October 13, 2026

Project Manual

For

Building Renovations & Site Improvements

Architect's Project Number 26017

Parkway Project #: PN062501B

At:

Ross Elementary School

1150 Ross Road

St Louis, MO 63146

Prepared by

bond architects

222 South Central Avenue
Suite 501
St. Louis MO 63146
P: 314-863-4994

SECTION 000107
SEALS PAGE

SEALS

1.01 OWNER'S PROJECT NUMBER: PN062501B

1.02 PROJECT TITLE: ROS BUILDING RENOVATION AND SITE IMPROVEMENTS

1.03 PROJECT LOCATION: ROSS ELEMENTARY | 1150 ROSS ROAD, ST. LOUIS, MO 63146

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SECTION 001100
INVITATION TO BID

THE FACILITIES DEPARTMENT OF THE PARKWAY SCHOOL DISTRICT INVITES YOU TO BID ON THE FOLLOWING PROJECT:

1.01 PN062501B - ROS BUILDING RENOVATION AND SITE IMPROVEMENTS AT ROSS ELEMENTARY | 1150 ROSS ROAD, ST. LOUIS, MO 63146

1.02 BIDS WILL BE RECEIVED AT:

A. Parkway School District

B. District Operations - Main Conference Room

C. 363 N. Woods Mill Road

D. Chesterfield, MO 63017

1.03 BIDS WILL BE RECEIVED ON OR BEFORE:

A. November 3, 2026 @ 3:30 PM CST

1.04 ALL BIDS WILL BE PUBLICLY OPENED ON THE AFOREMENTIONED DATE AT THE SPECIFIED TIME AND PLACE.

A. Bids may not be withdrawn for at least sixty (60) days after the closing date for receipt of Bids.

B. Bids will be based on multiple Bid Packages. See Section 011010 - Project Summary - Bid Packages for specific inclusion and responsibility.

1.05 THE OWNER FOR THE PROJECT IS:

A. Parkway School District
455 North Woods Mill Road
Chesterfield, Missouri 63017

1.06 THE OWNER'S REPRESENTATIVE FOR THE PROJECT IS:

A. Emir Kalkan
Manager of Planning and Construction
Parkway School District
363 North Woods Mill Road
Chesterfield, Missouri 63017
Telephone: (314) 415-8270
E-mail: ekalkan@parkwayschools.net

1.07 THE ARCHITECT FOR THE PROJECT IS:

A. Bond Architects
222 South Central Avenue, Suite 501
St. Louis, Missouri 63105
Tel: (314) 863-4994, Fax: (314) 863-4995

1.08 NOTE: BIDDERS SHALL DIRECT ALL QUESTIONS AND CLARIFICATIONS TO THE OWNER'S REPRESENTATIVE.

1.09 COPIES OF THE BIDDING DOCUMENTS MAY BE OBTAINED FROM 8:00 A.M. TO 5:00 P.M., MONDAY THROUGH FRIDAY COMMENCING ON OCTOBER 13, 2026 @ 2:00 PM CST, THROUGH DOCUMENT IMAGING SYSTEMS, INC., 1463 SOUTH VANDEVENTER AVENUE, ST. LOUIS, MISSOURI, 63110 (TELEPHONE NUMBER 314-531-0167).

A. The bid package can be viewed and ordered 24/7 through their website at https://parkwayschools.bonfirehub.com/portal/?tab=openOpportunities.

1. Cick on "Open Public Opportunities" tab at top of page.
2. Click on "View Opportunity" for "Ref # 27-26".

B. The bid package is available for purchase and there will be no deposit or refund.

1.10 BIDDING DOCUMENTS ARE ON FILE AT:

A. Associated General Contractors of Missouri, 6330 Knox Industrial Drive, St. Louis, Missouri, 63139, www.agcmo.org

B. Dodge Construction Network, www.construction.com

C. ConstructConnect, https://projects.constructconnect.com

1.11 A RECOMMENDED ATTENDANCE PRE-BID CONFERENCE IS SCHEDULED FOR OCTOBER 20, 2026 @ 10:00 AM CST. MEET AT ROSS ELEMENTARY - MAIN ENTRY LOCATED AT 1150 ROSS AVE., ST. LOUIS, MO 63146

A. Directions to the pre-bid conference may be obtained by contacting the Construction Manager.

1.12 A BID BOND WILL BE REQUIRED IN THE AMOUNT OF TEN PERCENT (10%) OF THE AMOUNT OF THE BIDDER'S BID.

A. The Bid Bond must accompany the Bid in order for the Bid to be accepted.

1.13 AN EXECUTED CONTRACTOR'S QUALIFICATION STATEMENT, AIA DOCUMENT A305 INCLUDING A QUARTERLY OR ANNUAL FINANCIAL STATEMENT NOT OVER 12 MONTHS OLD MUST BE DELIVERED TO THE OWNER UPON REQUEST.

A. Financial statements will be returned to the Bidder upon request received prior to the Notice To Proceed Date.

B. All financial statements not requested to be returned shall be shredded and disposed of following the Notice To Proceed Date.

1.14 IT IS ANTICIPATED THAT THE SUCCESSFUL BIDDER WILL BE GIVEN NOTICE TO PROCEED ON DECEMBER 17, 2026 WITH SUBSTANTIAL COMPLETION TO OCCUR ON OR BEFORE AUGUST 13, 2027.

A. The Bidder for each bid package will be allowed to order equipment, materials, and supplies as necessary upon entering into the Agreement Between Construction Manager and Contractor.

1.15 IT IS ANTICIPATED THAT THIS AGREEMENT WILL BE PRESENTED TO THE SUCCESSFUL BIDDER FOR SIGNATURE ON NOVEMBER 11, 2026.

1.16 PAYMENTS WILL BE MADE BY THE CONSTRUCTION MANAGER WITHIN APPROXIMATELY TEN (10) BUSINESS DAYS, BUT NOT LATER THAN THIRTY (30) CALENDAR DAYS AFTER RECEIPT OF AN APPLICATION AND CERTIFICATE FOR PAYMENT WHICH RECEIVES APPROVAL.

1.17 NOT LESS THAN THE PREVAILING HOURLY RATES OF WAGES FOR WORK OF A SIMILAR CHARACTER IN THE LOCALITY IN WHICH THE WORK IS PERFORMED, ALL AS MORE FULLY SET OUT IN THE DETAILED SPECIFICATIONS FOR THIS PROJECT, SHALL BE PAID TO ALL WORKERS EMPLOYED ON SAID PROJECT.

1.18 CONTRACTOR AND SUBCONTRACTORS SHALL PROVIDE A OCCUPATIONAL SAFETY AND HEALTH (OSHA) TEN-HOUR CONSTRUCTION SAFETY AND HEALTH PROGRAM FOR THEIR ON-SITE EMPLOYEES WHICH INCLUDES A COURSE IN CONSTRUCTION SAFETY AND HEALTH APPROVED BY OSHA OR A SMILILAR PROGRAM APPROVED BY THE MISSOURI DEPATMENT OF LABOR WHICH IS AT LEAST AS STRINGENT AS AN APPROVED OSHA PROGRAM, UNLESS SUCH EMPLOYEES HAVE PREVIOUSLY COMPLETED THE REQUIRED PROGRAM.

