required to provide specified and satisfactory operation of equipment. Adjust dampers, refrigeration valves, pressure regulators, controls, etc., to establish system operation as prescribed.
- E. Before putting systems in operation, perform the following functions:
 - 1. Clean filters, screens, and dirt pockets.
 - 2. Supply and install lubricants required for bearings, couplings, linkages, etc. After completion of installation of electrical motors, etc., these shall be completely relubricated and bearings repacked. This work shall be completed prior to putting equipment into operation and shall be in accordance with the manufacturer's requirements.
 - 3. Manufacturer's representatives shall check equipment installation to ensure that connections, alignment, and other details affecting the equipment performance are in accord with manufacturer's requirements.
 - 4. Instruct Owner in system operation and see that arrangements have been made for regular maintenance of equipment and services where required.
- F. Submit copies of the final certified test readings.

3.03 BALANCING THE SYSTEMS:

- A. The work to be performed under this section of the specifications shall include the furnishing of articles, labor, material, operations, and equipment necessary and incidental for the Testing and Balancing of the HVAC Systems as described in this specification and shown on the drawings.
- B. Work shall be done under the direct supervision of a certified test and balance engineer employed by the contractor. Instruments used by the contractor shall be accurately calibrated and maintained in good working order.
- C. Reports shall be submitted on standard forms similar to those shown in the National Standards for Field Measurements and Instrumentation Manual, published by Associated Air Balance Council.
- D. Work shall not begin until systems which are to be tested have been completed and are in full working order. Filters shall be restored and coils cleaned before system is balanced. The contractor shall put system equipment into full operation and shall continue the operation of equipment during each working day of the testing and balancing work.

E. In order to meet the required tolerance of the plans and specifications, the following general testing and balancing procedures shall be used by the contractor:

1. Air Systems:

a. Phase One: (Each zone of the structure shall be tested separately).

- 1) Supply and return air duct dampers are set at full open position.
- 2) Diffusers, side wall grilles, and variable volume regulators are set at full open position.
- 3) Outside air damper is set at minimum position.
- 4) Controls checked and set for full cooling cycle.
- 5) Branch line dampers to open position.
- 6) Set extractors and distribution grids to wide open position.

b. Phase Two:

- 1) Drill probe holes for static pressure readings, pitot tube traverse readings, and temperature readings.
- 2) Check motor electrical current supply and rated running amperage of fan motors.
- 3) Check fan and motor speeds.
- 4) Check available adjustment tolerance.

c. Phase Three:

- 1) Make first air distribution run throughout entire system recording first run statistics.
- 2) Using pitot tube traverse in main duct, branch duct, supply and return, proportion air in required amounts to the various main duct runs and branch runs.
- 3) Make second complete air distribution run throughout entire system for check on proper proportion of air as each section of the building encounters maximum load condition.

d. Phase Four:

- 1) Using pitot tube traverse, set main line dampers to deliver proper amount of cfm to areas.
- 2) Using pitot tube traverse, set branch line dampers to deliver proper amount of cfm to diffusers and side wall supply grilles in each zone.
- 3) Read cfm at each outlet and adjust to meet requirements.
- 4) Test and record items as listed in the following test procedures.

e. Testing Procedures:

- 1) Test and adjust blower rpm to design requirements.
- 2) Test and record motor full load amperes.
- 3) Make pitot tube traverse of main supply ducts and obtain design cfm at fans.
- 4) Test and record system static pressure, suction, and discharge.
- 5) Test and adjust system for design recirculated air, cfm.
- 6) Test and adjust system for design cfm outside air.
- 7) Test and record entering air temperatures. (DB heating and cooling).

- 8) Test and record entering air temperatures. (WB cooling).
- 9) Test and record leaving air temperatures. (DB heating and cooling).
- 10) Test and record leaving air temperatures. (WB cooling).
- 11) Adjust main supply and return air ducts to proper design cfm.
- 12) Adjust zones to proper design cfm, supply, and return.
- 13) Test and adjust each diffuser, grille, and register to within $\pm 5\%$ of design requirements.
- 14) Each grille, diffuser, and register shall be identified as to location and area.
- 15) Size, type, and manufacturer of diffusers, grilles, registers, and tested equipment shall be identified and listed. Manufacturer's ratings on equipment shall be used to make required calculations.
- 16) Readings and tests of diffusers, grilles, and registers shall include required fpm velocity and test resultant velocity, required cfm and test resultant cfm after adjustments.
- 17) In cooperation with the control manufacturer's representative, setting adjustments of automatically operated dampers to operate as specified, indicated, and/or noted, testing agency shall check controls for proper calibrations and list controls requiring adjustment.
- 18) Diffusers, grilles, and registers shall be adjusted to minimize drafts in areas.
- 19) This procedure shall also apply to exhaust fans, except delete reference to temperature.
- 20) Record fan size, type, rpm motor, full load current and voltage, and outdoor air temperature, DB and WB.
- 21) As a part of the work, make adjustments in or replacements of the pulleys, belts, motors, dampers, etc., or the addition of dampers required for correct balance as required at no additional cost.
- 22) Test sheets shall include initial test data, intermediate test data, and final test data.
- 23) Air temperature tests shall be done on both heating cycle and cooling cycle.
- 24) Test heating systems when outdoor temperature is below 30° F.
- 25) Test cooling systems when outdoor temperature is above 80° F.
- 26) Mark dampers, etc., with the correct setting.
- 27) Balance cooling systems while cooling is operating and cooling coil is wet.
- 28) Measure and record outdoor temperature while conducting thermal performance tests.
- 29) Balance air systems with air filters resistance at midpoint between clean and dirty. Use clean filters and add temporary artificial resistance as required. Remove artificial resistance or replace filters when complete.
- 30) Balance supply systems with specified outdoor air quantity.
- 31) Supply systems having free cooling cycle capability shall be tested and balanced on 100% outdoor air cycle in addition to minimum outdoor air cycle.
- 32) Test reports shall include complete thermal performance of heating/cooling systems.

- F. Test and Balance Report: Upon completion of the work, information shall be inserted on a sheet listing items required by these specifications and be included in complete Test and Balance report. Sheets shall be neatly typed.

END OF SECTION

SECTION 23 07 00
MECHANICAL INSULATION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

- A. Conform to all applicable provisions of Section 23 05 00.
- B. Refer to Section 23 88 00 for internal duct lining.

1.02 DESCRIPTION OF WORK:

- A. Insulate the following:
 - 1. Supply air ductwork.
 - 2. Return air ductwork.
 - 3. Outside air intake and combustion air intake ductwork.
 - 4. Exhaust ductwork.

1.03 QUALITY ASSURANCE:

- A. Work and materials shall be in compliance with local and federal code requirements.
- B. Work and materials shall be in compliance with National Fire Protection Association Standard No. 90A.
- C. Insulating materials shall be installed in accordance with the manufacturer's recommendations as to the method of application and for the proper type of adhesives to be used, except where contract documents specifically state other directions.

1.04 SHOP DRAWING SUBMITTAL:

- A. Submittals shall be required for the following items, and for additional items where required for a complete and operational system:
 - 1. Ductwork Insulation Materials.
 - 2. Exposed Exterior Ductwork and Piping Insulation.

PART 2 – PRODUCTS

2.01 MANUFACTURERS:

- A. Insulation shall be as manufactured by Johns Manville, Owens-Corning, Knauf or Manson.

- B. Mastics, sealers, cements, and other sundry materials shall be the product of a named insulation manufacturer or Chicago Mastic, Insulcoustic or Benjamin-Foster.

2.02 MATERIALS:

- A. Material shall have composite flame-spread rating of not over 25 and a smoke-development rating of not over 50 in accordance with Interim Federal Standard No. 00136A (Comm.-NSB) including coverings, mastics, and adhesives.
- B. Pastes, sizing, and cements used in connection with insulation work shall contain approved vermin and rodent repelling, mold resistant ingredients, and shall be certified. Materials shall be non-flammable in the wet state, incombustible or fire resistant in the dry state and shall be U.L. approved. Thickness of coatings, sealers, and adhesives specified herein shall serve as minimum requirements. Where manufacturer's recommendations exceed specified thickness, comply with manufacturer's recommendations.

2.03 DUCTWORK AND EQUIPMENT INSULATION:

- A. The following ductwork shall be externally insulated as described below:
 - 1. Supply Air Ductwork, DOAS system exhaust ductwork and Outside Air Ductwork that is not acoustically lined in concealed spaces.
 - 2. Return Air Ductwork.
 - 3. Outside Air Intake Ductwork.
 - 4. Combustion Air Intake Ductwork.
 - 5. Exhaust Ductwork Downstream of Backdraft Damper.
- B. Concealed ductwork insulation shall be 1-1/2" thick, minimum 3/4 lb. per cubic foot density Johns Manville Microlite FSK (or approved equal) fiberglass ductwrap, with an average thermal conductivity not to exceed 0.31 btu-in. per square ft. per degree F. per hour at a mean temperature of 75° F. Insulation shall be provided with reinforced aluminum foil vapor seal jacket.
- C. Exposed ductwork and equipment insulation shall be 1-1/2" thick, minimum 3 lbs. per cubic foot density Johns Manville 800 Series spin-glass rigid fiberglass board with an average thermal conductivity not to exceed 0.23 btu-in. per square ft. per degree F. per hour at a mean temperature of 75° F. Insulation shall be provided with reinforced aluminum foil vapor seal jacket.
- D. External outdoor exposed ductwork insulation shall be 2" thick (R-8) minimum 6 pounds per cubic foot density Johns Manville 800 series Spin-Glas rigid fiberglass board with an average thermal conductivity not to exceed 0.22 btu-in. per square foot per degree F. per hour at a mean temperature of 75° F. Insulation shall be provided with reinforced aluminum foil vapor seal jacket. Provide insulation with Venture-Clad or Aluma-Guard weather protective coating over reinforcing mesh and Insulkote primer. Install per manufacturer's installation instructions.

PART 3 – EXECUTION

3.01 INSTALLATION:

- A. On cold surfaces where a vapor barrier must be maintained, insulation shall be applied with a continuous, unbroken moisture and vapor seal. Hangers, supports, anchors, or other projections that are secured to cold surfaces shall be insulated and vapor sealed to prevent condensation.
- B. Surface finishes shall be extended in such a manner as to protect raw edges, ends, and surfaces of insulation.
- C. Duct insulation shall be continuous through walls, ceiling or floor openings, or sleeves, except where firestop or firesafing materials are required.
- D. No pipe covering or insulation materials shall be applied to piping, ductwork, or item of equipment until after tests have been completed and the work is proven sound and free from defects.
- E. Pipes, fittings, equipment, ductwork, etc., which are to be insulated shall be thoroughly dry and free from oil or other foreign matter before insulation is applied.
- F. Adhesives shall be applied as specified in continuous bands for complete coverage. The application of adhesives in daubs is not permitted.
- G. Equipment and work by other trades shall be protected during insulation installation.
- H. Entire insulation installation shall comply with manufacturer's recommendations. If there is a conflict between these contract documents and the manufacturer's recommendations, follow the more stringent procedure.

3.02 DUCTWORK INSULATION:

- A. Exposed ductwork rigid insulation shall be secured by applying adhesive in 4" wide continuous bands on 12" centers. Impale insulation in place butting edges snugly.
 - 1. Insulation shall be further secured to the sides of ductwork with approved type welded mechanical pins. These pins shall be applied 12" on center to surfaces of ductwork as follows:

Duct Size	Rows of Pins
Up to 11"	No pins Required
12" to 23"	One
24" to 35"	Two
36" to 47"	Three
48" to 59"	Four

- 2. After boards are impaled, weld pins shall be cut to extend 1/8" beyond face of board. A self-locking cap shall be pushed onto the pin after coating with adhesive sealant.
 - 3. Joints, breaks, punctures, and protuberances shall be completely sealed using vapor barrier adhesive and minimum 3" wide strip of material similar to the facing.

B. Exposed Exterior Insulation:

1. Apply Venture-Clad or Aluma-Guard weather protective coating over entire surface area of exterior ductwork. Entire weather protective coating installation shall comply with manufacturer's recommendations and requirements and shall provide a complete weatherproof enclosure.

C. Ductwork blanket insulation shall be cut slightly longer than circumference of duct. Wrap insulation around duct and secure by means of metal staples using the stitching method of application.

1. Ducts less than 24" wide shall be stapled along a longitudinal seam only. Ducts with either side 24" or wider shall be stapled at two corners on horizontal ducts and at four corners for vertical ducts. Tape the stitched seam with 4" wide pressure sensitive aluminum foil tape or seal joints with two coats of vapor barrier mastic reinforced with one layer of open weave glass fabric.
2. Insulation shall be further secured to the sides of flat-sided ductwork with approved type welded mechanical pins. Pins shall be installed as described in Item "A" above. The vapor barrier facing shall be thoroughly sealed where the pins have pierced through with a tape of same material by applying a vapor barrier adhesive to both surfaces as recommended by the manufacturer.
3. Other joints and penetrations of the vapor barrier facing shall be sealed with 4" pressure sensitive aluminum foil tape. Cuts or tears shall be sealed with strips of the aluminum foil tape.

END OF SECTION

SECTION 23 11 23

NATURAL GAS SYSTEM PIPING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

- A. Conform to applicable provisions of Section 23 05 00.

1.02 DESCRIPTION OF WORK:

- A. Supply labor, equipment, and material required for the complete installation and testing of the Natural Gas Piping distribution system.
 - 1. Natural Gas piping systems
 - 2. Piping connections to equipment

1.03 SHOP DRAWING SUBMITTALS:

- A. Submittals shall be required for the following items, and for additional items where required for a complete and operational system:
 - 1. Pipe Hangers and Supports
 - 2. Pipe material, joints, and fitting.
 - 3. Pipe Valves.
 - 4. Piping Distribution System Plans.
 - 5. Pipe Test Reports.

PART 2 – PRODUCTS

2.01 ESCUTCHION PLATES:

- A. In general, piping shall be concealed in walls and in ceilings. Where exposed pipes pass through finished floors, ceilings or walls, the floor plates shall be equal to Crane 13-BC.

2.02 PIPE HANGERS:

- A. Hangers, brackets, and clamps shall be of standard weight or malleable iron as specified for each use. Pipes supported from concrete construction shall use approved concrete inserts. Perforated strap hangers are not permitted.
- B. Supports and hangers shall be so constructed and adjusted as to allow for proper pitch and expansion of pipes.
- C. Provide necessary structural supports for piping to properly transmit load to building structure. Hangers shall not be supported from bottom chord of truss or lightweight metal flooring or roof decking.

- D. Except as noted elsewhere, install pipe hangers equal to Anvil, Midwest Hanger Supply Co., or Bergen-Paterson. Pipe hangers installed in corrosive areas, or exposed to moisture, or exposed to the outside elements shall be galvanized finish. Provide piping hangers as follows:

1. Adjustable clevis hanger for stationary steel pipe lines:

- a. Anvil Fig. 260
- b. Erico Fig. 400
- c. Bergen-Paterson Part 6750

- E. Pipe hangers shall be supported by mild steel hanger rods affixed to the building structure with approved steel fasteners. Rods, nuts, and fasteners shall be provided in accordance with hanger manufacturer's requirements. Vertical risers shall be supported by riser clamps at each floor line.

- F. The maximum spacing between hangers and supports, measured along the piping, shall be as follows:

Pipe Material	Pipe Size	Rod Dia.	Max Spacing
Steel Pipe	Up to 1 1/4"	3/8"	8'
	1 1/2" & 2"	3/8"	10'
	2 1/2" & 3"	1/2"	15'
	4" & Up	5/8"	15'

- G. Materials shall be as follows:

1. Trapeze Hangers: 1-1/2 x 1-1/2" x 1/8" angle with 3/4" rods.
2. Riser Clamps:
 - a. Anvil Fig. 261
 - b. Erico #510
 - c. Bergen-Paterson Part 6302
3. Beam Clamps, Rods, Supports, etc. for attachment to steel beams and bar joist: Anvil, Erico, or Bergen-Paterson.

2.03 PIPE AND FITTINGS:

- A. Pipe shall be standard weight Schedule 40 black steel in conformance with ASTM A53.
- B. Pipe 2-1/2" and larger shall have welded joints except at valves and connections to apparatus, where flanges must be installed. Use butt welding fittings specifically made by manufacturers for elbows and tees for branches, except as noted.
1. Welded Fittings:
 - a. Welded fittings shall be Tube-Turn or equal, 125 psi design. Use groove type welding rings on 4" or larger equal to or larger than one-half (1/2) the nominal diameter of the main.

- b. Use weldolets or welding tees for branches less than one-half (1/2) nominal diameter of the main. Welding heavy weight steel coupling into any mains instead of using a weldolet (where permitted above) only on low-pressure mains under 50 psi working pressure is acceptable.
- C. Pipe 2-1/2" and smaller, except as noted above, may have screwed joints with long lengths connected by couplings. Where fittings are necessary, they shall be standard weight malleable iron screwed fittings of approved make and ground joint brass lined unions shall be used where necessary and at connections with apparatus. No field fabricated fittings will be permitted unless specifically noted otherwise.
- D. Pipes shall be straight, true, and parallel and supported at intervals specified above or as indicated on the contract documents.

2.04 BELOW GRADE GAS PIPING

- A. Pipe shall be made from High Density Polyethylene (HDPE). Pipes shall be manufactured unit the original resin of 0% recycled materials and in accordance with ASTM D3350 classification; and listed in the PPI (Plastic Pipe Institute) TR-4. Pipe and fittings shall be manufactured and tested in accordance with ASTM D 2513 incorporated by reference in 49 CFR Part 192.
- B. Butt, socket, and saddle joints shall be joined by heat fusion and shall be made using procedures that have been qualified and approved in accordance with Title 49, CFR, and Part 192.283.
- C. Piping located beneath buildings shall be encased in an approved conduit. Where the conduit terminates into the building, the space between the conduit and the gas piping shall be sealed. Provide vent piping from the conduit to outdoors, minimum of 4" outside of building with opening installed to prevent entrance of water and insects.

2.05 VALVES:

- A. Supply and install valves on main branches and at equipment and elsewhere as shown or as required.
- B. Gas Valves:
 - 1. Valves 2" and under: Threaded, 2-Piece, Std. Port, Bronze Ball Valve, 600 CWP, Sizes: 1/4" to 2" Approvals: UL for Fuel/Gas. Tamperproof Feature: Locking feature for valves in locations accessible to the public. Apollo 80-100 Series, Nibco #T580-70-UL or #T585-70-UL, Watts #B-6000 or equal.
 - 2. Valves 2-1/2" and over: Flanged, cast-iron body, full port, Tamperproof Feature: Locking feature for valves in locations accessible to the public. Homestead 602 Flanged Lubricating Plug Cock, A.Y. McDonald Mfg. Co or equal.
- C. Valves shall be of same make and figure number. Valves shall be NIBCO, Milwaukee Valve, Stockham, Crane, Watts or approved equal and shall be of domestic manufacture.
- D. Piping to and from equipment shall have necessary shutoff valves, full size of line for isolating such equipment on system side of unions or flanges. Provide shutoff valves to isolate each item of equipment, pipe riser, or pipe branch.

- E. Valves shall be placed to permit easy operation and access.

2.06 GAS REGULATORS:

- A. Natural Gas regulators shall be manufactured by Pietro, Sensus/Utility Solutions Group or Fiorentine.
- B. Line Pressure Regulators: Comply with ANSI Z21.80.
 - 1. Body and Diaphragm Case: Cast iron or die-cast aluminum.
 - 2. Springs: Zinc-plated steel; interchangeable.
 - 3. Diaphragm Plate: Zinc-plated steel.
 - 4. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
 - 5. Orifice: Aluminum; interchangeable.
 - 6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
 - 7. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
 - 8. Pressure regulator shall maintain discharge pressure setting downstream and not exceed 150 percent of design discharge pressure at shutoff.
 - 9. Atmospheric Vent: Factory installed, stainless-steel screen in opening if not connected to vent piping.
- C. Appliance Pressure Regulators: Comply with ANSI Z21.18.
 - 1. Body and Diaphragm Case: Die-cast aluminum.
 - 2. Springs: Zinc-plated steel; interchangeable.
 - 3. Diaphragm Plate: Zinc-plated steel.
 - 4. Seat Disc: Nitrile rubber.
 - 5. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
 - 6. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
 - 7. Atmospheric Vent: Factory installed, stainless-steel screen in opening if not connected to vent piping.

2.07 VALVE TAGS AND SCHEDULE:

- A. Tag each valve with 1" diameter heavy brass tags secured to valve with brass hook. Prepare schedule giving the number of each valve, its service and general location.

2.08 FLEXIBLE GAS PIPING:

- A. Piping jacket shall be extruded from fire-retarded polyethylene and shall be resistant to U.V. jacketing flame spread and smoke density shall not exceed 25 and 50 (respectively) per ASTM E-84 standards.
 - 1. Flexible gas piping shall only be used at the final connection to isolated equipment.
 - 2. Tubing shall be made from 300 Series stainless steel strip conforming to ASTM A 240 shall be suitable for operation with natural gas system and be rated for 5 psi pressure.

PART 3 – EXECUTION

3.01 GENERAL:

- A. Clearances: Give careful consideration to clearances under beams, joists, over windows, to provide maximum headroom and the locations of lines and type of fittings used to obtain these clearances.
- B. Ascertain from the contract documents the heights of suspended ceilings and the size of shafts in which piping is to be concealed and the location and size of structural members in and adjacent to pipe shafts.
- C. Coordinate the piping, ductwork, and lighting work with one another and with other equipment. Where insufficient room is provided for piping above suspended ceilings or in vertical shafts, obtain clarification in writing before work is installed.
- D. Cutting: Cut pipe accurately to measurements established at the building, work into place without springing or forcing, and properly secure to structure in an approved manner.
- E. Cutting or other weakening of the building structure to facilitate piping installation will not be permitted, unless approved. Ream piping to remove burrs and install so as to permit free expansion and contraction without causing damage. Make changes in direction with fittings and changes in main sizes through eccentric reducing fittings.
- F. Before piping is installed, it shall be opened and pounded to remove foreign matter present. Ends of piping and tubing shall be sealed with caps or plugs during construction. Paper or rags will not be permitted. After installation and before final connections are made, piping systems shall be flushed with a material that is not injurious to either the pipe or material to be conveyed by the pipe.
- G. Threaded pipe shall be cut square and full threaded and shall be made with approved pipe thread compound, applied to the wall threads only, and shall be made up so that no more than two (2) threads will be exposed.

3.02 PIPING INSTALLATION:

- A. Gas piping shall be properly installed with joints made tight without caulking, lead, or painting. Piping shall be in accordance with NBFU and AGA requirements. Install piping as required for a complete and operational system. Provide accessories, elbows, etc. based on actual pipe routing requirements.
- B. Piping shall be brought to equipment connections in such a manner so as to prevent the possibility of loads or stresses being applied to the connections.
- C. Piping shall be isolated from building structure, walls, furring, other piping, etc., to avoid noise transmission.
- D. Provide shutoff valves and unions or flanges at each branch or in supply and return to each item of equipment. Valves and unions or flanges shall be suitably located to isolate each unit, branch circuit, or section of piping to facilitate maintenance and for removal of equipment and apparatus.

- E. Underground gas piping to be provided with a protective coating equivalent to Tapecoat H50 Gray self adhesive tape with abrasion resistant backing.
- F. Gas piping and fittings in non-accessible concealed spaces are to be welded.
- G. Furnish and install a drip-leg, gas cock, and union before making connection to each item. (Equipment on exterior of building to have drip leg below roof line).
- H. Exterior exposed gas piping shall be painted with one (1) coat of Rustoleum paint. Submit color samples for review.
- I. Inside of gas lines shall be blown out with compressed air prior to testing for leaks.
- J. Provide AGA approved gas regulator at equipment requiring lower gas pressure. Extend gas regulator vents line size to atmosphere as required. Do not combine vent lines.

3.03 PIPE TESTING:

- A. Gas piping shall be tested in accordance with the requirements of the inspection authority. Costs of tests as required by said authority shall be borne by the contractor. Joints shall be tested with a soap and water solution during this test to check for leaks. Repair leaks and retest.

END OF SECTION

SECTION 23 34 00
EXHAUST FANS AND ACCESSORIES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

- A. Conform to applicable provisions of Section 23 05 00, 23 07 00 and 23 88 00.

1.02 DESCRIPTION OF WORK:

- A. Furnish the labor, materials, equipment, appliances, services, and perform the operations in connection with the construction and installation of the exhaust systems. Work to be as herein specified and as denoted on the accompanying contract documents.
- B. This section of the work includes the furnishing and installing of exhaust fans and accessories.

1.03 QUALITY ASSURANCE:

- A. Fans shall be tested, rated, and certified for capacity and sound ratings.
- B. Exhaust fans shall be U.L. Listed and AMCA certified.
- C. Equipment in this section shall meet or exceed the requirements and quality of the items herein specified or as denoted on the contract documents.

1.04 SHOP DRAWING SUBMITTALS:

- A. Submittals shall be required for the following items and for additional items where required for a complete and operational system:
 - 1. Exhaust Fan Product Data
 - 2. Roof Curb
 - 3. Start-up Report

PART 2 – PRODUCTS

2.01 ROOF MOUNTED EXHAUST FANS:

- A. Roof mounted exhaust fans shall be of the ECM type and be UL listed. The motor compartments shall be constructed of heavy gauge aluminum mounted on an independent support structure. The fan hood shall have a rolled bead for added strength. The wheel and spun inlet shall be a centrifugal design of non-sparking construction. Fan blades shall be backward inclined median airfoil blades. Wheels shall be dynamically balanced to assure smooth and vibration-free rotation under maximum loading. The complete drive assembly including the motor and the wheel, shall be mounted on vibration isolators.

1. Electronically Commutated Motor (ECM):
 - a. Motor to be a DC electronic commutation type motor (ECM) specifically designed for fan applications.
 - b. Internal motor circuitry to convert AC power supplied to the fan to DC power to operate the motor.
 - c. Motor shall be provided with a potentiometer dial mounted at the motor. Motor speed shall be controllable down to 20% of full speed (80% turndown).
 - d. Motor shall have a minimum efficiency rating of 85% at all speeds.
2. Motor and drives shall be isolated from the exhaust airstream. Air for cooling the motor shall be supplied to the internal motor compartment through louvers from a location free from discharge contaminants. Motors shall permanently lubricated, sealed ball bearings. Motors shall be readily accessible for maintenance.
3. The wheel shaft on belt drive units shall be ground, polished, coated with a rust inhibitive finish and mounted in heavy duty, permanently sealed pillowblock ball bearings. Bearing shall be capable of 200,000 hours of life, average operation. The drives shall be sized at a minimum of 165% of driven horsepower. Drive belts shall be oil-resistant, non-static and capable to 25,000 hours of life, average operation.
4. The motor shall be factory wired to the disconnect junction box and a disconnect shall be supplied. A conduit chase shall be provided for running electrical wiring through the curb cap into the motor compartment.
5. Provide each fan with heavy gauge welded galvanized bird screen and motorized damper.
6. Sound and noise levels shall not exceed manufacturer's published values and oversized motors will not be accepted. Performance ratings shall be AMCA licensed for Air and Sound. Fans shall be UL listed.
7. Provide each fan with an insulated curb 12" in height minimum above finished roof. Curb to match pitch of roof as required.
8. Roof exhaust fans shall be as manufactured by Twin City. Fans manufactured by ACME, Loren-Cook, Carnes, or Greenheck will be considered equivalent.

PART 3 – EXECUTION

3.01 INSTALLATION:

- A. Equipment Installation:
1. Provide permanent placard attached to unit identifying unit number.

2. Provide temporary weathertight enclosures to protect roof openings until unit is installed.
3. Provide and install roof curb and set unit level onto roof curb. Adjust roof curb as required for sloped roofs. Equipment shall be sealed air and watertight to roof curb.
4. Install all field-installed options shipped loose with equipment per manufacturer's recommendations.
5. Do not operate units for any purpose, temporary or permanent, until ductwork is clean and fan has been test run under observation.

B. Ductwork Installation:

1. Connect exhaust air ductwork to equipment with flexible connections.
2. Install exhaust air equipment to maintain minimum 15 feet clearance between outdoor intake opening and nearest exhaust.

C. Temperature Control Installation:

1. Control wiring is to be in accordance with local, federal, state, and national electric wiring codes.

D. Start-up:

1. Submit start-up report for review. As a minimum, start up report shall contain the following information:
 - a. Electrical connections and terminals have been connected and are tight.
 - b. Fan sheaves are aligned and belts are properly tensioned.
 - c. Maintenance personnel have been instructed in the care and operation of the equipment.
 - d. Field supplied options shipped loose have been installed per manufacturer's recommendations.
 - e. Remote start/stop and reset are functional.

END OF SECTION

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SECTION 23 55 33
GAS-FIRED UNIT HEATERS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Work Included: This section of the work includes the furnishing and installing of gas-fired unit heaters of the size, capacity, and configuration where and as denoted on the contract documents.

1.02 QUALITY ASSURANCE:

- A. Unit shall be tested, rated, and certified as a complete unit in accordance with ARI for capacities and sound ratings.
- B. All equipment or components of the contract documents shall meet or exceed the requirements and quality of the items as denoted on the contract documents.
- C. Units shall be UL, CSA or ETL listed.
- D. Units shall be A.G.A. certified and conform with latest ANSI Standards.

1.03 PRODUCT HANDLING:

- A. Protection: Use all means necessary to protect unit heaters before, during, and after installation.
- B. Replacement and Repair: All scratched, dented, and otherwise damaged units shall be repaired or replaced as directed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Unit specified is manufactured by Sterling. Equivalent units manufactured by Reznor, Modine or Trane Company will be approved if equal in every respect.

2.02 UNIT HEATERS:

- A. General Description:
 - 1. Packaged unit heaters shall be high efficiency, gravity vented, gas-fired unit heater, ceiling suspended downturn discharge with discharge louver, and unit controls.
 - 2. Total heating and cfm capacity of each unit shall be as scheduled on the contract documents.

3. Installation, Operation and Maintenance manual shall be supplied within the unit.
4. Unit nameplate shall be provided in two locations on the unit.

B. Construction

1. Unit cabinet shall be constructed of galvanized steel and shall be pre-coated or powder coated with finish on all externally exposed surfaces.
2. Unit shall be designed for ceiling suspended horizontal discharge.
3. The units discharge louver shall be spring held and adjustable for directing air flow.
4. The cabinet shall have a full safety fan guard with no more than an 1/2" grille spacing.
5. The motor shall be open drip proof and the fan assembly shall be resiliently mounted to the cabinet to reduce vibration and noise.
6. Unit shall have full opening service access panel complete with screw closure attachment and lift handles for removal.
7. All components in the gas train, all standard electrical controls, and the power venter shall be within the service compartment.
8. The burner shall be a one piece burner assembly with a single orifice. The burner shall be of stainless steel construction with the flame separate from the burner interior. Unit shall have a single venture tube and orifice supplying fuel to a one-piece burner housing.
9. The heat exchanger shall be constructed of stainless steel and fabricated with no welding or brazing with only tool pressed mechanical joints.
10. The controls shall include a 2 stage gas valve, direct spark multi-try ignition with electronic flame supervision with timed lockout integrally controlled by a printed circuit board. The control board shall include diagnostic light, Dip switches for fan overrun settings, and a relay for fan only operation.