END OF INVITATION TO BID

SECTION 002000
INSTRUCTION TO BIDDERS

PART 1 GENERAL

1.01 SUMMARY

A. Document Includes:
   1. Instructions to Bidders.
   2. Site examination.
   3. Bidding Schedule.

B. Related Documents:
   1. Document 000010 – Bid Solicitation.
   2. Document 004100 – Bid Form - Stipulated Sum
   3. Document 004300 – Procurement Form Supplements
   4. Document 007210 – General Conditions

1.02 INSTRUCTIONS TO BIDDERS

A. To be considered all bids must in accordance with these Instructions to Bidders.

B. Those interested parties may obtain sets of Drawings and Specifications from the Architects/Engineer.

1.03 SITE EXAMINATION

A. Bidders shall carefully examine documents and construction site to obtain first-hand knowledge of existing conditions. Contractors will not be given extra payments for conditions which can be determined by examining site and these documents.

B. Contact the Construction Manager at the following address and phone number to arrange a date and time to visit the Project Site:
   1. Address: 4 Sunnen Drive, Suite 120, St. Louis, MO 63143
   2. Telephone: 314-453-2861
   3. Email: bevelsizer@poettkerconstruction.com

1.04 THE SCHEDULE FOR BIDDING THIS PROJECT IS AS FOLLOWS

A. Plans Available
   1. October 13, 2026 @ 2:00 PM CST

B. Pre-Bid Meeting
   1. October 20, 2026 @ 10:00 AM CST
      a. Ross Elementary - Main Entry
      b. 1150 Ross Ave.
      c. St. Louis, Mo 63146

C. Latest Time to Submit Request for Interpretation:
   1. October 27, 2026 @ 3:00 PM CST

D. Latest Time to Issue an Addendum
   1. October 29, 2026 @ 3:00 PM

E. Bid Opening
   1. November 3, 2026 @ 3:30 PM CST
   2. Parkway School District
      District Operations - Main Conference Room
      363 N. Woods Mill Road
      Chesterfield, MO 63017

1.05 BIDDING INSTRUCTIONS

A. All requests for interpretations shall be in writing via e-mail and addressed to the Construction Manager and must be received by the date and time identified in Article 1.4 of this section in order to be given consideration. All questions must be submitted/titled as “Request for Clarification Pre-Bid Question and Comment Form” or e-mailed using the name and “Request for Clarification Pre-Bid Question” in the subject line of the e-mail. The form is included at the end of this section. Questions not submitted in accordance with this form and specified time frame will not be accepted. Any and all interpretations and supplemental instructions will be made by addendum to the Drawings and Specifications and forwarded to all bidders on plan room distribution lists via email. All responses will also be posted to plan rooms listed in section 000010 – Bid Solicitation. All responses by the Construction Manager must be in writing to be binding. Any response general in nature or affecting these Instructions to Bidders shall be sent via addendum as previously described. All bidders are required to return the signature page of the addendum signed to the Construction Manager within 24 hours after receipt. Failure of any bidder to receive any such addendum or interpretations shall not relieve such bidder from an obligation under the bid as submitted. All addenda so issued shall become part of the Contract Documents. No addendum will be issued later than the date and time identified in Article 1.4 of this section except one withdrawing the request for Bids or one postponing date for receiving Bids. Oral interpretations, changes or corrections will not be binding and Bidders shall not rely upon such interpretations, changes and corrections. Each Bidder shall ascertain prior to submitting Bid that all addenda issued have been received and shall acknowledge receipt in Bid.
   1. Questions shall be directed to:
      a. Ben Evelsizer
      b. bevelsizer@poettkerconstruction.com

B. Materials products and equipment described in Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution. No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect at least ten days prior to the date for receipt of Bids. Each such request shall include name of material or equipment for which it is to be substituted and a complete description of the proposed substitute including drawings, cuts, performance and test data and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment or other work that incorporation of the substitute would require shall be included. The burden of proof of the merit of proposed substitute is upon the proposer. Architect's decision of approval or disapproval of a proposed substitution shall be final. If the Architect approves any proposed substitution prior to receipt of Bids, such approval will be set forth in an addendum. Bidders shall not rely upon approvals made in any other manner. No substitutions will be considered after the contract award unless specifically provided in the Contract Documents.

C. Bids shall be made on unaltered Bid Forms furnished by the Construction Manager. Fill in all blank spaces and submit one (1) copy. Bids shall be signed with name typed below signature. Where bidder is a corporation, bids must be signed with legal name of corporation followed by name of state of incorporation and legal signature of an officer authorized to bind the corporation to a contract.

D. Each bidder submitting a bid shall submit on form provided a list of any subcontractors and major suppliers proposed to use with the bid. Failure to do so could disqualify the bid.

E. Each bidder shall designate on the attached bid form one person who shall serve as the bidder’s contact person for all matters pertaining to the bid. In absence of such designation, the person who signs the bid shall be deemed the bidder contact.

F. Each bid shall be accompanied by bid bond made payable to the Owner, in the amount of ten percent (10%) of the bid sum. Security shall be either certified check, cashier's check, bank money order or bid bond issued by surety licensed to conduct business in the State of Missouri. Successful bidder's security will be retained until he has signed the contract and furnished required payment and performance bonds. Owner reserves the right to retain security of the next two (2) lowest bidders until the lowest bidder enters into contract or until sixty (60) days after bid opening, whichever is shorter. All other bid security will be returned as soon as practicable. If any bidder refuses to enter into a contract, Owner will retain bid security as liquidated damages, but not as a penalty.

G. All costs associated with the preparation and submission of a bid is the sole responsibility of the bidder. These costs shall not be chargeable to the Owner by any successful or unsuccessful bidder. All bids become the property of the Owner and shall not be returned except in the case of a late submission.

H. Simultaneously, with delivery of the executed contract, the successful bidder, at its own expense, shall furnish surety in the form of a performance bond and a labor and material payment bond in the amount of One Hundred Percent (100%) of the contract amount. Surety for such bonds shall be a company duly authorized and licensed in the State of Missouri and acceptable to the Owner. The Attorney-In-Fact who signs bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

I. All copies of the bid and any other documents required to be submitted with bid shall be enclosed in a sealed opaque envelope. Envelope shall be identified with "ROS Building Renovation and Site Improvements"- Bid Package # (Number as required)", bidder's name and address. Mailed bid envelopes shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof. Oral, telephonic or telegraphic bids are invalid and will not receive consideration. Bids shall be deposited at the location designated in the Bid Solicitation prior to time and date designated for opening, or any extension thereof made by addendum. Bidder shall assume full responsibility for timely delivery at location designated for receipt of Bids. Bids received after time and date for receipt of bids will be returned unopened.

J. A bid may not be modified, withdrawn or canceled during the Sixty (60) Days immediately following bid opening, and each bidder so agrees in submitting his Bid. Any bidder may withdraw, cancel or modify its bid, at any time prior to scheduled time for opening of bids, by letter or telegram actually received by Owner prior to bid time, or, with proper identification, by personally securing bid submitted; if by telegram, written confirmation over signature of bidder shall be mailed and postmarked on or before date and time of bid opening. Withdrawn bids may be resubmitted up to bid opening time provided that they are in full compliance with these Instructions to Bidders.