C. Units shall be complete with the following items:

1. Provide adjustable discharge louvers.
2. Provide a remote wall mounted 2 stage thermostat with an on/off switch on stat sub-base, and summer winter switch.
3. Flue and combustion air kit.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Manufacturer shall prepare schedule for approval listing/identifying unit number and noting size, style, capacity, and other requirements for each unit heater.
- B. Furnish and install all necessary supporting steel members and vibration isolation as recommended by manufacturer.
- C. The unit manufacturer shall furnish the temperature controls for field installation. Install all controls and wiring in accordance with local, federal, and state electric wiring codes.

END OF SECTION

SECTION 23 74 14
ROOF-TOP HVAC UNITS (02-30 TONS)

PART 1 – GENERAL:

1.01 DESCRIPTION:

- A. Work Included: This section of the work includes the furnishing and installing of single zone VAV, natural gas-fired heating, electric cooling roof-top HVAC units of the size, capacity, and configuration indicated on the drawings.

1.02 QUALITY ASSURANCE:

- A. Unit shall be tested, rated, and certified as complete unit in accordance with ARI for capacities and sound ratings.
- B. Unit shall be UL-tested and certified in accordance with ANSI Z21.47 Standards.
- C. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
- D. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen). All equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified or as denoted on the drawings.
- E. Unit shall be UL listed.
- F. Units shall be AGA approved.
- G. Unit shall meet ASHRAE 90.1-2001 Energy Standards.

1.03 SHOP DRAWING SUBMITTALS:

- A. Submittals shall be required for the following items, and for additional items where required for a complete and operational system:
 - 1. Rooftop Equipment Product Data
 - 2. Roof Curb
 - 3. Controls
 - 4. LON/BACNET Interface
 - 5. Manufacturer's Start-up Report

PART 2 – PRODUCTS

2.01 MANUFACTURERS:

- A. Unit specified is manufactured by Aeon, Trane, Johnson Controls, Carrier, Valent, Greenheck or Daikin will be approved equivalent in all respects.

2.02 EQUIPMENT:

- A. Description: Factory assembled and tested; designed for roof or slab installation; and consisting of compressors, condensers, evaporator coils, condenser and evaporator fans, refrigeration and temperature controls, gas heater, filters, and dampers.

- B. Construction:

- 1. Unit shall be completely factory assembled, piped, and wired and shipped in one section.
- 2. Unit shall be specifically designed for outdoor roof top application with a fully weatherproof cabinet.
- 3. Cabinet shall be constructed entirely of G90 galvanized steel with the exterior constructed of 20 gauge or heavier material.
- 4. Paint finish shall be capable of withstanding at least 2000 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.
- 5. The unit roof shall be sloped or cross-broken to assure drainage.
- 6. Unit specific color coded wiring diagrams shall match the unit color coded wiring and will be provided in both point-to-point and ladder form.
- 7. Diagrams shall also be laminated in plastic and permanently affixed inside the control compartment.
- 8. Access to filters, blower, heating section, and other items needing periodic checking or maintenance shall be through hinged access doors with quarter turn latches. Door fastening screws are not acceptable.
- 9. All openings through the base pan of the unit shall have upturned flanges of at least 1/2" in height around the opening through the base pan.
- 10. Air side service access doors shall have rain break overhangs.
- 11. All access doors shall have an internal metal liner to protect the door 1/2 inch thick, 1 1/2 lb. density fiberglass insulation.
- 12. The interior air side of the cabinet shall be entirely insulated on all exterior panels with 1 inch thick, 1 1/2 lb. density fiberglass insulation or 2" of foam injection double wall panel.
- 13. Unit shall have decals and tags to indicate unit lifting and rigging, service areas, and caution areas. Installation and maintenance manuals shall be supplied with each unit.

- C. Cabinet:

- 1. Double wall insulation liners
- 2. Unit shall be furnished with 304 stainless steel drain pans.

- D. Supply Fans:

- 1. Blower(s) shall be entirely self contained on a slide deck for service and removal from the cabinet.
- 2. All direct drive blower(s) shall have forward curved blades.
- 3. Blowers, drives and motors shall be dynamically balanced.

E. Outside Air Options:

1. Shall be a fully modulating, enthalpy-controlled economizer with multistage integrated economizer and compressor operation for maximum benefit. The economizer shall consist of a motor operated outdoor air damper and return air damper assembly constructed of extruded aluminum, hollow core, air foil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 25 CFM of leakage per sq. ft. of damper area when subjected to 2 in. w.g. air pressure differential across the damper. Damper motor shall be spring return to ensure closing of outdoor air damper during periods of unit shut down or power failure.
2. IAQ control with CO₂ sensor and controls to vary the amount of outdoor air between minimum to maximum position. CO₂ sensor to be mounted in the return air duct.

F. Filters:

1. 4" thick fiberglass MERV 11 pre-filter.
2. 2" thick fiberglass MERV 8 filter.
3. Clogged filter switch

G. Evaporator Coils:

1. Options:
 - a. Evaporator coil drain pan(s) shall be fabricated of 304 stainless steel.

H. Refrigeration System:

1. Compressors shall utilize R454B or R32 refrigerant, direct drive, hermetically sealed, suction gas cooled, digital scroll type compressors with centrifugal oil pump, oil level sight glass, oil charging valve, internal overloads, internal spring isolation, and rubber grommet mountings. Units shall be provided with multiple compressors (minimum 2) with separate refrigeration circuits and refrigeration controls.
2. Compressors shall be mounted in an isolated compartment to permit operation of the unit without affecting air flow when the door to the compartment is open.
3. Compressors shall be isolated from the base pan and supply air to avoid any transmission of noise from the compressor into the building area.
4. System shall be equipped with thermostatic expansion valve type refrigerant flow control.
5. System shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant controls.
6. Unit shall be equipped with Schrader type service fittings on both the high side and low pressure sides of the system.
7. Unit shall be equipped with refrigerant liquid line driers.
8. Unit shall be fully factory charged with refrigerant.
9. Unit shall be provided with the following options:
 - a. Each compressor shall be individually staged for capacity control.
 - b. All circuits shall be equipped with liquid line sight glasses.
 - c. Unit shall be provided with a hot gas reheat coil piped to the lead refrigerant system.

- d. Dehumidification Control: The dehumidification system shall provide increased dehumidification control by further subcooling the hot liquid refrigerant leaving the condenser coil. System shall be capable of maintain unit discharge relative humidity level of 50% (adj).
 - 1) Unit shall be provided with a hot gas reheat coil and modulating hot gas reheat control valve piped to the lead refrigerant system. The system shall be equipped with crankcase heaters, low pressure switches, and thermostatic expansion valves. Provide complete with humidistat, (wall mounted) (factory mounted in the return air opening), to operate the dehumidification circuit only when needed.
 - e. Unit shall be equipped with a 5 minute anti-short cycle delay timer for each stage.
 - f. Unit shall be equipped with 20 second between stage delay timers for each stage.
 - g. Each compressor shall be equipped with suction and discharge service valves.
10. Evaporator and Condenser Coil shall be minimum 5/16" o.d. seamless copper tubing mechanically bonded to aluminum fins and shall be factory leak tested at 150 psig and pressure tested at 450 psig. Dual circuit coils to be of intermingled configuration with full face of coil active during full or part load conditions.

I. Gas Heat Section:

- 1. Unit shall be equipped with a modulating gas valve, adjustable speed combustion blower, and stainless steel tubular heat exchanger. The heat exchanger shall have a 25 year non pro-rated warranty. The completely factory mounted gas heating assembly shall be capable of operating at any firing rate between 100% and 30% of rated capacity. The combustion air and gas firing rate shall both be capable of modulation. A discharge air sensor shall be provided for field installation in the supply air ductwork to sense the discharge air temperature. The discharge air setpoint shall be adjusted at the electronic controller within the rooftop unit control compartment.
- 2. Unit shall be provided with a gas ignition system consisting of an electronic ignitor to a pilot system, which will be continuous when the heater is operating, but will shut off the pilot when heating is not required.

J. Safeties:

- 1. Unit shall incorporate a solid-state compressor lockout which provides reset capability should any of the following safety devices trip and shut off compressor:
- 2. Compressor lockout protection provided for either internal or external overload.
- 3. Low-pressure switch.
- 4. Dual freezestats (evaporator coil).
- 5. High-pressure switch.
- 6. Supply-air thermostat shall be located in the unit.
- 7. Heating section shall be provided with the following minimum protections:
 - a. High-temperature limit switch.
 - b. Induced-draft motor speed sensor.
 - c. Flame rollout switch.
 - d. Flame proving controls.
 - e. Redundant gas valve.

K. Electrical Power:

1. Unit shall be provided with a factory installed and wired internal disconnect.
2. Unit shall be provided with phase and brown-out protection to shut down all motors in the unit if the phases are more than 10% out of balance on voltage, or the voltage is more than 10% under design voltage or on phase reversal.

L. Firestat

1. Unit shall be provided with a firestat(s) sensing in the: (A) return air; (B) supply air; or (C) both the return & supply air portion of the unit wired to shut off the unit control circuit.

M. Unit shall be complete with the following factory installed options:

1. Provide 5-year warranty on all compressors for parts and labor.
2. Condenser Coil Hail Guard Assembly: Hail guard shall protect against damage from hail and flying debris.

N. Unit shall be complete with the following field installed options:

1. Vibration Isolating type roof curbs sized and constructed to support the roof-top unit shall be provided by manufacturer supplying equipment (See Section 230500).
2. Flue Discharge Deflector: Flue discharge deflector directs unit exhaust vertically instead of horizontally.
 - a. Install deflector such that maintenance door can be opened without removing deflector. Provide additional brackets as required for installation.
 - b. Modify factory provided flue deflector such that the top of the deflector shall not extend more than 2'-0" above top of unit.

O. Single Zone Variable Air Volume Unit Controls:

1. Provide with a self-contained, factory furnished control system and LON or BACNET interface. The control system shall include the following as a minimum:
 - a. Supply Air Fan Control:
 - 1) Occupied Mode: Supply fan shall run continuous. Variable Speed Drive is modulated based on space temperature.
 - 2) During ventilation mode fan will operate at 30%, and the outdoor air damper is maintained at minimum position.
 - 3) Unoccupied Mode: The supply fan shall operate intermittently to maintain setpoint temperature.
 - b. Heating System Control:
 - 1) Modulating gas upon a call for heating the combustion blower starts, a pre-purge cycle is executed and ignition sequence takes place.
 - a) When occupied, the fan will energize and operate at 50%.

- b) Heating is enabled when the temperature falls one deadband (adj.) below the Heating Setpoint (adj.). Heating is disabled when the temperature at the Mode Enable Sensor rises one deadband (adj.) above the Heating Setpoint.
- c) When in the heating mode, the unit will modulate or stage heat to maintain the supply air temperature setpoint.
- d) The supply fan VFD will be proportionally modulated between 50% and 100% of the maximum design airflow as the space temperature falls within the VFD Proportional Reset Window (adj.) below the heating enable.
- e) Heating is disabled if the Outdoor Air Temperature is above the Heating Lockout Set-point by 1° F.
- f) Controller will include stage up and stage down delays and a minimum off time and minimum run time for each stage of heat (all adjustable).

c. Cooling System Control:

- 1) When occupied, the fan will energize and operate at 30%.
- 2) Cooling is enabled when the temperature at the Mode Enable Sensor rises one deadband (adj.) above the Cooling Setpoint (adj.). Cooling is disabled when the temperature at the Mode Enable Sensor falls one deadband (adj.) below the Cooling Setpoint (adj.).
- 3) When in the Cooling Mode, cooling will be modulated to maintain the Supply Air Temperature at the Supply Air Temperature Cooling Setpoint of 55°F (adj.)
- 4) The supply fan VFD will be proportionally modulated between 30% and 100% of the maximum design airflow as the space temperature rises within the VFD Proportional Reset Window above the cooling enable set-point.
- 5) When space temperature drops below the target space temperature setpoint, the controller will switch to the CAV/space reset of the supply air setpoint cooling mode. When in this Mode the unit will maintain the Supply Air Temperature at the Active Supply Air Temperature Cooling Setpoint by modulating compressors. The VCM will modulate the supply air set-point between 55° to 65° (adj.) as the space temperature drops from the set-point to 2° below the set-point. If the space temperature is above setpoint the controller will switch out of CAV/space reset of the supply air setpoint mode back into VAV/constant supply air temperature cooling mode as described above and will begin to modulate the VFD higher while keeping a constant cooling supply air temperature.
- 6) Mechanical cooling is disabled if the Outdoor Air Temperature is below the Cooling Lockout Set-point by 1° F.
- 7) In addition to stage up and stage down delays, the controller uses a minimum off time (adj.) and a minimum run time (adj.) for each compressor.

- d. Outside Air Control:
 - 1) Occupied Mode: The outside air dampers shall open to the minimum set point to provide outside air.
 - a) Demand Control Ventilation: Outside air reset control shall be provided to vary the amount of outside air from the minimum to maximum values indicated on schedules based on demand control ventilation from wall mounted CO2 sensors.
 - 2) Unoccupied Mode: The outside air dampers shall be closed.
- e. Exhaust Fan control:
 - 1) Occupied Mode: the exhaust fan and exhaust dampers shall modulate to maintain the building pressurization set point.
 - 2) Unoccupied Mode: The exhaust fan shall remain off.
- f. In the event of a power failure, unit control system shall sequence the unit to re-start beginning with the first stage of cooling or heating.
- g. Perform a quick test to check the status of input and output signals to the control system.
- h. The unit shall be indexed on and off and indexed into modes of operation by the FMS.
- i. Morning warm up controls provided by FMS.
- j. As a minimum, provide the following points to the FMS:

Status and Alarm Points	Sensor Reading Points	Safety Alarms	Adjustable Points
Unit ON/Off	SA Temperature	Smoke Detection	Applicatory Mode
Supply Fan	RA Temperature	Low SA Temp	Building Pressure Setpoint
Exhaust Fan	OA Temperature	High SP	SA temp set point
Heating stages	SA SP	General Unit Alarm	Compressor Lockout C-non-adj.
Cooling Stages	Space Temperature	Dirty Filter	Occupancy Schedule
Economizer	O/A damper % open		Unoccupied Setpoints
Outside Air	Building pressure		O/A Damper set point
Morning Warm Up	Energy Recovery Wheel		SA Static Pressure set point
Humidity (R/A)			Heating & Cooling Enable
Energy Recovery Wheel			Economizer enable

PART 3 – EXECUTION

- A. Equipment Installation:
 - 1. Provide permanent placard attached to unit identifying unit number.
 - 2. Provide temporary weathertight enclosures to protect roof openings until unit is installed.

3. Install roof curb and set unit level onto roof curb. Adjust roof curb as required for sloped roofs. Equipment shall be sealed air and watertight to roof curb.
4. Install return air filters and outside air filters.
5. Install all field-installed options shipped loose with equipment per manufacturer's recommendations.
6. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated and fan has been test run under observation.