K. Protests
   1. Any bidder who submitted a bid and believes the bid was improperly rejected or that the bid selected by the Owner is not in the best interest of the Owner may submit a written notice of intent to protest the bid to the Owner within two (2) days. The Owner shall consider all protests before execution of a contract. Each protest must specify the reasons supporting the protest. The Owner may require that additional information be provided. Failure to supply such required information shall be cause for dismissal of the protest.
   2. The Owner shall immediately investigate the allegations against the Owners actions and shall issue a written response to the protest.
   3. This provision allowing for the submission of protest shall not confer any right on any bidder but is intended solely to assist the Owner in determining the best responsible bid.

L. Any complaint or protest of the bidding procedure must be filed by the bidder to the Owner. Within 2 days of bid opening the bidder shall notify the Owner in writing of his intent to protest bidding. The bidder shall perfect this notice of intent within 3 days.

M. Whenever in its opinion it is in the best interest of the Owner, the Owner reserves the right to accept any bid, reject any or all bids, waive technical deficiencies and irregularities, allow bidder to remedy technical deficiencies or irregularities within a stated time, rescind any notice of award if the owner determines the notice of award was issued in error, rebid any contract, disqualify bids and bidders, before or after opening, upon evidence of collusion with intent to defraud or other illegal practices upon part of bidder, lack of responsibility as evidenced by poor workmanship and progress of past work, incomplete work which, in judgment of Owner, might hinder or prevent prompt completion of additional work if awarded, for being in arrears on existing contracts, in litigation with the Owner, or having defaulted on a previous contract.

N. Bidder's attention is directed to the fact that all Federal and Missouri State Laws, municipal ordinances and regulations of any and all authority having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though herein written out in full.

O. Owner is exempt from payment of Federal & Missouri Department of Revenue's Use and Sales Tax on material entering permanently into structure. Retail sales tax shall not be included in the bid amount. Tax identification number(s) will be provided in conjunction with execution of the Agreement.

P. Bids will be opened as announced in Bid Solicitation.

Q. Owner reserves the right to reject any or all bids or any part thereof, to waive any informalities in bidding and to accept bids deemed most favorable to the Owner.

R. Notwithstanding any delay in preparation and execution of the formal Contract Agreement, each bidder shall be prepared, upon written notice of bid acceptance, to commence work on dates stipulated in such notice.

S. Any work in providing or preparing to provide the services specified herein that is commenced by the successful bidder prior to execution of a written contract agreement shall be at the bidder's expense.

T. Contract Time: Work performed under this Contract shall be commenced on the date stipulated in written Notice to Proceed and, subject to authorized adjustments; all work at the site shall be Substantially Complete no later than the date identified on the milestone schedule.

U. The Owner requires background screening to be completed on all contractor/subcontractor employees. All employees must have documentation that a background screening has been completed on them prior to working on any district projects. The background screening is to be conducted by a firm approved to conduct background checks in the State of Missouri. Each employee must complete, sign, and date the Consent and Waiver Release form. These forms will be submitted and the applicant cleared before the applicant may work on any part of the school grounds. The Contractor is responsible for submitting the forms to a firm approved to conduct background checks in the State of Missouri, and for any costs involved in the screening. All information received as a result of a background check will be strictly confidential. A notice of automatic disqualification will be sent to the hiring or using entity. After the screenings, the Contractor is also responsible for sending the Construction Manager copies of approved background checks for their records.

V. Combination bids will be accepted. If providing a combination bid, bidder must ALSO submit a bid for each respective individual bid package that is included with the combination bid. Individual bids and combination bids shall be on the same bid form. Bidders must be able to self -perform a minimum of 15% of each individual bid package unless noted otherwise.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

AIA® Document A701® – 2018

Instructions to Bidders

for the following Project:
(Name, location, and detailed description)

062501B - Building Renovations & Site Improvements
Ross Elementary School
1150 Ross Road
St. Louis, Missouri 63146
Bid No. 27-26

THE OWNER:
(Name, legal status, address, and other information)

Parkway School District
455 North Woods Mill Road
Chesterfield, Missouri 63017
Telephone Number: 314-415-8100

THE ARCHITECT:
(Name, legal status, address, and other information)

Bond Architects
222 S. Central Avenue; Suite 501
St. Louis, Missouri 63105
Telephone Number: 314-863-4994

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ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

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ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- **.1** the Bidder has read and understands the Bidding Documents;
- **.2** the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- **.3** the Bid complies with the Bidding Documents;
- **.4** the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- **.5** the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- **.6** the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

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§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

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User Notes: (1265250894)

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than two days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:

(Insert the form and amount of bid security.)

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

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§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:
(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

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

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows:
(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

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§ 5.2 Rejection of Bids
Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)
§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement
Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability
A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals
§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

.1 a designation of the Work to be performed with the Bidder's own forces;
.2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and
.3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements
§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

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§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.
(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

§ 7.2 Time of Delivery and Form of Bonds
§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS
§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.4 Building Information Modeling Exhibit, if completed:

.5 Drawings

Number	Title	Date

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.6 Specifications

Section	Title	Date	Pages

.7 Addenda:

Number	Date	Pages

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[ ] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017.)

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents listed below:
(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

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SECTION 003100
AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.01 EXISTING CONDITIONS

A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of Contract Documents, as follows:

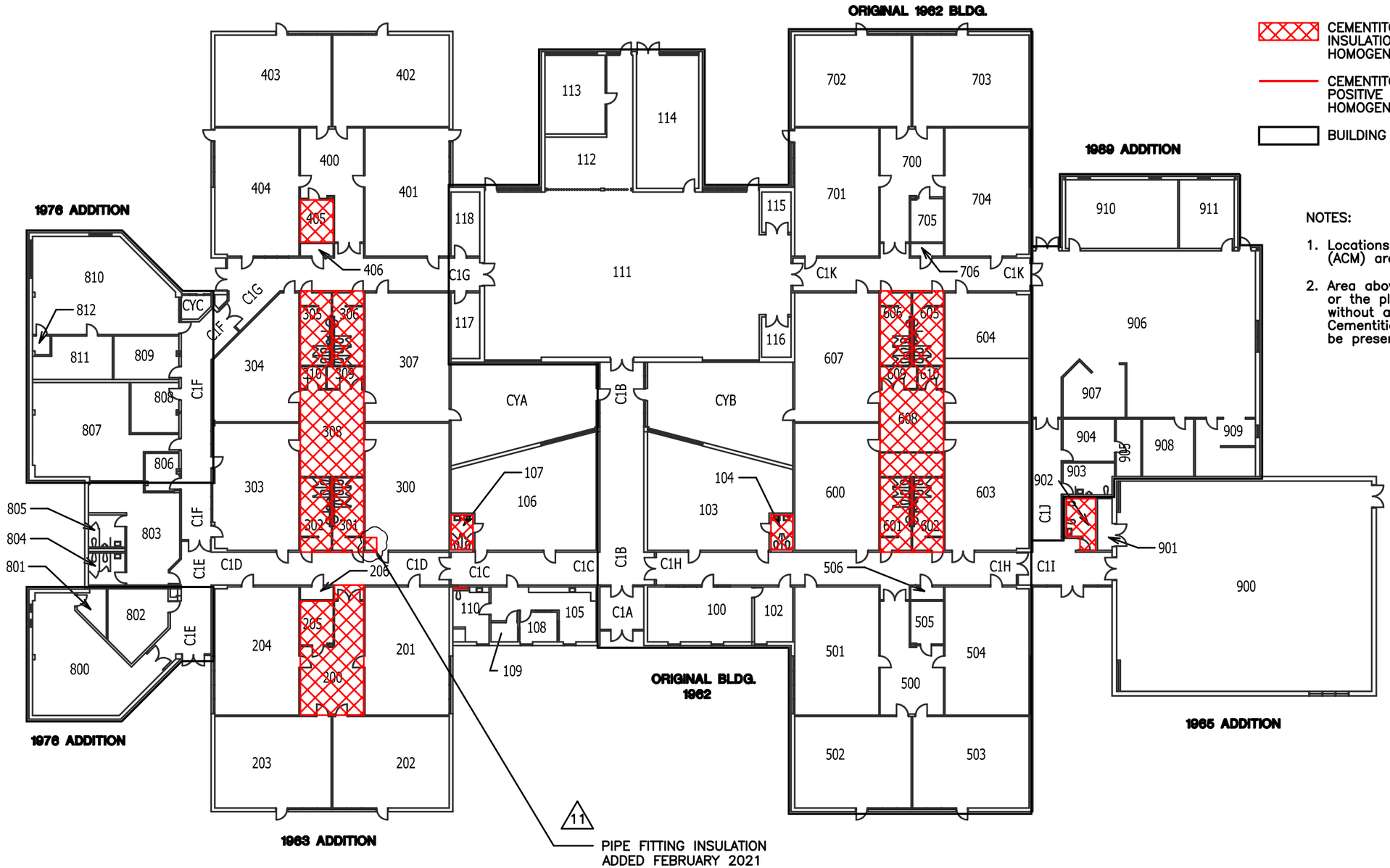
B. Asbestos Management Plans: Available for interiors of facilities only.
   1. Original copy is available for inspection at Owner's offices during normal business hours.
   2. Asbestos containing material location drawings excerpted from the asbestos management plans are attached following this document.
   3. All asbestos abatement required to accomplish the Work shall be performed by the Owner's asbestos abatement contractor.

C. Lead Management Plans: Available for interiors and exteriors of facilities.
   1. Original copy is available for inspection at Owner's offices during normal business hours.
   2. Lead containing material location drawings excerpted from the leadmanagement plans are attached following this document.
   3. All lead abatement required to accomplish the Work shall be performed by the Owner's lead abatement contractor.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION



LEGEND

- CEMENTITOUS (MUDDED) PIPE FITTING INSULATION POSITIVE FOR ASBESTOS HOMOGENEOUS MATERIALS #7, 8, 45 AND #46
- CEMENTITOUS (MUDDED) PIPE FITTING INSULATION POSITIVE FOR ASBESTOS PRESUMED TO BE IN CHASE HOMOGENEOUS MATERIALS #7 AND #45
- BUILDING ADDITION YEAR OF COMPLETION

NOTES:

1. Locations of asbestos–containing material (ACM) are approximate.
2. Area above the 1'x1' concealed spline ceiling tile or the plaster ceiling could not be accessed without affecting the integrity of the ceiling system. Cementitious (mudded) pipe fitting insulation may be present above this type of ceiling.

0 30
FEET

psi Information To Build On
Engineering • Consulting • Testing
8669 Olive Boulevard St. Louis, MO 63132
Tel (314) 432-8073 Fax (314) 432-5119

TITLE:
ASBESTOS – THERMAL SYSTEM INSULATION
ROSS ELEMENTARY – FIRST LEVEL
1150 ROSS AVE. – CREVE COEUR, MO. 63146

PARKWAY SCHOOLS

DWN:	DES:
TDA	MCD
CHKD:	APPD:
MCD	MCD
DATE:	REV:
02–04–21	11

PROJECT NO: 00291604
PARKWAY SCHOOL DIST.
ST.LOUIS COUNTY, MO.

A2–01



BUILDING ADDITION YEAR OF COMPLETION

BLACK MASTIC POSITIVE FOR ASBESTOS UNDER CARPET (NO TILE) HOMOGENEOUS MATERIAL #56

TILE AND MASTIC BOTH POSITIVE FOR ASBESTOS – HOMOGENEOUS MATERIAL #50 EXPOSED

TILE AND MASTIC BOTH POSITIVE FOR ASBESTOS – HOMOGENEOUS MATERIAL #50 UNDER CARPET

TILE NEGATIVE FOR ASBESTOS / MASTIC POSITIVE FOR ASBESTOS – HOMOGENEOUS MATERIAL #48 EXPOSED

TILE AND MASTIC BOTH POSITIVE FOR ASBESTOS – HOMOGENEOUS MATERIAL #49

LEGEND

TILE NEGATIVE FOR ASBESTOS / MASTIC POSITIVE FOR ASBESTOS – HOMOGENEOUS MATERIAL #16 & #17 (HOMOGENEOUS MATERIAL #17 IS TILE USED FOR REPLACEMENT THROUGHOUT GYMNASIUM) – EXPOSED

TILE NEGATIVE FOR ASBESTOS / MASTIC POSITIVE FOR ASBESTOS – HOMOGENEOUS MATERIAL #20 UNDER CARPET

TILE AND MASTIC BOTH POSITIVE FOR ASBESTOS – HOMOGENEOUS MATERIAL #21 UNDER CARPET

TILE AND MASTIC BOTH POSITIVE FOR ASBESTOS – HOMOGENEOUS MATERIAL #22 UNDER CARPET

TILE AND MASTIC BOTH POSITIVE FOR ASBESTOS – HOMOGENEOUS MATERIAL #47 UNDER CARPET

TILE NEGATIVE FOR ASBESTOS / MASTIC POSITIVE FOR ASBESTOS – HOMOGENEOUS MATERIAL #48 UNDER CARPET

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8669 Olive Boulevard St. Louis, MO 63132
Tel (314) 432-8073 Fax (314) 432-5119

TITLE:

ASBESTOS – MISCELLANEOUS MATERIAL – FLOORING
ROSS ELEMENTARY – FIRST LEVEL
1150 ROSS AVE. – CREVE COEUR, MO. 63146

PARKWAY SCHOOLS

DWN:	DES:
TDA	MCD
CHKD:	APPD:
MCD	MCD
DATE:	REV:
08-20-21	10

PROJECT NO: 00291604
PARKWAY SCHOOL DIST.
ST.LOUIS COUNTY, MO.