B. Ductwork Installation:

1. Connect supply and return air ductwork to equipment with flexible connections.
2. Provide outside air intake duct extensions as required to maintain minimum 15 feet clearance between outdoor intake opening and nearest vent or exhaust.

C. Piping Installation:

1. Make natural gas piping connections to rooftop unit and check gas piping for leaks. Paint all external gas piping.
2. Install piping as required for a complete and operational system. Provide accessories as required based on actual field pipe routing and system requirements.
3. Piping shall be brought to equipment connections in such a manner so as to prevent the possibility of loads or stresses being applied to the connections.
4. Verify unit installation is level for proper condensate drainage. Install condensate drain piping from unit connection to roof and provide properly sized trap as per manufacturer's recommendations.

D. Temperature Control Installation:

1. Control wiring is to be in accordance with local, federal, state, and national electric wiring codes.
2. Unit is to be controlled by temperature control system. Coordinate installation of controls, thermostats, sensors, tubes, etc. with temperature control contractor.

E. Manufacturer Start-up:

1. Arrange and pay for tests and start-up fee required for installation of equipment.
2. Equipment manufacturer shall furnish required control devices, panels, sensors, wiring diagrams, etc. for the installation. Manufacturer shall work with and assist in the initial equipment controls set up for a complete and operational system and to verify that required temperature controls points are communicating with the FMS system.
3. Equipment manufacturer shall provide a factory trained service technician to completely check-out and start-up equipment, associated controls and accessories. Manufacturer's representative shall instruct the maintenance personnel in the care and operation of the equipment.
4. Submit manufacturer's start-up report for review. As a minimum, start up report shall contain the following information:
 - a. Electrical connections and terminals have been connected and are tight.
 - b. Gas piping has been checked for leaks.
 - c. Fan sheaves are aligned and belts are properly tensioned.
 - d. Refrigerant suction, discharge, and liquid service valves on each circuit are open.
 - e. Dampers open and sequences are functioning properly.

- f. Temperature control points are communicating with FMS system.
- g. Maintenance personnel have been instructed in the care and operation of the equipment.
- h. Field supplied options shipped loose have been installed per manufacturer's recommendations.
- i. Equipment shuts down upon fire alarm activation.
- j. Remote start/stop and reset are functional.
- k. Heating and cooling capacity control functions properly.
- l. Fan VFD is set for proper CFM.
- m. List all field set point values (i.e. space temperature and system pressure set-points, occupancy schedules, supply air temperature set-point, economizer temperature set-point, etc.).

END OF SECTION

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SECTION 23 74 15

ROOF-TOP DOAS UNITS (02-30 TONS)

PART 1 – GENERAL:

1.01 DESCRIPTION:

- A. Work Included: This section of the work includes the furnishing and installing of single zone VAV, natural gas-fired heating, electric cooling roof-top Dedicated Outside Air System (DOAS) of the size, capacity, and configuration indicated on the drawings.

1.02 QUALITY ASSURANCE:

- A. Unit shall be tested, rated, and certified as complete unit in accordance with ARI for capacities and sound ratings.
- B. Unit shall be UL-tested and certified in accordance with ANSI Z21.47 Standards.
- C. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
- D. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen). All equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified or as denoted on the drawings.
- E. Unit shall be UL listed.
- F. Units shall be AGA approved.
- G. Unit shall meet ASHRAE 90.1-2001 Energy Standards.

1.03 SHOP DRAWING SUBMITTALS:

- A. Submittals shall be required for the following items, and for additional items where required for a complete and operational system:
 - 1. Rooftop Equipment Product Data
 - 2. Roof Curb
 - 3. Controls
 - 4. LON/BACNET Interface
 - 5. Architectural Louvers
 - 6. Manufacturer's Start-up Report

PART 2 – PRODUCTS

2.01 MANUFACTURERS:

- A. Unit specified is manufactured by Aaon. Equivalent units manufactured by Carrier, Daikin, Greenheck or Valent will be approved equivalent in all respects.

2.02 EQUIPMENT:

- A. Description: Factory assembled and tested; designed for roof or slab installation; and consisting of compressors, condensers, evaporator coils, condenser and evaporator fans, refrigeration and temperature controls, gas heater, filters, and dampers.

- B. Construction:

- 1. Unit shall be completely factory assembled, piped, and wired and shipped in one section.
- 2. Unit shall be specifically designed for outdoor roof top application with a fully weatherproof cabinet.
- 3. Cabinet shall be constructed entirely of G90 galvanized steel with the exterior constructed of 20 gauge or heavier material.
- 4. Paint finish shall be capable of withstanding at least 2000 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.
- 5. The unit roof shall be sloped or cross-broken to assure drainage.
- 6. Unit specific color coded wiring diagrams shall match the unit color coded wiring and will be provided in both point-to-point and ladder form.
- 7. Diagrams shall also be laminated in plastic and permanently affixed inside the control compartment.
- 8. Access to filters, blower, heating section, and other items needing periodic checking or maintenance shall be through hinged access doors with quarter turn latches. Door fastening screws are not acceptable.
- 9. All openings through the base pan of the unit shall have upturned flanges of at least 1/2" in height around the opening through the base pan.
- 10. Air side service access doors shall have rain break overhangs.
- 11. All access doors shall have an internal metal liner to protect the door 1/2 inch thick, 1 1/2 lb. density fiberglass insulation.
- 12. The interior air side of the cabinet shall be entirely insulated on all exterior panels with 1 inch thick, 1 1/2 lb. density fiberglass insulation or 2" of foam injection double wall panel.
- 13. Unit shall have decals and tags to indicate unit lifting and rigging, service areas, and caution areas. Installation and maintenance manuals shall be supplied with each unit.

- C. Cabinet:

- 1. Double wall insulation liners
- 2. Unit shall be furnished with 304 stainless steel drain pans.

- D. Supply Fans:

- 1. Blower(s) shall be entirely self contained on a slide deck for service and removal from the cabinet.
- 2. All direct drive blower(s) shall have backward inclined airfoil blades.
- 3. Blowers, drives and motors shall be dynamically balanced.

E. Outside Air Options:

1. Shall be 0 - 100% with a motor operated outside air damper assembly constructed of extruded aluminum, hollow core, air foil blade with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 25 CFM of leakage per sq. ft. of damper area when subjected to 2 in. w.g. air pressure differential across the damper. Damper motor shall be spring return to ensure closing of outdoor air damper during periods of unit shut down or power failure.

F. Exhaust Fan Sections:

1. Power Exhaust Fans

- a. Axial flow direct drive fans shall have all aluminum construction and adjustable blade pitch. Direct drive fans shall be directly connected to and supported by the motor shaft. Motor bearings shall be rated for 200,000 hours service and shall have external lubrication connections. Fan(s) and motor(s) shall be dynamically balanced. (For Variable Volume Systems VFD drive(s) shall be factory mounted and wired to the fan motor(s).)

G. Energy Recovery Wheel:

1. The rooftop unit shall have a factory mounted and tested energy recovery wheel. The energy recovery wheel shall be mounted in a rigid frame containing the wheel drive motor, drive belt, wheel seals and bearings.
2. The energy recovery cassette shall be rated in accordance with ARI Standard 1060 and shall bear the ARI certification symbol.
3. The energy recovery cassette shall contain a total energy recovery heat wheel constructed of a light weight polymer material with permanently bonded desiccant coating. The energy recovery wheel media shall be capable of removal from the cassette and replacement without the use of tools. Wheel media shall be cleanable using hot water or light detergent without degrading the efficiency.
4. The exhaust fan shall be backward inclined type. Fan(s) and motor(s) shall be dynamically balanced. A back draft damper shall be included with the exhaust fan. Outside air filters shall be 4 inch, pleated, disposable.
5. Motors shall be standard efficiency (premium efficiency). Motors for use with VFD shall be premium efficiency inverter rated only. Motor bearings shall be ball bearing and shall have external lubrication connections.

H. Filters:

1. 2-inch- thick, fiberglass, throwaway with an ASHRAE efficiency of 30%.
2. 4" thick fiberglass pleated with an ASHRAE efficiency of 30%
3. Clogged filter switch

I. Evaporator Coils:

1. Options:

- a. Evaporator coil drain pan(s) shall be fabricated of 304 stainless steel.

J. Refrigeration System:

1. Compressors shall utilize R454B or R32 refrigerant, direct drive, hermetically sealed, suction gas cooled, digital scroll type compressors with centrifugal oil pump, oil level sight glass, oil charging valve, internal overloads, internal spring isolation, and rubber grommet mountings. Units shall be provided with multiple compressors (minimum 2) with separate refrigeration circuits and refrigeration controls.
2. Compressors shall be mounted in an isolated compartment to permit operation of the unit without affecting air flow when the door to the compartment is open.
3. Compressors shall be isolated from the base pan and supply air to avoid any transmission of noise from the compressor into the building area.
4. System shall be equipped with thermostatic expansion valve type refrigerant flow control.
5. System shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant controls.
6. Unit shall be equipped with Schrader type service fittings on both the high side and low pressure sides of the system.
7. Unit shall be equipped with refrigerant liquid line driers.
8. Unit shall be fully factory charged with refrigerant.
9. Unit shall be provided with the following options:
 - a. Each compressor shall be individually staged for capacity control (RT-5 ONLY).
 - b. All circuits shall be equipped with liquid line sight glasses.
 - c. Dehumidification Control: The dehumidification system shall provide increased dehumidification control by further subcooling the hot liquid refrigerant leaving the condenser coil. System shall be capable of maintain unit discharge relative humidity level of 50% (adj).
 - 1) Unit shall be provided with a hot gas reheat coil and modulating hot gas reheat control valve piped to the lead refrigerant system. The system shall be equipped with crankcase heaters, low pressure switches, and thermostatic expansion valves. Provide complete with humidistat, (wall mounted) (factory mounted in the return air opening), to operate the dehumidification circuit only when needed.
 - d. Unit shall be equipped with a 5 minute anti-short cycle delay timer for each stage.
 - e. Unit shall be equipped with 20 second between stage delay timers for each stage.
 - f. Each compressor shall be equipped with suction and discharge service valves.
10. Evaporator and Condenser Coil shall be minimum 5/16" o.d. seamless copper tubing mechanically bonded to aluminum fins and shall be factory leak tested at 150 psig and pressure tested at 450 psig. Dual circuit coils to be of intermingled configuration with full face of coil active during full or part load conditions.

K. Gas Heat Section:

1. Unit shall be equipped with a modulating gas valve, adjustable speed combustion blower, and stainless steel tubular heat exchanger. The heat exchanger shall have a 25 year non pro-rated warranty. The completely factory mounted gas heating assembly shall be capable of operating at any firing rate between 100% and 30% of rated capacity. The combustion air and gas firing rate shall both be capable of modulation. A discharge air sensor shall be provided for field installation in the supply air ductwork to sense the discharge air temperature. The discharge air setpoint shall be adjusted at the electronic controller within the rooftop unit control compartment.
2. Unit shall be provided with a gas ignition system consisting of an electronic ignitor to a pilot system, which will be continuous when the heater is operating, but will shut off the pilot when heating is not required.

L. Safeties:

1. Unit shall incorporate a solid-state compressor lockout which provides reset capability should any of the following safety devices trip and shut off compressor:
2. Compressor lockout protection provided for either internal or external overload.
3. Low-pressure switch.
4. Dual freezestats (evaporator coil).
5. High-pressure switch.
6. Supply-air thermostat shall be located in the unit.
7. Heating section shall be provided with the following minimum protections:
 - a. High-temperature limit switch.
 - b. Induced-draft motor speed sensor.
 - c. Flame rollout switch.
 - d. Flame proving controls.
 - e. Redundant gas valve.

M. Electrical Power:

1. Unit shall be provided with a factory installed and wired internal disconnect.
2. Unit shall be provided with phase and brown-out protection to shut down all motors in the unit if the phases are more than 10% out of balance on voltage, or the voltage is more than 10% under design voltage or on phase reversal.

N. Smoke Detector

1. Unit shall be provided with a smoke detector(s) sensing in the:
 - a. Return & supply air portion of the unit wired to shut off the unit control circuit upon sensing particles of combustion or notification from fire alarm system. Coordinate smoke detector manufacturer with fire alarm system to comply with UL system listing requirements.

O. Unit shall be complete with the following factory installed options:

1. Provide 5-year warranty on all compressors for parts and labor.
2. Condenser Coil Hail Guard Assembly: Hail guard shall protect against damage from hail and flying debris.

P. Unit shall be complete with the following field installed options:

1. Vibration Isolating type roof curbs sized and constructed to support the roof-top unit shall be provided by manufacturer supplying equipment (See Section 230500).
2. Provide additional drives, sheaves, belts, and pulleys as required for proper balancing of each piece of equipment for installation by the testing and balancing contractor.
3. Flue Discharge Deflector: Flue discharge deflector directs unit exhaust vertically instead of horizontally.
 - a. Install deflector such that maintenance door can be opened without removing deflector. Provide additional brackets as required for installation.
 - b. Modify factory provided flue deflector such that the top of the deflector shall not extend more than 2'-0" above top of unit.

Q. Single Zone Unit Controls:

1. Provide with a self-contained, factory furnished control system and LON or BACNET interface. The control system shall include the following as a minimum:
 - a. Supply Air Fan Control:
 - 1) Occupied Mode: Supply fan shall run continuous.
 - 2) Unoccupied Mode: The supply fan shall be off.
 - 3) Supply fan shall be disabled if discharge air temperature drops below 40 degrees F (adj).
 - b. Heating System Control:
 - 1) Modulating gas upon a call for heating the combustion blower starts, a pre-purge cycle is executed and ignition sequence takes place.
 - a) When in the heating mode, the unit will modulate to maintain the supply air temperature setpoint of 70 degrees F (adj).
 - c. Cooling System Control:
 - 1) Cooling is enabled through the FMS.
 - 2) When in the Cooling Mode, cooling will be modulated to maintain the Supply Air Temperature Setpoint of 75°F (adj.)
 - 3) In addition to stage up and stage down delays, the controller uses a minimum off time (adj.) and a minimum run time (adj.) for each compressor.
 - d. Outside Air Control:
 - 1) Occupied Mode: The outside air dampers shall open.
 - 2) Unoccupied Mode: The outside air dampers shall be closed.
 - e. Exhaust Fan control:

- 1) Occupied Mode: the exhaust fan and exhaust dampers shall modulate to maintain the building pressurization set point.
 - 2) Unoccupied Mode: The exhaust fan shall remain off.
- f. Energy Recovery Wheel:
- 1) Occupied Mode: Wheel shall be operational.
 - 2) Economizer Mode: Wheel shall be off.
 - 3) Unoccupied Mode: Wheel shall be off.
- g. In the event of a power failure, unit control system shall sequence the unit to re-start beginning with the first stage of cooling or heating.
- h. Perform a quick test to check the status of input and output signals to the control system.
- i. The unit shall be indexed on and off and indexed into modes of operation by the FMS.
- j. Morning warm up controls provided by FMS.
- k. As a minimum, provide the following points to the FMS:

Status and Alarm Points	Sensor Reading Points	Safety Alarms	Adjustable Points
Unit ON/Off	SA Temperature	Smoke Detection	Applicatory Mode
Supply Fan	RA Temperature	Low SA Temp	Building Pressure Setpoint
Exhaust Fan	OA Temperature	High SP	SA temp set point
Heating stages	SA SP	General Unit Alarm	Compressor Lockout C-non-adj.
Cooling Stages	Space Temperature	Dirty Filter	Occupancy Schedule
Economizer	O/A damper % open		Unoccupied Setpoints
Outside Air	Building pressure		O/A Damper set point
Morning Warm Up	Energy Recovery Wheel		SA Static Pressure set point
Humidity (R/A)			Heating & Cooling Enable
Energy Recovery Wheel			Economizer enable

PART 3 – EXECUTION

A. Equipment Installation:

1. Provide permanent placard attached to unit identifying unit number.
2. Provide temporary weathertight enclosures to protect roof openings until unit is installed.
3. Install roof curb and set unit level onto roof curb. Adjust roof curb as required for sloped roofs. Equipment shall be sealed air and watertight to roof curb.
4. Install return air filters and outside air filters.
5. Install all field-installed options shipped loose with equipment per manufacturer's recommendations.
6. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated and fan has been test run under observation.