A3-01



LEGEND

- SINK MASTIC/SEALANT – POSITIVE FOR ASBESTOS. HOMOGENEOUS MATERIALS #27, #55 & #81
- VIBRATION JOINT CLOTH – ASSUMED TO CONTAIN ASBESTOS – HOMOGENEOUS MATERIAL #30 (ROOM 900). REMAINING VIBRATION JOINT CLOTH POSITIVE FOR ASBESTOS HOMOGENEOUS MATERIAL #58
- BUILDING ADDITION YEAR OF COMPLETION

NOTES:

1. All chalkboards, metal or slate, are assumed to have an Asbestos–Containing mastic behind them. (Mastic=Homogeneous Material #31, #63 & #82)
2. All solid core, metal or wooden doors, are assumed to be Asbestos–Containing unless noted otherwise. (Homogeneous Material #32, #65 & #84)
3. All bulletin boards are assumed to have Asbestos–Containing mastic behind them. (Homogeneous Material #33, #67 & #85)
4. Locations of asbestos–containing materials (ACM) are approximate.
5. All mirrors are assumed to have an Asbestos–Containing mastic behind them.
6. Consult with Parkway Environmental Department prior to drilling into or demolishing concrete block walls.

16

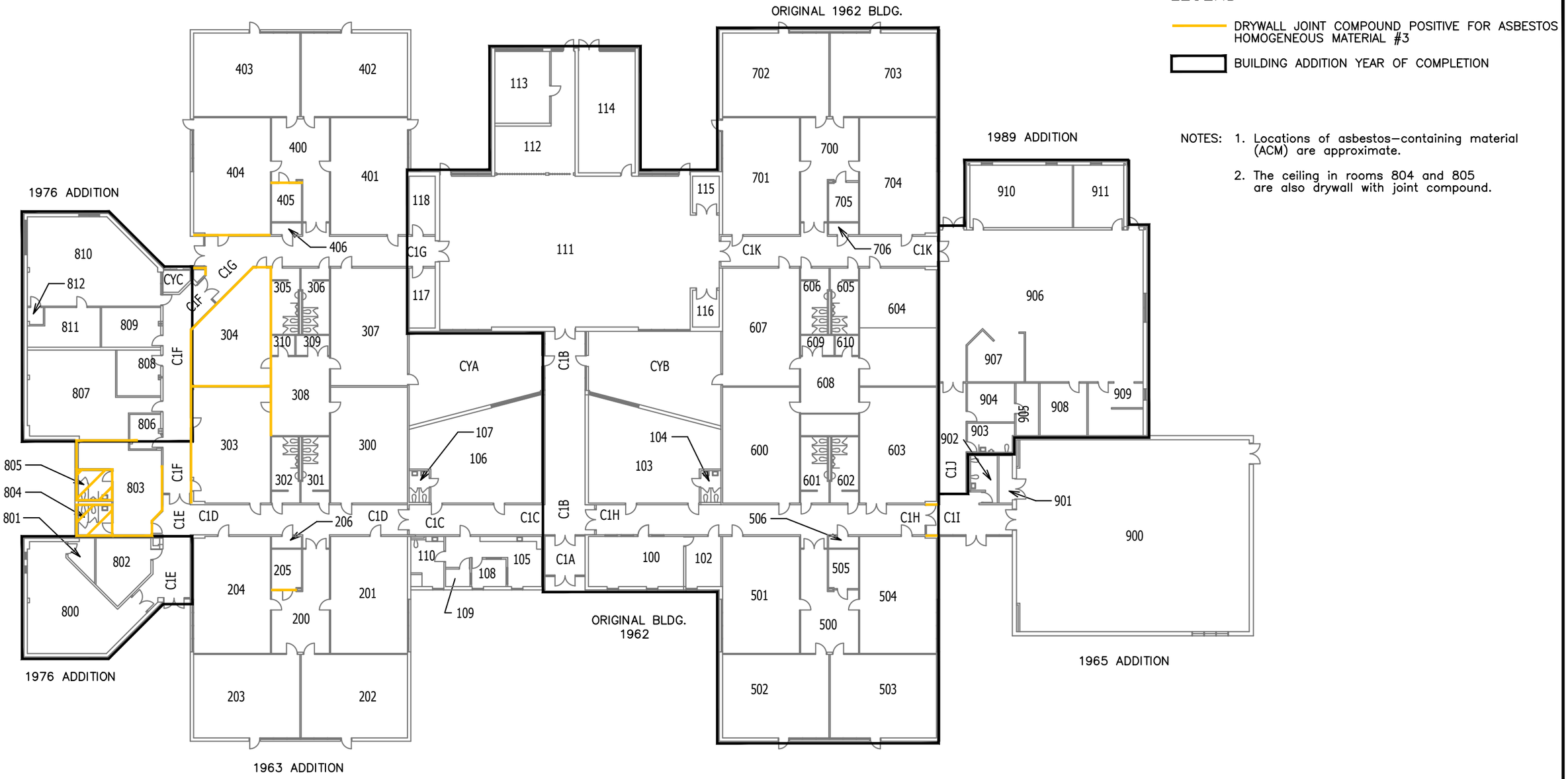
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Tel (314) 432-8073 Fax (314) 432-5119

TITLE:
ASBESTOS – MISCELLANEOUS MATERIAL – OTHER
ROSS ELEMENTARY – FIRST LEVEL
1150 ROSS AVE. – CREVE COEUR, MO. 63146

PARKWAY SCHOOLS

DWN:	DES:	PROJECT NO: 00291604
TDA	MCD	PARKWAY SCHOOL DIST. ST.LOUIS COUNTY, MO.
CHKD: MCD	APPD: MCD	
DATE: 02–16–18	REV: 16	A4–01



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Tel (314) 432-8073 Fax (314) 432-5119