B. Ductwork Installation:

1. Connect supply and exhaust air ductwork to equipment with flexible connections.
2. Provide outside air intake duct extensions as required to maintain minimum 15 feet clearance between outdoor intake opening and nearest vent or exhaust.

C. Piping Installation:

1. Make natural gas piping connections to rooftop unit and check gas piping for leaks. Paint all external gas piping.
2. Install piping as required for a complete and operational system. Provide accessories as required based on actual field pipe routing and system requirements.
3. Piping shall be brought to equipment connections in such a manner so as to prevent the possibility of loads or stresses being applied to the connections.
4. Verify unit installation is level for proper condensate drainage. Install condensate drain piping from unit connection to roof and provide properly sized trap as per manufacturer's recommendations.

D. Temperature Control Installation:

1. Control wiring is to be in accordance with local, federal, state, and national electric wiring codes.
2. Unit is to be controlled by temperature control system. Coordinate installation of controls, thermostats, sensors, tubes, etc. with temperature control contractor.

E. Manufacturer Start-up:

1. Arrange and pay for tests and start-up fee required for installation of equipment.
2. Equipment manufacturer shall furnish required control devices, panels, sensors, wiring diagrams, etc. for the installation. Manufacturer shall work with and assist in the initial equipment controls set up for a complete and operational system and to verify that required temperature controls points are communicating with the FMS system.
3. Equipment manufacturer shall provide a factory trained service technician to completely check-out and start-up equipment, associated controls and accessories. Manufacturer's representative shall instruct the maintenance personnel in the care and operation of the equipment.
4. Submit manufacturer's start-up report for review. As a minimum, start up report shall contain the following information:
 - a. Electrical connections and terminals have been connected and are tight.
 - b. Gas piping has been checked for leaks.
 - c. Fan sheaves are aligned and belts are properly tensioned.
 - d. Refrigerant suction, discharge, and liquid service valves on each circuit are open.
 - e. Dampers open and sequences are functioning properly.
 - f. Temperature control points are communicating with FMS system.
 - g. Maintenance personnel have been instructed in the care and operation of the equipment.
 - h. Field supplied options shipped loose have been installed per manufacturer's recommendations.
 - i. Equipment shuts down upon fire alarm activation.
 - j. Remote start/stop and reset are functional.
 - k. Heating and cooling capacity control functions properly.
 - l. Fan VFD is set for proper CFM.

- m. List all field set point values (i.e. space temperature and system pressure set-points, occupancy schedules, supply air temperature set-point, economizer temperature set-point, etc.).

END OF SECTION

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SECTION 23 82 39
ELECTRIC SPACE HEATING EQUIPMENT

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

- A. Conform to applicable provisions of Section 23 05 00.

1.02 DESCRIPTION OF WORK:

- A. This section of the work includes the furnishing and installing of the electric propeller, cabinet unit heaters and radiation panel heaters of the size and capacity where, and as denoted, on the drawings.

1.03 QUALITY ASSURANCE:

- A. Unit shall be tested, rated, and certified as complete unit in accordance with ARI for capacities and sound ratings.
- B. Equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified, or as denoted on the drawings.
- C. Units shall be UL, CSA or ETL listed.
- D. Assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.
- E. 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

1.04 PRODUCT HANDLING:

- A. Protection: Use means necessary to protect equipment before, during, and after installation.
- B. Replacement and Repair: Scratched, dented, and otherwise damaged units shall be repaired or replaced as directed.

1.05 SHOP DRAWING SUBMITTALS:

- A. Submittals shall be required for the following items, and for additional items where required for a complete and operational system:
 - 1. Propeller Unit Heaters

PART 2 – PRODUCTS

2.01 PROPELLER UNIT HEATERS

- A. Description: An assembly including casing, coil, fan, and motor in horizontal discharge configuration with adjustable discharge louvers.
 - 1. Comply with the safety requirements in UL 2021.
- B. Cabinet: Removable panels for maintenance access to controls. Baked-enamel finish applied to factory-assembled and -tested propeller unit heater before shipping.
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- D. Discharge Louver: Adjustable fin diffuser for horizontal units and conical diffuser for vertical units.
- E. Electric-Resistance Heating Elements: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in steel or corrosion-resistant metallic sheath with fins no closer than 0.16 inch. Element ends shall be enclosed in terminal box. Fin surface temperature shall not exceed 550 deg F at any point during normal operation.
 - 1. Circuit Protection: One-time fuses in terminal box for overcurrent protection and limit controls for high-temperature protection of heaters.
 - 2. Wiring Terminations: Stainless-steel or corrosion-resistant material.
- F. Fan and Motor:
 - 1. Fan: Propeller type with aluminum wheel directly mounted on motor shaft in the fan venturi.
 - 2. Motor: Permanently lubricated. Comply with requirements in IEEE 841.
- G. Control Devices: Wall-mounting thermostat (tamperproof for locations where heater is used for freeze protection only).
- H. Capacities and Characteristics: See equipment Schedule on the drawings
- I. Manufacturers: Subject to compliance with requirements, provide products indicated on Drawings or a comparable product by one of the following: Chromalox, Inc., Indeco, Modine Manufacturing Company, McQuay International or Reznor/Thomas & Betts Corporation.

PART 3 – EXECUTION

3.01 GENERAL:

- A. Equipment Installation:
 - 1. Manufacturers shall prepare schedule for approval listing room number, style, size, and capacity of equipment.

2. Equipment to fit snugly and securely to wall. Joints to be properly made up to fit tightly together with no cut or unfinished edges exposed.
3. Securely support suspended unit heaters from structural steel above finished ceilings. Provide necessary additional steel angles or channel for proper attachment to building structure.
4. Install wall and ceiling unit heaters to comply with NFPA 90A.
5. Install wall and ceiling unit heaters level and plumb.
6. Install vibration isolators for suspended unit heaters, per manufacturer's recommendations, and as previously specified.
7. Install all field-installed options shipped loose with equipment per manufacturer's recommendations.

B. Temperature Control Installation:

1. Control wiring is to be in accordance with local, federal, state, and national electric wiring codes.
2. Install wall-mounted thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

C. FIELD QUALITY CONTROL

1. Perform the following field tests and prepare test reports:
 - a. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - b. For units that have electric resistance heating coils, operate electric heating elements through each stage to verify proper operation and electrical connections.
 - c. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
2. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

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SECTION 23 88 00
DUCTWORK AND ACCESSORIES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

- A. Comply with applicable provisions of Section 23 05 00.
- B. Refer to Section 23 07 00 for external duct insulation.

1.02 DESCRIPTION OF WORK:

- A. Furnish the labor, materials, equipment, appliances, services, and perform the operations in connection with the construction and installation of the work. Work to be as herein specified and as denoted on the accompanying drawings.
- B. This section of the work includes the furnishing and installing of steel ductwork, acoustic and thermal lining, and accessories and specialties incidental to the construction of the heating, ventilating, air conditioning, and exhaust systems, including plenums, and housing and the like, necessary, and required by the systems.

1.03 QUALITY ASSURANCE:

- A. Construction of heating, air conditioning, and general exhaust ductwork and duct liner application shall be in accordance with the recommendations of SMACNA's and ASHRAE's latest edition manuals.
- B. Duct coverings, duct lining, tapes, and core materials in panels; used in duct systems shall have flamespread rating not over 25 without evidence of continued progressive combustion and a smoke developed rating no higher than 50. If coverings and linings are to be applied with adhesives, they shall have a flamespread rating not over 25 and a smoke developed rating no higher than 50 when in the final dry state.
- C. Conflicts between ASHRAE and SMACNA duct construction recommendations shall be submitted for review.
- D. Installations of sheet metal ducts and related work shall comply with applicable local, state, and national codes, rules regulations, and ordinances.
- E. Ductwork shop drawings must be properly submitted. Ductwork installed prior to receipt of reviewed shop drawings may have to be removed.
- F. Comply with the enclosed specification in its entirety. If, on various walk-throughs and inspections, changes have been made without prior approval and the changes are not specified within, make the applicable changes to comply with this specification and the drawings.

1.04 SHOP DRAWING SUBMITTALS:

- A. Submittals shall be required for the following items, and for additional items where required for a complete and operational system:
 - 1. Fabrication, assembly, and installation, including plans, elevation, sections, components, and attachments to other work.
 - a. Ductwork Layout indicating sizes, configuration, and liner material.
 - b. Elevation of top of ducts.
 - c. Fittings
 - d. Location of ductwork accessories including dampers, turning vanes and access doors and panels.
 - e. Hangers and supports including methods for duct and building attachment.
 - 2. Interference drawings, as required or requested.
 - a. Plans, drawn to scale, on which the following items are shown and coordinated with each other:
 - 1) Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
 - 2) Suspended ceiling elevation and components.
 - 3) Structural members
 - 3. Ductwork Construction Standards
 - 4. Flexible Ductwork
 - 5. Ductwork Lining
 - 6. Automatic Dampers
 - 7. Fire Dampers
 - 8. Diffusers and Registers
 - 9. Louvers
 - 10. Filters
 - 11. Ductwork Pressure Test Reports

PART 2 – PRODUCTS

2.01 DUCTWORK:

- A. Low pressure ductwork (positive or negative) shall be designed for static pressure rating up to 2" wg, with nominal duct air velocities of 2,000 fpm or less. Class "A" seals shall be used in the construction of the ductwork to make duct joints and connections airtight (SMACNA 1995 Edition).
- B. Exposed round ducts and fittings shall be factory fabricated spiral lock seam duct with machine formed fittings as manufactured by United Sheet Metal or approved equal. Fittings shall be sealed with United Fire Retardant Duct Sealer or approved equal. Sections of duct shall spiral in the same direction.

- C. Concealed round ducts and fittings may be fabricated with longitudinal seams. Elbows to be segmented adjustable seam type.
- D. Round galvanized air ducts shall be constructed of the following gauges except where specifically noted otherwise on the drawings:

Duct Diameter	Gauge – Spiral Seam	Gauge – Longitudinal Seam
Low Pressure		
3" to 8"	26	26
9" to 14"	26	24
15" to 26"	24	22

- E. Rectangular ductwork (unless noted otherwise) shall be constructed of new prime grade galvanized sheet steel, manufactured in accordance with ASTM A525 G-90 standards for hot dip galvanized sheet. Coating weight shall not be less than 1.25 ounces per square foot where used in normal applications. Sheets having coating that will flake or peel under forming operation will not be allowed. Ductwork shall be of the gauge and provided with the recommended reinforcement as outlined in the most current SMACNA "HVAC Duct Construction Standards" for the specified system operating pressure.
- F. Locker/Shower Area supply, return and exhaust ductwork shall be new prime grade aluminum sheet, alloy 3003-H-14. Ductwork shall be of the thickness and provided with the recommended reinforcement as outlined in the most current SMACNA "HVAC Duct Construction Standards" for the specified system operating pressure.
- G. Exposed round and rectangular ductwork shall have paint grip coating. Be responsible for thoroughly cleaning exterior of exposed ductwork to ensure dirt and grease are removed and paint grip coating is properly applied, ready for final painting.

2.02 DUCTWORK JOINTS AND SEAMS:

A. Transverse Joints:

1. Rectangular Ducts:

- a. For ducts with longest side 12" wide and over, construct ductwork using the Ductmate 35/25 slide on systems, per Ductmate Industries Duct Construction Standards, dated July 1992 and Installation and Assembly Instructions, dated January 1993 (1-800-245-3188).
 - 1) The SMACNA T-22 flanged connection may be used as defined on Page 1-25 and 1-37 of the 1985 SMACNA Manual, First Edition, or an approved equal.
 - 2) The non-proprietary T-24 flange and proprietary T.D.C./T.D.F. flanges, are acceptable.
- b. For transverse joint construction, 11" wide and smaller, the above mentioned may be used, or refer to SMACNA's 1985 Manual, First Edition, for proper duct construction procedures.
- c. Ductmate 440 butyl gasket, or an approved equal, shall be used between rectangular transverse flanged duct connections, Ductmate's 440 butyl gasket, will be used exclusively with the Ductmate Systems.

- d. For rectangular ductwork located outside, exposed to weather, construct ductwork per "Transverse Joints, Rectangular" with one (1) exception. Use continuous metal cleat on top joints of ducts, for added weather protection, or other approved methods of sealing.

2. Round Ducts:

- a. For round ducts of 10" diameter and larger, construct ductwork using the Ductmate "Spiralmate" system, installed per Ductmate Industries construction standards. Round ducts under 10" in diameter shall be constructed per SMACNA manual standards.
- b. Spirosafe line of self-sealing round spiral duct and fittings as manufactured by Lindab, Inc. may be used in lieu of as specified above. The ductwork system is to have factory installed double-lipped gaskets rated to operate between -20 F. and 212 F. and that meets SMACNA Leakage Class 3 integrity from -20 in.WG to +12 in. WG without use of caulking or sealants. The ductwork system is to have rolled over edges. Where round ductwork is specified to be lined, the Spirosafe double wall ductwork and fittings with perforated inner liner is to be used. Spirosafe ductwork and fittings are to be cleaned by the contractor ready for painting in lieu of paint grip specified.

B. Longitudinal Seam:

1. Rectangular Ductwork

- a. The Pittsburgh Lock seam shall be used, no exception.

2. Round Ductwork

- a. Concealed: Spiral or Snaplock seams, except type RL-8, as defined by SMACNA HVAC Duct Construction Standards Metal and Flexible – Second Edition 1995 shall be used.
- b. Exposed: Spiral seam shall be used; no exception.

C. Duct Closure Systems:

- 1. Metal joints, longitudinal and transverse seams, and connections shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems, liquid sealants, or tapes.
 - a. Tapes used to seal ductwork shall be listed and labeled in accordance with UL 181A and shall be marked "181A-P" for pressure sensitive tape, "181A-M" for mastic or "181A-H" for heat-sensitive tape. Unlisted duct tape is not permitted as a closure system on any duct.
 - b. Closure systems used to seal metal ductwork shall be installed in accordance with the manufacturer's installation requirements.

2.03 EXTERIOR DUCTWORK:

- A. Exterior supply and return air ductwork joints, seams, etc. shall be fabricated by ThermaDuct or EnduraDuct and installed per manufacturers recommendations for a weather tight system. Ductwork shall be provided with vinyl cladding, bolted corner joints, rated for 6" of positive or negative pressure and comply with SMACNA Air Leakage Class 1 requirements. Joints and seams of vinyl cladding shall be heat or chemically welded together for a weather tight seam per manufacturers recommendations. Ductwork shall be provided with the following:
 - 1. Exterior of duct shall consist of factory bonded FSK aluminum with UV stable, 39 mil, titanium infused vinyl cladding laminated to foam insulation
 - 2. Interior of duct shall consist of factory bonded aluminum foil vapor barrier
 - 3. Insulation value of R-8.1 (1x1 3/16" panel)
 - 4. Closed Cell Phenolic Foam Insulation
 - 5. 10 year leakage warranty

2.04 FLEXIBLE DUCT:

- A. Final connections to registers and diffusers may be made with insulated flexible ductwork equal to Thermaflex M-KE. Flexible ductwork shall only be installed in a concealed ceiling space.
- B. Flexible Ducts shall be Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2 inch-(38-mm) thick, glass-fiber insulation around a continuous inner liner and comply with UL 181, Class 1.
 - 1. Reinforcement - Steel-wire helix encapsulated in inner liner.
 - 2. Outer Jacket - Glass-reinforced, silver Mylar with a continuous hanging tab, integral fibrous-glass tape, and nylon hanging cord.
 - 3. Outer Jacket - Polyethylene film.
 - 4. Inner Liner - Polyethylene film.
- C. Flexible ductwork shall have a rating of 6-inch wg (1500 Pa) positive, ½-inch wg (125 Pa) negative.
- D. The flexible duct shall be capable of maintaining the shaping required by job conditions without subsequent sagging or drooping.
- E. Flexible duct shall be 5'-0" maximum in length.
- F. Flexible ductwork shall not exceed long radius 90° bends. Bends exceeding 90° or tight radius bends shall be reworked at no cost to the Owner.
- G. Flexible ductwork is not permitted on the inlet side of variable air volume boxes.

2.05 DUCTWORK LINING:

- A. Ductwork liner shall be Johns Manville Linacoustic RC. Ductwork liner as manufactured by Knauf, Owens-Corning or Certain-Teed will be acceptable if equal. The product name is to be imprinted on the air stream surface.

- B. Ductwork Liner shall be installed in accordance with the Sheet Metal and Air Conditioning Contractor's National Association Duct Liner Application Standard, Second Edition, shall meet ASTM C1071 standards and liner facing must meet EPA registration requirements for antimicrobial protection.
- C. Liner shall be 1-1/2 pcf density with the following minimum performance values:
 - 1. 0.5 Inch Thick: 0.55 NRC, 0.46 Thermal Conductivity
 - 2. 1.0 Inch Thick: 0.70 NRC, 0.24 Thermal Conductivity
 - 3. 1.5 Inch Thick: 0.85 NRC, 0.16 Thermal Conductivity
- D. Unless otherwise indicated, the duct dimensions given on the drawings are to be clear inside dimensions after insulation is applied.
- E. Round ductwork indicated to be lined shall be lined with 1" thick "Permacote Spiracoustic Plus" insulation manufactured by Johns Manville. Liner shall be installed per manufacturer's recommendations and requirements.

2.06 BALANCING DAMPERS:

- A. Volume dampers to be opposed blade, or single blade type (splitter type dampers are not acceptable) designed for reduced volume control. Damper hardware must be durable and installed properly. Damper blades should be stiffened by forming or other method, as required for the duty. Damper to have locking device to hold damper in a fixed position without vibration. Dampers shall be equal to American Warming Model VC-8 (rectangular) and VC-9 (round) for installation in low pressure systems and Model VC-2 (rectangular) and VC-23 (round) for installation in medium pressure systems.
 - 1. Balancing Dampers to have lock type damper operator and linkage as best suites construction and access conditions.
 - 2. Dampers with accessible operators to be provided with locking damper quadrants complete with locking nuts and graduate scale.
 - 3. Dampers with nonaccessible operators provide with Young Series 300 concealed regulator and coverplate complete with worm gear or linkage as required for smooth damper operation.
 - 4. Dampers in under the slab ducts provide with Young Series 335 adjustable cover regulators.

2.07 AUTOMATIC DAMPERS:

- A. Where denoted on the drawings, the automatically operated dampers in connection with the automatic temperature control system will be furnished by Division 230923 work: installed by this contractor. Other dampers to be furnished and installed by this contractor shall be as follows:
 - 1. Dampers, unless otherwise specified, shall be "low-leakage" dampers and shall be designed for tight shut-off such that for a 1,500 fpm damper leakage does not exceed 1% at 6" wg. Silent-closing replaceable butyl and neoprene seals shall be provided on blades on all four (4) sides of the frame. Louver linkage to be concealed in frame channel outside of the air stream. Bearings to be nylon bushings and to be oil-impregnated sintered iron. Rigid blade construction of no lighter than double #22 gauge and 6" maximum blade width; frames to have welded corners and be diagonally braced.

2. Furnish dampers with 2-position, line voltage electric operators. Operators shall be of sufficient size to provide 100% shut-off.

2.08 FIRE DAMPERS:

- A. Fire dampers shall be furnished and installed in supply, return, and exhaust ducts passing through fire rated walls where noted on the drawings, and in compliance with applicable codes, local, state, insurance, and other authorities having jurisdiction. They shall comply with requirements outlined in the latest issue of NFPA Pamphlet 90A. Fire dampers shall be in compliance with U.L. Standard for Fire Dampers, UL 555, and shall be U.L. labeled, tested, and inspected. Fire dampers shall be Air Balance, Type B, horizontal (spring loaded) or vertical guillotine type as required. Fire damper shall provide 95% duct free area. Fusible links to be standard 165° F. unless otherwise required by code.
 1. For ceilings rated for more than 1 hour provide ceiling radiation damper. Ceiling radiation type fire dampers shall be Air Balance Model 229-AH, UL rated for 1 hour ceilings. Radiation damper shall provide 100% duct free area. Provide UL classified thermal blankets for lay-in type diffuser/grille installations.
 2. Install hinged access door at each fire damper. Locate to permit release of fire damper catch and replace fusible link. Stencil "Fire Damper Access" on access doors. The access door shall be a minimum of 12" x 12", 26 gauge with rigid insulation and cam latches. Access doors shall be Air Balance Model FSA 100 for low pressure and FSA 100H for medium pressure installations.
- B. Install hinged access door at each fire and fire/smoke damper. Locate to permit release of fire damper catch and replace fusible link. Stencil "Fire Damper Access" on access doors. The access door shall be a minimum of 12" x 12", 26 gauge with rigid insulation and cam latches. Access doors shall be National Controlled Air Model ADR-1.
- C. Equivalent units as manufactured by American Warming, Air Balance, Greenheck, NCA, Nailor, or Ruskin will be acceptable.

2.09 TURNING VANES:

- A. Turning vanes shall be furnished and installed where denoted on drawings and in square elbows, designed to carry the air around the 90° bend without eddying or pressure fluctuation in the turn. Vanes shall be formed blade type and of standard catalog product of reputable manufacturer. Manufacturer of the air turns shall recommend the number and size of blades. Air turns shall be the complete unit type installed along the diagonals of each square elbow.
- B. Vanes shall be constructed and installed to limit pressure loss to not more than 20% of the velocity pressure.

2.10 DIFFUSERS AND REGISTERS:

- A. Round, square, and/or rectangular supply air diffusers and return air registers with neck dimensions, capacity, and style shall be as scheduled or denoted on drawings. Registers and diffusers shall be of steel construction with baked off white enamel finish (unless otherwise noted), equipped with necessary baffles to eliminate drafts and provide proper air distribution. Each register and diffuser shall be equipped with approved style opposed blade volume damper as noted on the drawings.
1. Coordinate type of each ceiling diffuser, grille and register with the ceiling system into which it is to be installed.
 2. Approved manufacturers of air diffusers and return air grilles include the following: Nailor, Titus, MetalAire, Krueger or Price.
 3. Supply diffusers shall be constructed of steel or aluminum as specified on the drawings and have a minimum of four louvered vane assemblies. The inner vane assembly shall be removable without the use of tools for access to accessories. The inner vane assembly shall be fixed to provide the proper air distribution characteristics required. No deflecting blades are to be used. Coordinate diffuser frame style with the ceiling system into which it is to be installed.
 4. Supply registers shall be constructed of steel, stainless steel or aluminum as specified on the drawings. Supply register shall be double deflection type. Each bar shall be adjustable for the desired air flow deflection without affecting the setting of other bars. Damper shall be of the opposed blade type and interlock to ensure the minimum of air leakage when closed.
 5. Return air and exhaust air registers shall be constructed of steel, stainless steel or aluminum as specified on the drawings. Registers shall combine a curved hemmed edge blade with an opposed blade damper. Damper blades shall be the same as that of the supply register.
 6. Registers for direct mounting on spiral ducts shall be mounted without use of a rectangular register tap. Provide end caps for registers to conform to duct diameter. Round duct registers shall be manufactured by Lindab. Registers shall have double deflection blade with vacuum adjustable damper.

2.11 LOUVERS:

- A. Louvers: Furnish and install wall mounted, 6" deep, high performance, drainable louvers of the size and type as indicated on the drawings. Frames and blades shall be .081" thick 6063-T5 alloy extruded aluminum. Blades shall be 35° drainable types. Jambs shall be constructed with integral downspouts for carrying water from the blades of the louver sill. Screens shall be provided on the interior of the louver and shall consist of 1/2" mesh .063" diameter aluminum wire mounted in an extruded aluminum frame. Screens shall be removable from the louver for cleaning. Louvers shall have anodized finish, color to match architectural aluminum.
1. Louvers shall pass 1,100 fpm free area velocity with less than .25" w.g. pressure drop and shall carry less than .03 ounces of water per square foot during a 15 minute period when tested in accordance with AMCA Standard 500. Louvers shall bear the AMCA Certified Ratings Seal for both Air Performance and Water Penetration.
- B. Louvers shall be as manufactured by Pottorff, Greenheck, NCA, Arrow-United, or Ruskin.

2.12 FILTERS:

- A. Provide filters of number, size and capacity as required for air handling systems indicated on drawings and as stated in these specifications. Filters shall be as manufactured by American Air Filter, Farr, Cambridge, or Continental.
 - 1. Factory built air handling units shall be provided with medium efficiency (30%-35% per ASHRAE Test Standard 52-68), pleated, disposable filters (American Air Filter, 2" thick, "Am-Air" filter).
 - 2. Factory built-up air handling units shall be supplied with American Air Filter Series 12 "Access Air" filter housing. The housing shall be furnished with a door at each end and shall be capable of operating at static pressures of up to 5" W.G. Access to only one (1) end shall be required for filter servicing. Filter tracks shall be provided for 2" prefilters and 4" final filters. Size unit as required for 450 fpm maximum air velocity across filters.
 - a. Provide each unit with required number of 2" prefilters as described in A-1 above and required number of 4" American Air Filter Varicel II high efficiency (80%-85% per ASHRAE Test Standard 52068) final filters.
- B. In the original installation of filters and filtering equipment, provide filters of the types specified for each system. On completion of the work, furnish and deliver to the Owner, spare filters equal to the complete replacement of such filters provided in the original installation.
 - 1. Filter media installed in air handling systems used to provide temporary heating is not to be considered a part of the original installation.
- C. Install at each air supply filter bank, pressure gauge for measuring resistance to air flow through each bank of filters. Gauges to be of the dial type, with 3-7/8" diameter white dial with black figures and graduations and have point zero adjustment: complete with two (2) static pressure taps with integral compression fittings, two (2) vent valves and fittings, tubing, mounting panel, screws and like items.
 - 1. At the completion of gauge installation, adjust gauges.
 - 2. Installation shall be complete per manufacturer's instructions.

PART 3 – EXECUTION

3.01 INSTALLATION:

- A. Duct shall be installed substantially as indicated on the drawings. However, where conflicts occur with other trades, building structure, etc. make minor changes in duct locations without extra cost.
- B. Duct sizes indicated on the accompanying drawings are inside dimensions and where ductwork is acoustically lined the duct shall be oversized accordingly to provide the same minimum cross sectional area.

- C. Provide galvanized angle iron frames around ducts where passing through walls, floors, partitions, etc. to cover openings in both sides of penetration, except at fire dampers. Sleeves or openings for ducts which are to be insulated shall be of sufficient size to permit the full specified thickness of insulation to pass through the sleeve opening.
- D. Pack and caulk around ductwork passing through floors or walls where required to prevent sound transmission, using fiberglass packing and metal collar.
- E. Locate ductwork within walls, ceilings, utility or pipe spaces, chases, joist spaces, and the like, insofar as is practical and so that such work will be properly concealed.
 - 1. Space sufficiently distant from other work and from adjacent lines, ducts, etc., to permit maintenance, replacement, insulation, etc., so not less than 1" space will exist in between completed finished surfaces.
 - 2. Space parallel runs of ductwork so that each individual run of duct can be separately insulated. Parallel runs of duct or piping, insulation as a bundle, will not be acceptable.
- F. This contractor shall clean the interior of ductwork and fittings, leaving area clean and free of loose insulation and/or other construction debris.

3.02 DUCTWORK LINER:

- A. Ductwork liner shall be applied to the following:
 - 1. Supply air ductwork – 1.5" lining
 - 2. Supply air exposed round ductwork – 1.0" lining
 - 3. Return air ductwork – 1.0" lining
 - 4. DOAS system discharge air ductwork – 1.5" lining
 - 5. DOAS system exhaust air ductwork – 1.0" lining
 - 6. Exhaust ductwork within 10'-0" of fan – 1.0" lining
 - 7. Transfer air ductwork – 0.5" Lining
- B. Duct liner shall be cut to assure overlapped and compressed longitudinal corner joints. Cut edges shall be properly sealed with mastic to assure no erosion of insulation.
- C. Fasteners shall start within 3" of the upstream transverse edges of the duct liner and 3" from the longitudinal joints and shall be spaced at a maximum of 12" o.c. except that they shall be placed not more than 6" from a longitudinal joint of the liner nor 12" from a corner break.
- D. Duct liner shall be adhered to the sheet metal (with 100% coverage) and edges coated with one (1) of the adhesives conforming to the Standard for Adhesives for Duct Liner, ASC-A-7001C -1972 of the Adhesive and Sealant Council, Inc.
- E. Duct liner shall be further secured with fasteners conforming to the Mechanical Fastener Standard, MF-1-1975 on Page 22 of the Duct Liner Application Standard, Second Edition, of the Sheet Metal and Air Conditioning Contractor's National Association.
- F. At contractor's option, low pressure round supply ductwork located in a concealed ceiling more than 30 feet from the supply fan discharge that serves only one (1) diffuser or register may be externally insulated in lieu of duct lining specified above.

3.03 FITTINGS:

- A. Sheet metal elbows and fittings shall be constructed to comply with the following:
 - 1. Curved elbows shall have a radius not less than 150% of duct width to the centerline of the duct. ($R/D = 1.5$).
 - 2. Where R/D ratio is less than 1.5, use hollow vane (air foil) vanes or turn blades.
 - 3. Elbows and other fittings shall be constructed the same as required for straight runs of ductwork. Round elbows shall be crimped and beaded on the downstream end. Square elbows must have turning vanes.
 - a. Using back to back 90° elbows should be avoided. Use 45° offset fittings for change in ductwork direction.
 - 4. Failure to install square elbows with turning vanes will result in rejection of that portion of the work.
 - 5. The dimensions of ducts shown on the drawings shall not be considered as absolute but change from same shall be subject to review.
 - a. Changes or transitions in shapes shall be done with long slants not to exceed 24° angle.
 - b. Equivalent areas shall be maintained for changes in shape of ductwork. In no case shall area be changed without special permission.
 - c. Changes in duct shape from round or oval duct to square or rectangular ductwork shall be made with smooth tapered transitions. Direct connection of round and square ductwork will not be accepted.
 - d. Branch duct take-off connections shall be made with enlarged entrance low loss fittings.

3.04 FLASHING:

- A. Flash and counterflash wherever sheet metal ducts of other sheet metal construction passes through roof or outside walls. Flash and counterflash at roof fans. Flashing to be 18 gauge galvanized metal constructed so as to make watertight in a neat appearing manner (unless stated otherwise on the plans). Roof curbs and flashing provided by this Division shall be coordinated with the roofing contractor to avoid conflicts.