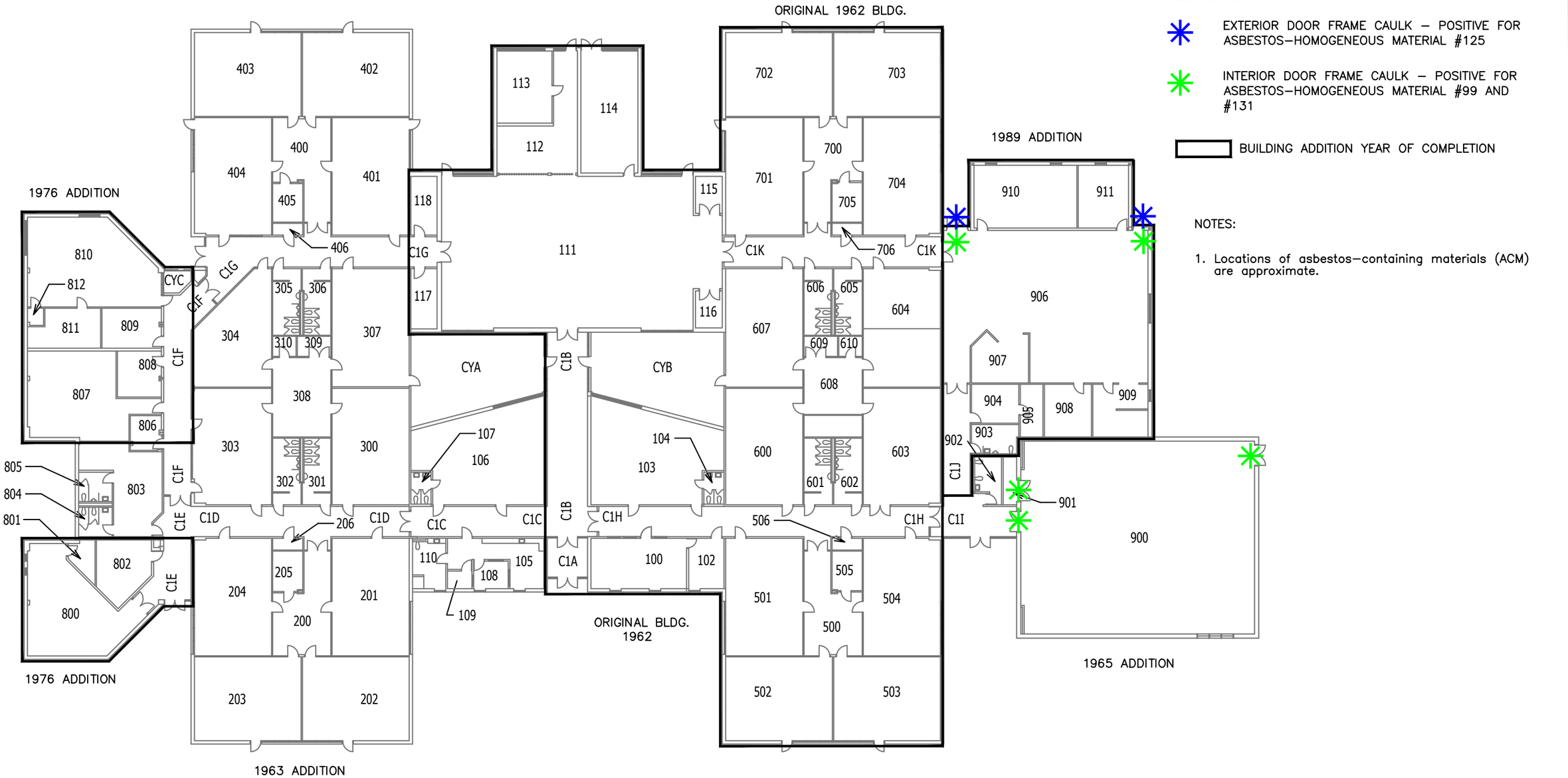
TITLE:
ASBESTOS – MISCELLANEOUS MATERIAL – JOINT COMPOUND
ROSS ELEMENTARY – FIRST LEVEL
1150 ROSS AVE. – CREVE COEUR, MO. 63146

PARKWAY SCHOOLS

DWN:	DES:
TDA	MCD
CHKD:	APPD:
MCD	MCD
DATE:	REV:
02–27–15	3

PROJECT NO: 00291604
PARKWAY SCHOOL DIST.
ST.LOUIS COUNTY, MO.

A5–01



LEGEND

EXTERIOR DOOR FRAME CAULK – POSITIVE FOR ASBESTOS–HOMOGENEOUS MATERIAL #125

INTERIOR DOOR FRAME CAULK – POSITIVE FOR ASBESTOS–HOMOGENEOUS MATERIAL #99 AND #131

BUILDING ADDITION YEAR OF COMPLETION

NOTES:

1. Locations of asbestos–containing materials (ACM) are approximate.

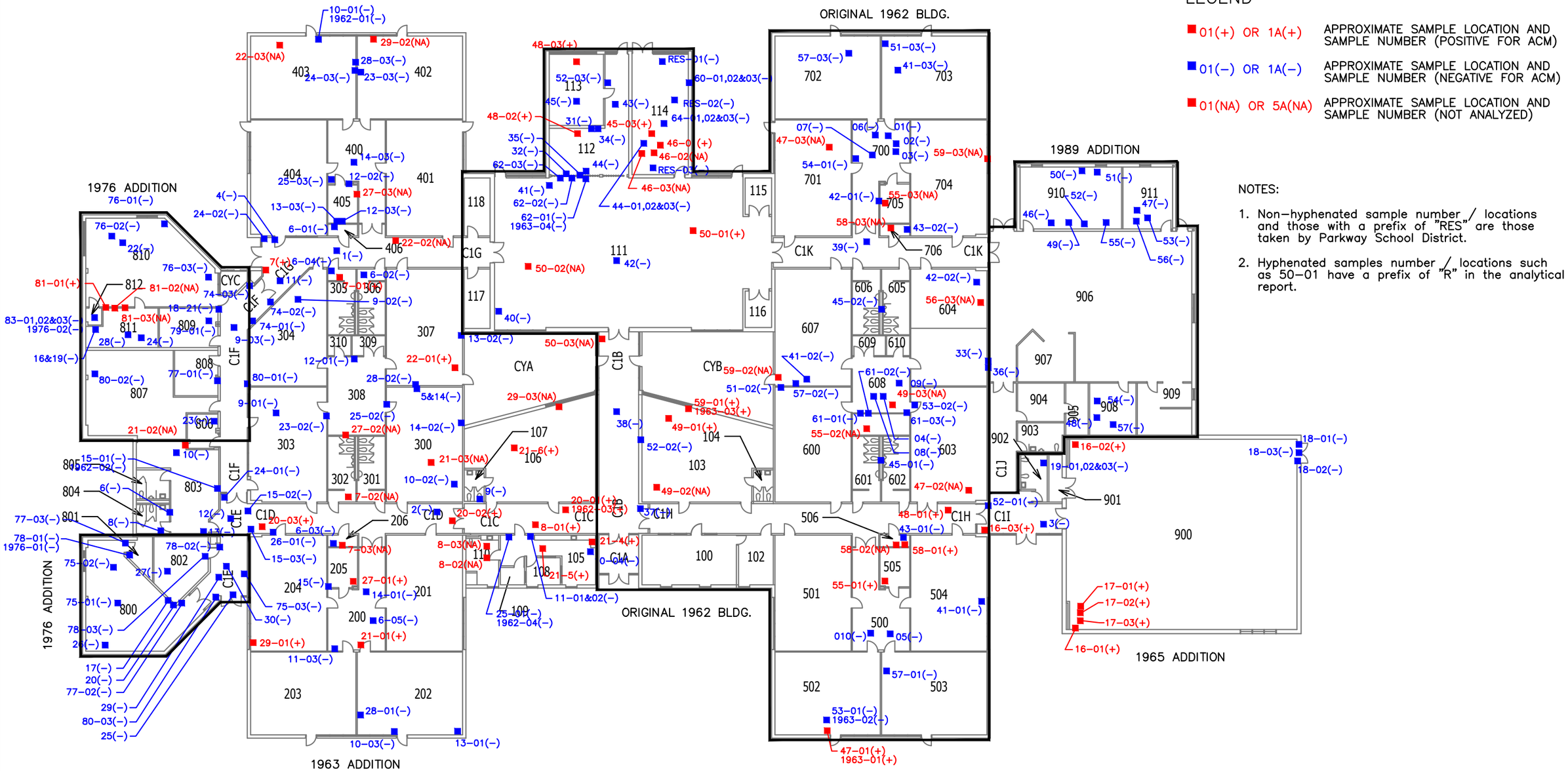
0 30
FEET

psi Information To Build On
Engineering • Consulting • Testing
8669 Olive Boulevard St. Louis, MO 63132
Tel (314) 432-8073 Fax (314) 432-5119