3.05 BALANCING DAMPERS:

- A. Furnish and install balancing and adjusting dampers in low pressure ductwork at each multi-zone discharge zone supply air duct and at each low pressure supply air, return air and exhaust ductwork for each main and branch take-off including takeoffs to each air distribution device.

3.06 FLEXIBLE CONNECTIONS:

- A. Furnish and install flexible joints at suction and discharge connections of sheet metal ductwork to supply and exhaust fans and/or other equipment employing such fans. Fabricate of 30 ounce "Ventglas" or equal neoprene coated fabric properly secured by bolted angles or band iron. No metal-to-metal contact will be allowed. Flexible connection fabric shall be approved by the Underwriters' Laboratories, Inc. and comply with UL-191-1967.

3.07 ACCESS DOORS:

- A. Furnish and install airtight access doors in ducts where required for servicing and adjustment of damper, motors, cleaning of screens, etc. Doors shall be heavy gauge, constructed of the same material as duct, provided with heavy angle iron frames (protruding out from duct), and having continuous piano hinge, neoprene or airtight, felt gasket and cam lock.
- B. Minimum Size: 12" x 12", where duct is insulated fill doors with insulation to same thickness.

3.08 DUCTWORK SUPPORT:

- A. Galvanized ductwork 60" or smaller in maximum dimension shall be supported by 1" x 16 GA. galvanized band iron hangers secured to building structure. Ducts larger than 60" in maximum dimension shall be supported by 1-1/2" x 16 GA. galvanized band iron hangers. No hangers shall be secured to the underside of lightweight roof decking or lightweight floor slabs. Where required, trapeze hangers using adequate strength steel angles shall be used and rods shall be secured to the building structure. Maximum spacing for duct supports and hangers shall be 8'-0" on center. Duct hangers and supports shall be in accordance with SMACNA standards.
- B. Perforated strap iron hangers will not be permitted.
- C. Vertical ducts shall be supported by means of no less than two (2) galvanized structural angles secured to duct at the floor level.

3.09 DUCT SEALING AND LEAK TESTING:

- A. Joints and seams including longitudinal seams on plenums and ducts shall be airtight or sealed as required. Poorly made joints, splits, visible holes at corners, etc., shall be reworked or new pieces of ductwork installed as directed by the Engineer. Where excessive pulsating of ductwork or plenum housing is found, additional stiffeners shall be added as directed.
- B. Low Pressure Duct System: The corners of joints, openings, etc., shall be sealed as hereinbefore specified. Particular care shall be taken on ductwork on the suction side of fans. There shall be no audible leaks.

END OF SECTION

SECTION 26 3200

EMERGENCY GENERATOR

1.01 WORK INCLUDED

- A. This specification is designed to govern the furnishings and complete installation ready for satisfactory service, of all material and apparatus necessary to complete the Emergency Generator indicated on the drawings and as described hereinafter.

1.02 RULES AND REGULATIONS

- A. All work shall be installed in strict accordance with all applicable rules and regulations of local, state, and federal governments, or other authorities having lawful jurisdiction.
- B. This Contractor shall cooperate with and assist other Contractors on the job in conformity with all trade jurisdictions. He shall perform all work covered by the drawings and specifications which properly comes under the jurisdiction of the trade that he represents. Where jurisdictional rules require the assistance of electrical mechanics in the moving or setting of electrically powered equipment, the Contractor shall provide such assistance.
- C. The Contractors attention is called to the fact that it is not the intent of these specifications or accompanying drawings to interpret the meaning of, or show all requirements of the national or local codes. It shall be this contractor's responsibility to compile his bid to include such monies as may be necessary to complete said job in accordance with all codes.

1.03 LOCAL CONDITIONS

- A. The Contractor shall visit the site and determine all existing local conditions affecting work in his contract. He shall examine the architectural drawings and specifications to familiarize himself with the type of construction to be used for all new work and how it will affect the installation work in his contract.
- B. Failure to determine existing conditions or the nature or new construction will not be considered a basis for the granting of additional compensation.

1.04 APPROVAL OF MATERIALS

- A. Within 10 days after acceptance of this Contractor's bid, he shall submit to the Architect for approval, a list of manufacturers of equipment proposed for the work.
- B. All equipment and materials shall be of the general type and quality herein specified. Wherever the words "or approved equal" appear in the specification, the Architect's decision as to quality and relative merit shall be final.
- C. Each item of equipment shall be a standard catalog product of a reputable manufacturer. Selection of major items of equipment shall be confined to manufacturers mentioned in the specifications. Should equipment of lesser cost than the herein specified be proposed by the Contractor and be acceptable to both the Architect and Owner, a Corresponding credit shall be granted by the Contractor to the Owner.

1.05 MINOR DEVIATIONS

- A. The dimensions and ratings of equipment herein specified or indicated on the drawings are intended to establish the outlines and characteristics of such equipment generally. Minor deviations will be permitted to allow the manufacturers specified to bid on their nearest stock equipment.
- B. Where manufacturers catalog numbers or types are mentioned in the specifications or indicated on the drawings, they are intended to be used as a guide only and shall not be interpreted as taking precedence over the basic rating and duty specified. In all cases manufacturers shall verify the duty specified with the particular characteristics of the equipment he intends to offer for approval.

1.06 SUBMITTALS

- A. Provide submittals per Division I requirements.
- F. Submit product data, installation instructions, operations and maintenance manuals and shop drawings for the following items:
 - 1. Generator
 - 2. Automatic Transfer Switch
 - 3. Controller

1.07 INTERFERENCES

- A. The Contractor shall confer with other Contractors at the site to avoid interference, so that a minimum of head room and clearance may be obtained. In the event that interferences develop, the Architect's decision will be final and no additional compensation will be allowed for the moving of misplaced wiring, lighting fixtures, or equipment.
- B. The Contractor shall furnish all necessary scaffolding, staging, or cribbing required for the completion of the work. All such scaffolding, etc. shall be removed from the premises when its use is no longer required on the job.

1.08 SLEEVES

- A. Where conduits pass through concrete floors, galvanized sheet metal sleeves shall be set.
- B. Where conduits pass through concrete floors likely to become wetted with water occasionally, galvanized steel pipe sleeves shall be set. Tops of such sleeves shall project 1-1/2" above the surfaces of finished floors.

1.09 CUTTING AND PATCHING

- A. This Contractor shall do all cutting of building materials required for the installation of work herein specified. No structural members shall be cut without the approval of the Architect and all such cuttings shall be done in a manner directed by him.
- B. All patching shall be done in a neat and workmanlike manner meeting with the approval of the Architect, by mechanics of the particular trade involved.

1.10 HANGERS AND SUPPORTS

- A. All suspended conduits shall be rigidly supported from the construction by means of approved conduit hangers or clamps firmly anchored in place and spaced at intervals of not to exceed standard construction practices as called for in the National Electrical Code.

1.11 GENERATOR

- A. Provide a pad mounted generator – Kohler Model 500REZK Natural Gas Fired Generator with Weather Enclosure, Automatic Transfer Switch, 500 KVA 277/480V, Block Heater, Battery Charger and Decision-Maker 8000 Controller.
- B. Cummins
- C. Caterpillar

1.12 WIRING

- A. Connect transfer switches to building power panels as shown.

1.14 TEST OPERATION

- A. Unit shall be designed for periodic test operation.

1.15 PULL BOXES AND JUNCTION BOXES

- A. Provide pull boxes or junction boxes in conduit runs where indicated or where required to facilitate the pulling of wires or the making of connections. All pull boxes and junction boxes shall be provided with plain blank removable covers held in place with screws. The covers of all shall be accessible.

1.16 CONDUIT

- A. In general all interior wiring shall be encased in conduit. All conduit shall be as manufactured by N.E., Allied Tube, International Rue, Triangle or General Electric.
- B. At the Contractor's option, where conduit work is roughed-in in dry locations above suspended ceilings, standard galvanized electric metallic tubing or thin wall conduit may be used. Rigid galvanized conduit shall be used where conduits are laid in concrete slabs or in damp locations, or for exposed work. PVC conduit is acceptable when conduit is laid in or below concrete floor on grade when it meets the approval of local Electrical Inspector. PVC conduit must have additional ground wire installed.
- C. Furnish all brackets, hangers and supports per National Electric Code.
- D. Conduit fittings in dry locations may be set screw type fittings.

1.17 WIRE

- A. In general, all wire and cable for use in all locations shall consist of code grade type THHN 600 volt plastic insulated copper wire of sizes indicated on the drawings as per National Electric Code.

- B. No wire smaller than No. 12 shall be used for lighting or power wiring. Where the distance from the panel board to the load center of any lighting circuits exceeds 75 feet, No. 10 wire shall be used.

1.18 GROUNDING

- A. The wiring system and the conduit system shall be permanently and effectively grounded in accordance with the requirements of the National Electric Code and the local inspecting authority having jurisdiction.

1.19 REMOVAL OF RUBBISH

- A. This Contractor shall remove all his rubbish as fast as it accumulates, keep the building and premises clean during progress of the work and the premises at completion in perfect condition as far as his work is concerned.
- B. In the case of disputes concerning the ownership of rubbish, the Construction Manager will decide and his decision will be final. Should the Contractor refuse, neglect or otherwise fail to remove the rubbish, the Owner will do so and the cost of the work will be deducted from the amount due to the Contractor under his contract.

1.20 INSPECTIONS AND TESTS

- A. All work under this Contract shall be subject to the inspection and approval of the Architect whose decision shall be binding on all parties.
- B. The Contractor shall test all wiring and connections for continuity and grounds before any equipment and fixtures are connected, and when so directed by the Architect the Contractor shall demonstrate by meggar test the insulation resistance of any circuit or group of circuits. Where such insulation resistance test shall indicate the possibility of faulty insulation, he shall pull out the conductor at fault, replace same with new and all such work and replacement to be at the Contractor's sole expense.

1.21 DRAWINGS

- A. The drawings which accompany these specifications constitute a part of this Contract and indicate the general arrangement of circuits, feeders, location of switches, conduits and other work. The drawings and specifications are complementary to each other and what is called for by one shall be as binding as if called for by both.
- B. Data presented in these drawings are as accurate as preliminary surveys and planning can determine, but accuracy is not guaranteed, and field verification of all dimensions are directed.
- C. The specifications and drawings are for guidance, but the exact locations, distances and levels will be governed by actual field conditions. Deviation from the design is not permitted unless approved by the Architect.
- D. Electrical Contractor shall also review architectural, plumbing and mechanical trade drawings to pick up any equipment not shown on his drawings as well as to adjust his work to conform to all conditions shown thereon.

- E. Discrepancies shown on different plans or between drawings and actual field conditions or between plans and specifications shall be promptly brought to the attention of the Architect prior to submitting bid. These drawings may be superseded by later addenda or revisions as required by the construction and/or discrepancies, and the Contractor shall conform to all reasonable changes without extra cost to the Owner or Architect.

END OF SECTION

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SECTION 31 1200

SITE PREPARATION AND CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Remove surface debris.
- B. Remove site structures as indicated on the drawing.
- C. Clear site of plant life and grass.
- D. Provide erosion control devices.

1.02 REGULATORY REQUIREMENTS

- A. Conform to applicable code for disposal of debris.
- B. Coordinate clearing work with utility companies.
- C. All work shall comply with the rules and regulations of all local and state agencies having jurisdiction. Nothing contained herein shall be construed as permitting work that is contrary to such rules, regulations and codes.
- D. All work in public property shall conform to applicable rules and regulations of the area.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Erosion control fence: Fabrico, Inc. silt fence - 36"X100' woven polypropylene with hardwood stakes at 10' o.c. with 75% sediment retention.
- B. Straw Bales
- C. Substitutions: under provisions of Division 1.

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify that existing plant life and features designated to remain are tagged or identified.

3.02 PROTECTION

- A. Protect utilities that remain from damage.
- B. Protect trees, plant growth, and features designated to remain as final landscaping.

- C. Protect bench marks and existing structures, paving; curbs, sidewalks, etc. from damage or displacement.
- D. Install erosion control devices such as but not limited to erosion control fencings and straw bales as required per all applicable codes, governing authorities and local ordinances.

3.03 CLEARING

- A. Clear areas required for access to site and execution of Work.
- B. Remove designated site structures as indicated on the drawings. All finish edges of paving, curbs and walks to remain shall be saw cut straight. Walks shall be saw cut to the next closest control joint.
- C. Remove trees and shrubs. Remove stumps to a depth of 24 inches.
- D. Clear undergrowth and deadwood without disturbing subsoil.
- E. Backfill and compact open pits and holes caused as a result of clearing as per Backfilling Specifications.

3.04 REMOVAL

- A. Remove debris, rock, and extracted plant life from site.
- B. Remove erosion control devices when approved by the architect or local governing authority.

END OF SECTION

SECTION 31 2213

ROUGH GRADING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Remove topsoil and stockpile for later reuse. Remove excess from site. Excess topsoil shall not be removed from the site until final grading is complete. Contractor is responsible to verify existing top soil thicknesses in the field by whatever means is necessary.
- B. Excavate subsoil and stockpile for later reuse. Remove excess from site. Excess subsoil shall not be removed from the site until final grading is complete.
- C. Grade and rough contour site.

1.02 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Division 1.
- B. Accurately record location of utilities remaining, rerouted utilities, new utilities by horizontal dimensions, elevations or inverts, and slope gradients.

1.03 PROTECTION

- A. Protect trees, shrubs, lawns, and other features remaining as portion of final landscaping.
- B. Protect bench marks, existing structures, roads, sidewalks and paving and curbs.
- C. Protect above or below grade utilities which are to remain.
- D. Repair damage.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil: Excavated material, graded free of lumps exceeding 2" in diameter, roots, rocks larger than one inch, subsoil, debris, and large weeds.
- B. Subsoil: Excavated material, graded free of lumps larger than 6 inches, rocks larger than 3 inches and debris.

PART 3 EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Identify known below grade utilities. Stake and flag locations.

- C. Identify and flag above grade utilities.
- D. Maintain and protect existing utilities remaining which pass through work area.
- E. Notify utility company to remove and relocate utilities.
- F. Upon discovery of unknown utility or concealed conditions, discontinue affected work and notify Architect.

3.02 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, re-landscaped, or re-graded and stockpile in area designated on site.
- B. Do not excavate wet topsoil.
- C. Topsoil and subsoil may not be removed from the site until any requirements for fill has been met where stockpiled material is suitable and a surplus exists. Approval to remove any surplus must also be given by the Architect.

3.03 SUBSOIL EXCAVATION

- A. Excavate subsoil from areas to be re-landscaped or re-graded and stockpile.
- B. Do not excavate wet subsoil.
- C. When excavation through roots is necessary, perform work by hand and cut roots with a sharp axe.
- D. Subsoil may not be removed from the site until any requirement for fill has been met where stockpiled material is suitable and a surplus exists. Approval to remove any surplus must also be given by the Architect.

3.04 DISPOSAL

- A. Remove all waste materials and unsuitable or surplus soil from the Owner's property and legally dispose of it.
- B. Burning of combustible cleared and grubbed materials is not permitted on the Owner's property.

END OF SECTION

SECTION 31 2219

FINAL GRADING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. This specification section applies to any and all “restoration” work required on site.
- B. Finish grade subsoil and proof roll.
- C. Relocate and place, level and compact existing and imported topsoil.

1.02 PROTECTION

- A. Protect landscaping and other features remaining as final work.
- B. Protect existing structures, fences, roads, sidewalks, paving, and curbs.