TITLE:
ASBESTOS – MISCELLANEOUS MATERIAL – CAULK
ROSS ELEMENTARY – FIRST LEVEL
1150 ROSS AVE. – CREVE COEUR, MO. 63146

PARKWAY SCHOOLS

DWN:	DES:	PROJECT NO: 00291604
TDA	MCD	PARKWAY SCHOOL DIST. ST.LOUIS COUNTY, MO.
CHKD: MCD	APPD: MCD	
DATE: 02–16–18	REV: 1	A8–01



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Tel (314) 432-8073 Fax (314) 432-5119

TITLE:

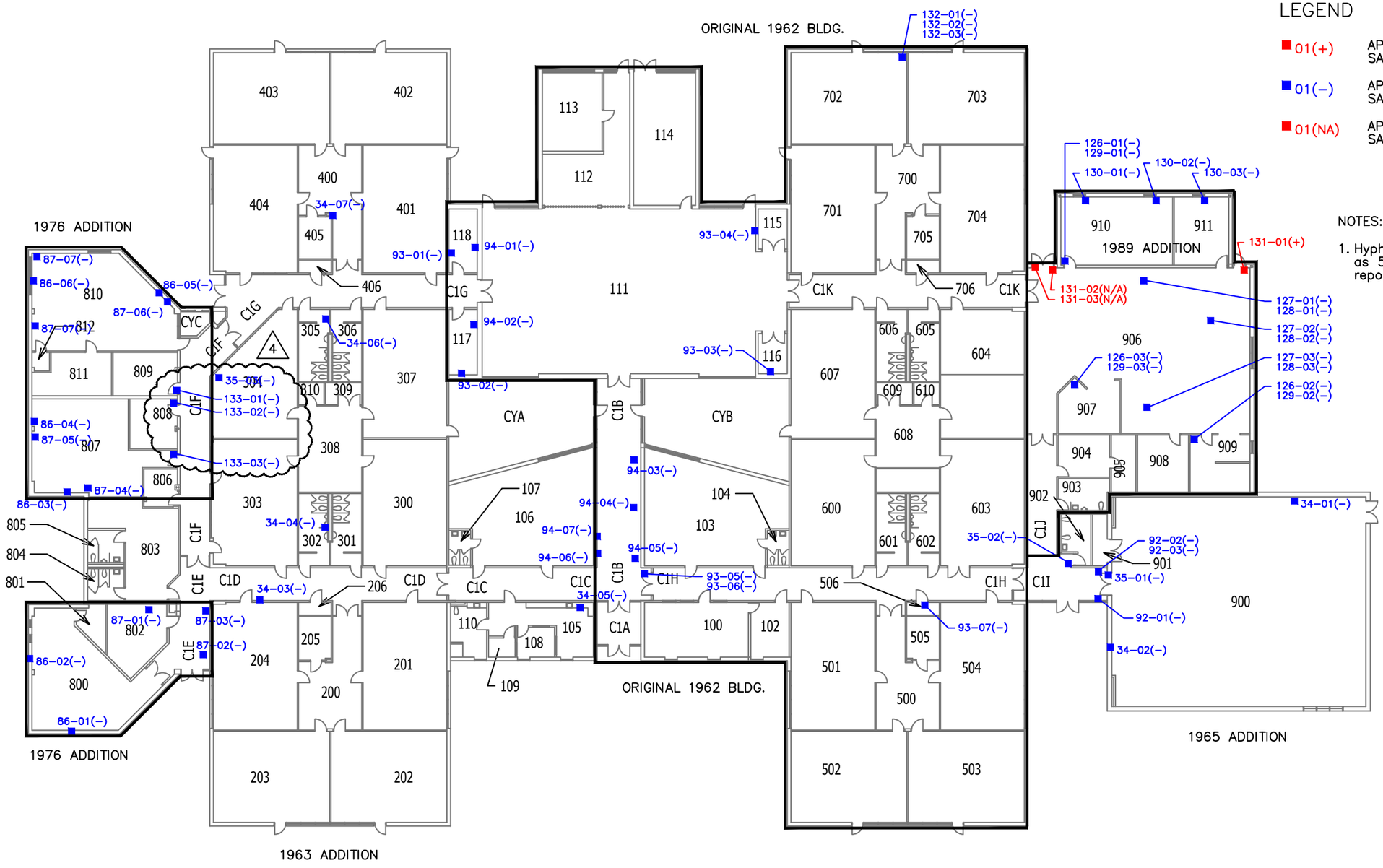
ASBESTOS – BULK SAMPLE LOCATIONS
ROSS ELEMENTARY – FIRST LEVEL
1150 ROSS AVE. – CREVE COEUR, MO. 63146

PARKWAY SCHOOLS

DWN: TDA	DES: MCD
CHKD: MCD	APPD: MCD
DATE: 02–27–15	REV: 1

PROJECT NO: 00291604
PARKWAY SCHOOL DIST.
ST.LOUIS COUNTY, MO.

B1–01



LEGEND

01(+)	APPROXIMATE SAMPLE LOCATION AND SAMPLE NUMBER (POSITIVE FOR ACM)
01(–)	APPROXIMATE SAMPLE LOCATION AND SAMPLE NUMBER (NEGATIVE FOR ACM)
01(NA)	APPROXIMATE SAMPLE LOCATION AND SAMPLE NUMBER (NOT ANALYZED)

NOTES:

1. Hyphenated samples number "–" locations such as 50–01 have a prefix of "R" in the analytical report.

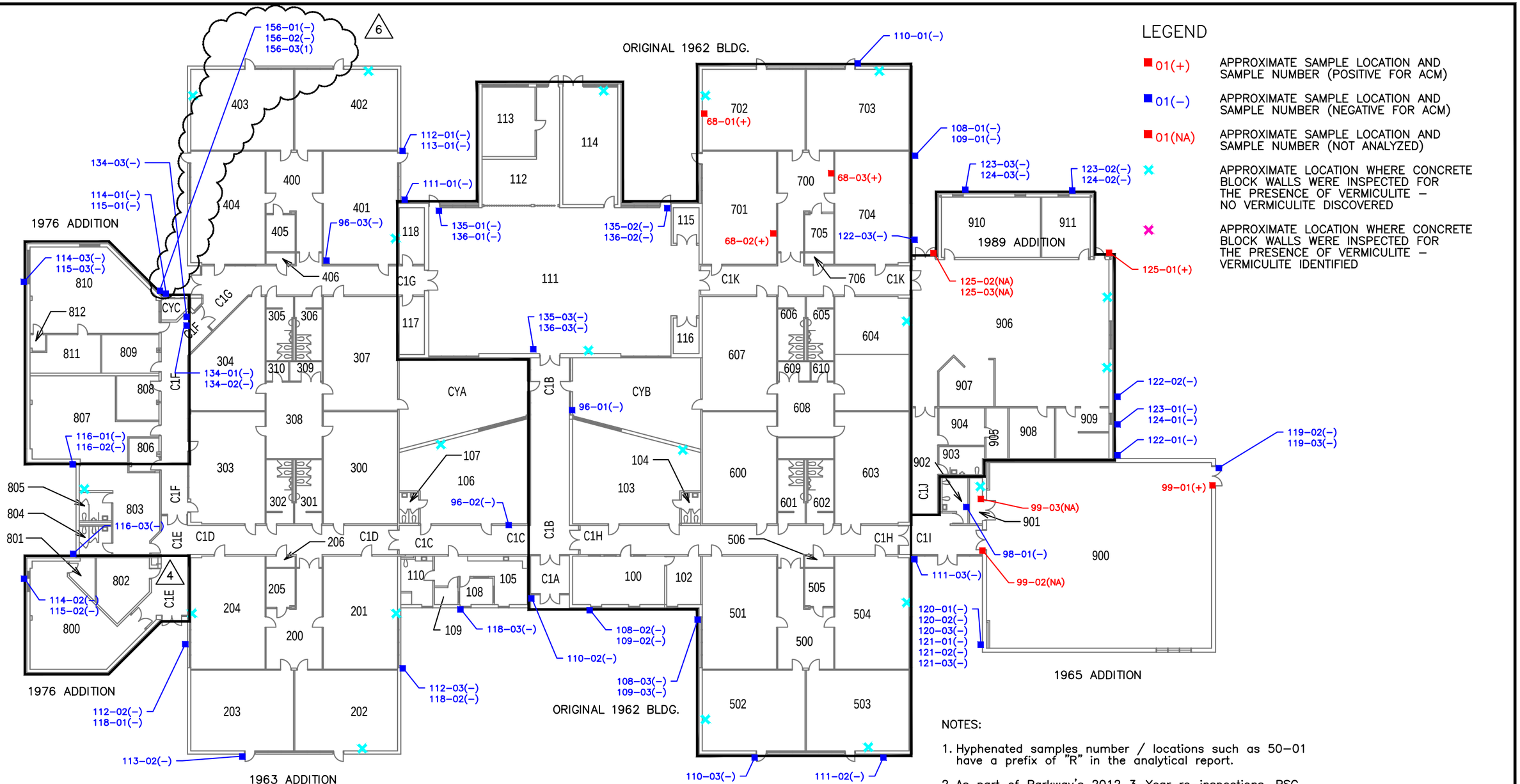
psi Information To Build On
Engineering • Consulting • Testing
8669 Olive Boulevard St. Louis, MO 63132
Tel (314) 432-8073 Fax (314) 432-5119