1.03 TESTS

- A. Provide analysis of all imported topsoil.
- B. Analyze to ascertain topsoil composition to include soil particle, classification sizes and quantities, percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.
- C. Submit minimum 10 oz. sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Reuse existing topsoil at the site and provide additional topsoil as required.
- B. Existing topsoil composition:

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify site conditions and note irregularities affecting work of this Section.
- B. Beginning work of this Section means acceptance of existing conditions.

3.02 SUBSOIL PREPARATION

- A. Eliminate uneven areas and low spots. Remove debris, roots, branches, stones, in excess of 1/2 inch in size.
- B. Scarify subgrade to depth of 3 inches where topsoil is scheduled. Scarify in areas where construction equipment has compacted subsoil.

3.03 PLACING TOPSOIL

- A. The entire site shall be finish graded with a "Gill Pulveriser", "Roseman Rake" or other approved method. Finish grading shall reduce all soil particles to a size not larger than 1" in the largest dimension.
- B. Topsoil shall be evenly spread, compacted, and graded to the thickness indicated or specified and to the elevations and slopes shown. Unless otherwise noted, topsoil surface shall be 1 inch below header boards, walks, curbs and pavement, and shall be 6 inches in depth for areas designated "landscaping by others" or to be "grass" and shall be a minimum 4 inches in depth for areas designated to be "sodded". For areas scheduled for planting, place 6" of topsoil and shall be 3" below walk.
- C. Topsoil Compaction: Compact topsoil to achieve 50% pore spaces and 50% solid material on a total volume basis.
- D. Use topsoil in relatively dry state. Place during dry weather.
- E. Fine grade topsoil eliminating rough or low areas. Maintain levels, profiles, and contours of subgrade to ensure positive drainage. Make changes in grade gradual. Blend slopes into level areas.
- F. Manually spread topsoil around trees, plants and buildings to prevent damage.
- G. Remove vegetable matter and foreign non-organic material while spreading.
- H. Leave stockpile area and site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 31 2316

EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Excavation for building foundations.
- B. Excavation for slabs-on-grade and paving.
- C. All other excavation as may be required for completion of project.

1.02 FIELD MEASUREMENTS

- A. Verify that survey benchmark and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Protect above and below grade utilities which are to remain.
- C. Protect plant life, lawns, and other features remaining as a portion of final landscaping.
- D. Protect bench marks, existing structures, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

3.02 EXCAVATION

- A. Excavate subsoil required to accommodate building foundations, slabs-on-grade, paving, site structures and construction operations.
- B. Excavation cut not to interfere with normal 45 degree bearing splay of foundation.
- C. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- D. Hand trim excavation. Remove loose matter.
- E. Remove lumped subsoil, boulders, and rock up to 1/3 cu. yd. measured by volume.
- F. Notify Architect of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- G. Correct unauthorized excavation at no extra cost to Owner.

- H. Correct areas over-excavated by error in accordance with Section 31 2316 - Backfilling, at no cost to the Owner.
- I. Stockpile excavated material and dispose of excavated material as per Section 31 2213 - Rough Grading.

3.03 FIELD QUALITY CONTROL

- A. Field inspection will be performed under provisions of Division 1.
- B. Provide for visual inspection of bearing surfaces.

3.04 PROTECTION

- A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation, from freezing.

END OF SECTION

SECTION 31 2319

DEWATERING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The work of this section consists of the requirements for dewatering excavations if water is encountered and the situation warrants dewatering.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Materials for dewatering shall be at the Contractor's option.

PART 3 - EXECUTION

3.01 WATER REMOVAL

- A. At all times during the construction and protection of the work, the Contractor shall provide suitable means to promptly remove and dispose of all water entering excavations.
- B. The excavation shall be kept dry and no water shall be allowed to enter the trench until backfilling is complete or until such earlier time as approved by the Architect.
- C. In water bearing sand or quicksand, special precautions shall be taken. Well points, tight sheeting, drains, or other devices shall be used to keep the excavation dry, as required, and to provide conditions satisfactory to Architect.
- D. All water shall be disposed of in a suitable manner without damage to adjacent property or sewers.
- E. No water may be disposed of into an existing sanitary or combined sewer.
- F. Provide check dikes or other devices to retain water so as to permit eroded or suspended soils to settle and to prevent this soil from being carried into streams, lakes, or other nearby bodies of water.
- G. At completion of dewatering operations, remove materials and equipment.

END OF SECTION

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SECTION 31 2323

BACKFILLING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Backfilling within building.
- B. Backfilling against foundation walls at new concrete walks.
- C. Backfilling against foundation walls not at new concrete walks.
- D. Backfilling under concrete walks and paving.
- E. All other backfilling as may be required for completion of the project.

PART 2 MATERIALS

2.01 COMPACTED BACKFILL

- A. Under foundations, floors, walks, paving and against all walls where floor final elevation is below grade: Clean coarse sand, crushed stone or crushed concrete containing no vegetable or organic materials and no rocks larger than 1" diameter or any silts or lumps. All materials must be approved by an approved independent testing agency.

2.02 NONCOMPACTED BACKFILL

- A. For backfill against walls where floor is above grade and there are no exterior walks or paving above the backfill area: Either clean sand as above or site soil materials void of lumps, organic materials, rocks or boulders.

PART 3 EXECUTION

3.01 COMPACTED BACKFILL

- A. Under all building floor slabs, concrete walks and paving the backfill shall be compacted to at least 95% of the maximum dry density with reference to Standard Proctor ASTM D698. All compacted backfill shall be tested by an approved independent testing agency.
- B. Under all building foundations the backfill shall be compacted to 98.0% of the maximum dry density with reference to Standard Proctor ASTM D698. If any unsuitable soil is required to be excavated below or adjacent to the building foundations, the removal of unsuitable soil should extend past the structural area by a width equal to the depth of fill material underneath the foundations.
- C. Place fill materials in horizontal loose layers not exceeding 6" in thickness and spread, mix and place in such manner as to produce a uniform thickness of material. Placement shall start in the deepest area and progress approximately parallel to the finished grade. No fill material shall be placed when free water is standing in the area where fill is to be placed, or on frozen subsoil areas.

- D. Compact each layer of soil in the specified area with an approved roller as required to produce modified Proctor density. Obtain the Architect's or Testing Agency's approval before the next layer is started. The quantity of materials placed shall not exceed the capacity of the compaction equipment.
- E. Do not compact material when the moisture varies more than 2% from the optimum moisture content will be approximately 10% to 12%; however, the exact value shall be determined by the testing laboratory as the work progresses. A uniform moisture content will be required throughout the layers of fill material. Wetting or drying manipulation shall be required if necessary to accomplish this. Suspend compaction operations when, in the Architect's or testing agency's opinion, satisfactory results cannot be obtained because of rain or other unsatisfactory conditions.

3.02 NONCOMPACTED BACKFILL

- A. Place fill materials in horizontal loose layers not exceeding 6" in thickness and spread, mix and place in such manner as to produce a uniform thickness of material. Placement shall start in the deepest area and progress approximately parallel to the finished grade. No fill material shall be placed when free water is standing in the area where fill is to be placed, or on frozen subsoil areas.
- B. Do not use material from the topsoil stockpile for this fill. If excessive settlement occurs, refill the areas to eliminate any low spots or sinkholes resulting from settlement. Excessive settlement shall be considered anything over one-tenth (0.1) of a foot.

END OF SECTION

SECTION 32 3113

CHAIN LINK FENCE

PART 1 GENERAL

1.01 WORK INCLUDED

- A. The work included in this section consists of furnishing all labor and materials required for the construction of the fences, gates, and accessories, complete, as shown on the drawings and covered in the specifications. The fence shall be as manufactured by Page Fence, Cyclone or an approved equal as approved by the Architect.

1.02 SUBMITTALS

- A. Submit shop drawings and product literature under provisions of Division 1.
- B. Submit manufacturer's installation instructions under provisions of Division 1.
- C. Submit color selections for privacy slats.

1.03 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacture of equipment with 5 years minimum experience.
- B. Installer: Company with 5 years minimum experience and approved by manufacturer.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original unopened packages, containers or crates with manufacturer's labels intact during regular business hours. Store off ground, under cover and protected from damage until accepted by owner at completion.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Master Halco
- B. Stephen's Pipe & Steel.
- C. Merchants Metal
- D. Page Fence
- E. Cyclone
- F. Substitutions under provisions of Division 1.

2.02 MATERIALS

- A. Material Finish:
 - 1. Galvanized: All posts, rails, gate frames, braces and other fence accessories shall have a minimum 2.0 oz. hot-dipped galvanized finish in accordance with ASTM standard F-1234 Type B & D.

- B. Fabric: The fence height noted on the drawing indicates the fabric width and shall conform to the following:
 - 1. The chain link fabric shall be 2" diamond mesh, fabricated from #9 gauge wire having a minimum tensile strength of 80,000 pounds per square inch. The fabric edges shall be knuckled at top and bottom.
- C. Posts: Posts shall be Type II, S.S. 40 steel. All gate posts shall be of the size recommended by the manufacturer. The line, corner and terminal posts shall be in accordance with the following:
 - 1. line: 2.375" O.D. Pipe Type II, S.S. 40
 - 2. corner and terminal: 2.875" O.D. Pipe Type II, S.S. 40
- D. Top rail: 1.66" O.D. Type II, S.S. 40
- E. Post Caps: heavy malleable iron
- F. Gate Frames: 2" O.D. Pipe
- G. Braces: All terminal, gate and corner posts (in both directions) shall be horizontally braced to the adjacent post or posts with a 1.66" O.D. pipe and a diagonal 3/8" round steel truss rod with take-up.
- H. Tension Wire: No. 7 gauge spring coil or crimped wire.

PART 3 EXECUTION

3.01 ERECTION

- A. Chain Link Fence Posts: Line posts shall be set in 12" x 48" concrete footings and shall extend 42" into the concrete. Corner and gate post footings shall be 16" x 48" concrete footings with other requirements as line posts. Maximum post spacings shall be as called for on the drawings. Top of excavation for the posts must be smaller in diameter than the bottom.
- B. Chain Link Fabric: Line fence fabric shall be securely attached to terminal and corner posts with 1/4" x 3/4" tension bars and #11 gauge, 1" wide pressed steel bands spaced 14" apart. Line post ties shall be 6 gauge wire 14" o.c. and top rail ties shall be 9 gauge wire on 24" centers. Fabric bottom shall be 2" above grade.
- C. Concrete: All concrete footings for line fence shall extend 2" above grade and be crowned to shed water. Mushrooming of top of footing is not acceptable.
- D. Tension Wire: Tension wire shall be stretched taut from terminal post to terminal post and securely fastened to each intermediate post 6 inches above the grade line and to the fabric with aluminum hog rings spaced at 24 inches maximum. A tension wire is required for all fabric not having a bottom rail for anchorage.
- E. Privacy Slats: Install privacy slats diagonally within fence fabric in locations as shown on the drawings.
- F. Swing Gates: The swing gates shall be in sizes as indicated on the drawings shall be manually operated. The gates shall be designed to minimize deflection, shall have all welded connections and shall have a 2.0 ounce, hot dipped galvanized finish after

fabrication. Provide concrete base and rod acceptor for double swing gates as required.

1. Frames: The gate frame shall be designed by the manufacturer with the following minimum member sizes:
 - a. top and bottom rails: 2" pipe
 - b. verticals: 1-1/2" pipe
 - c. horizontals: 1-1/4" pipe
2. Fabric: The gate fabric shall be 2" diamond mesh, 9 gauge wire with a minimum 0.40 oz. per sq. ft. aluminum coating finish, securely attached with end tension bars, top and bottom tension wires and 6 gauge wire ties at 12" o.c. to verticals and diagonals.
3. Accessories: Each gate shall be equipped with a latch suitable for padlock locking, front and rear stops and hinges of ball and socket design with full 180 degree swing from closed to open position.
4. Install gates and adjust true to fence line and grade.

3.02 CLEAN UP

- A. Remove debris and unused materials from site. Leave area clean and ready for use.

3.03 GUARANTEE

- A. Material and workmanship shall be guaranteed for a period of one (1) year to be free from defects in manufacture and to be in accordance with the manufacturer's Specifications. Faulting material or workmanship shall be replaced at no expense to Owner.

END OF SECTION

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SECTION 32 9219

GRASS SEEDING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. This specification section applies to any and all “restoration” work required on site.
- B. Fertilizing.
- C. Hydroseeding.
- D. Mulching.
- E. Maintenance of installation until third mowing is complete.

1.02 DEFINITIONS

- A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.03 REGULATORY REQUIREMENTS

- A. Comply with regulatory agencies for fertilizer and herbicide composition.

1.04 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

1.05 TESTS

- A. Provide analysis of topsoil fill.
- B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.
- C. Submit minimum 10 oz. sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.

1.06 MAINTENANCE DATA

- A. Submit maintenance data for continuing Owner maintenance.
- B. Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store and protect products from the elements.

- B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.08 COORDINATION

- A. Coordinate the work of this Section with other work under separate contracts.

1.09 MAINTENANCE SERVICE

- A. Maintain seeded and sodded areas immediately after placement until grass is well established and exhibits a vigorous growing condition for three cuttings. Reseed or resod areas over one (1) square foot or as directed by Architect.

PART 2 PRODUCTS

2.01 ACCEPTABLE SEED SUPPLIERS

- A. Pilgrim Seed, Plymouth, Indiana.
- B. Substitutions: Approved equals.

2.02 SEED MIXTURE

- A. Seed Mixture: Cisco or approved equal.
 - 1. 70% II Millenium Turf Type Tall Fescue.
 - 2. 20% Dominator Perennial Rye Grass.
 - 3. 10% Annual Rye Grass

2.03 ACCESSORIES

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are acceptable.
- B. Fertilizer: FS O-F-241, recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil. To the following proportions: Nitrogen 19 percent, phosphoric acid 19 percent, soluble potash 19 percent.
- C. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.
- D. Herbicide: As recommended by Contractor. May be used at Contractor's option.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that prepared soil base is ready to receive the work of this Section.
- B. Beginning of installation means acceptance of existing site conditions.

3.02 FERTILIZING

- A. Apply fertilizer in accordance with manufacturer's instructions. At a rate of 200#/acre.
- B. Apply after smooth raking of topsoil and prior to roller compaction.
- C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.
- D. Apply no more than 24 hours before seeding.
- E. Mix thoroughly into upper 2 inches of topsoil.
- F. Lightly water to aid the dissipation of fertilizer.

3.03 HYDROSEEDING

- A. Apply 6-8 pounds of seed mixture per 1000 sq ft.
- B. 75% of seed shall be applied by drill seeding.
- C. Remaining 25% of seed shall be hydroseeded with Hydromulch at the rate of 2000 # per acre.
- D. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.
- E. Clean hydroseed from walks, walls, paving, etc.

3.04 SEED PROTECTION

- A. Identify seeded areas with stakes and string around area periphery. Set string height to 36 inches. Space stakes at 72 inches.

3.05 MAINTENANCE

- A. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.
- B. Neatly trim edges and hand clip where necessary.
- C. Immediately remove clippings after mowing and trimming.
- D. Water to prevent grass and soil from drying out. The Owner's water may be used for this operation, but hoses and distribution shall be the responsibility of the Contractor.
- E. Control growth of weeds. Apply herbicides, if used, in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- F. Immediately reseed areas which show bare spots.

- G. Protect seeded areas with warning signs during maintenance period.
- H. Contractor shall guarantee all work for a period on one year from date of final acceptance of his work.

END OF SECTION