TITLE:

ASBESTOS – BULK SAMPLE LOCATIONS
ROSS ELEMENTARY – FIRST LEVEL
1150 ROSS AVE. – CREVE COEUR, MO. 63146

PARKWAY SCHOOLS

DWN: TDA	DES: MCD	PROJECT NO: 00291604	
CHKD: MCD	APPD: MCD	PARKWAY SCHOOL DIST. ST.LOUIS COUNTY, MO.	
DATE: 12–04–17	REV: 4	B1.1–01	



psi Information To Build On
Engineering • Consulting • Testing
8669 Olive Boulevard St. Louis, MO 63132
Tel (314) 432-8073 Fax (314) 432-5119

TITLE:

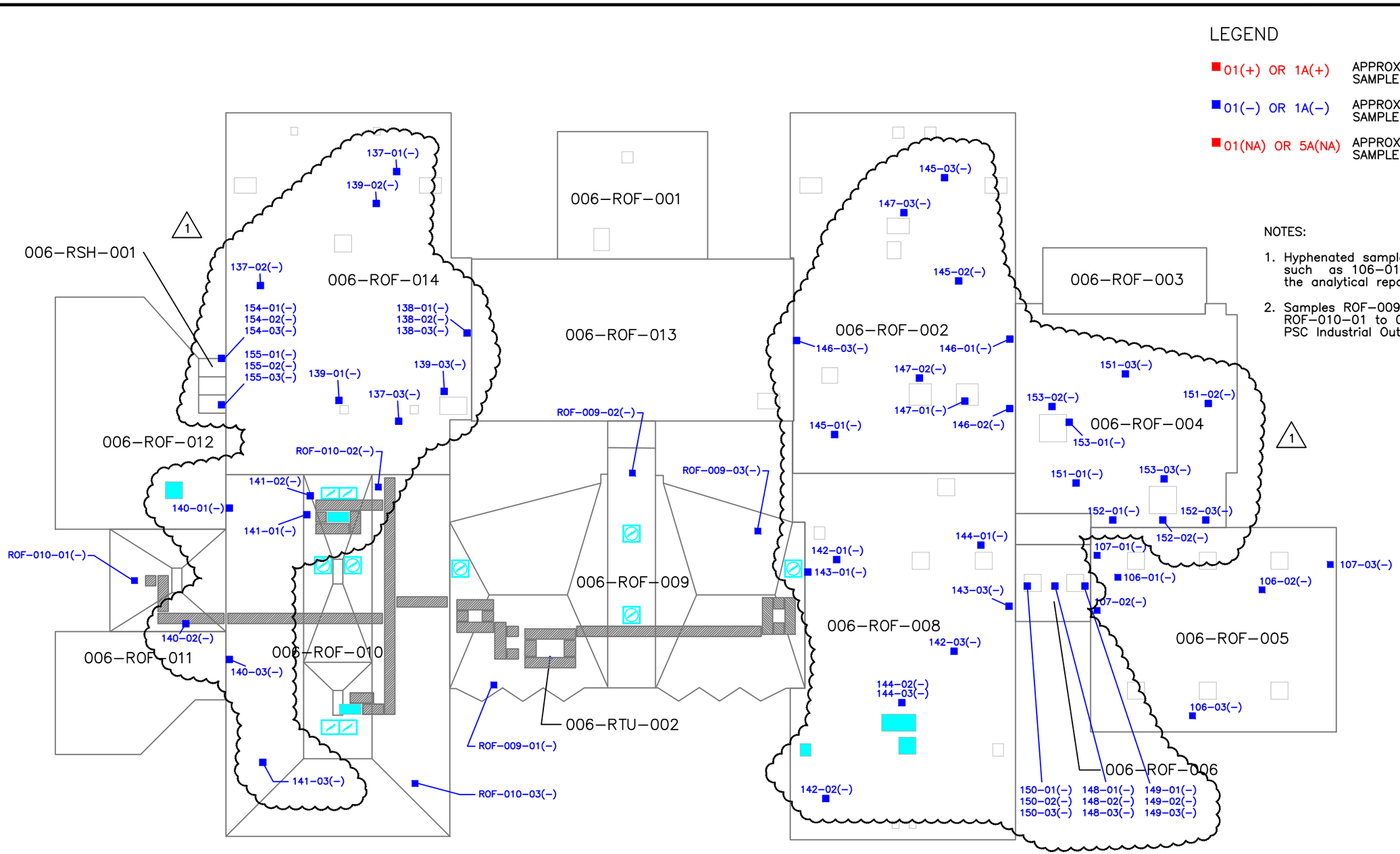
ASBESTOS – BULK SAMPLE LOCATIONS
ROSS ELEMENTARY – FIRST LEVEL
1150 ROSS AVE. – CREVE COEUR, MO. 63146

PARKWAY SCHOOLS

DWN: TDA	DES: MCD
CHKD: MCD	APPD: MCD
DATE: 08–13–20	REV: 6

PROJECT NO: 00291604
PARKWAY SCHOOL DIST. ST.LOUIS COUNTY, MO.

B1.2–01



psi Information To Build On
Engineering • Consulting • Testing
8669 Olive Boulevard St. Louis, MO 63132
Tel (314) 432-8073 Fax (314) 432-5119

TITLE:

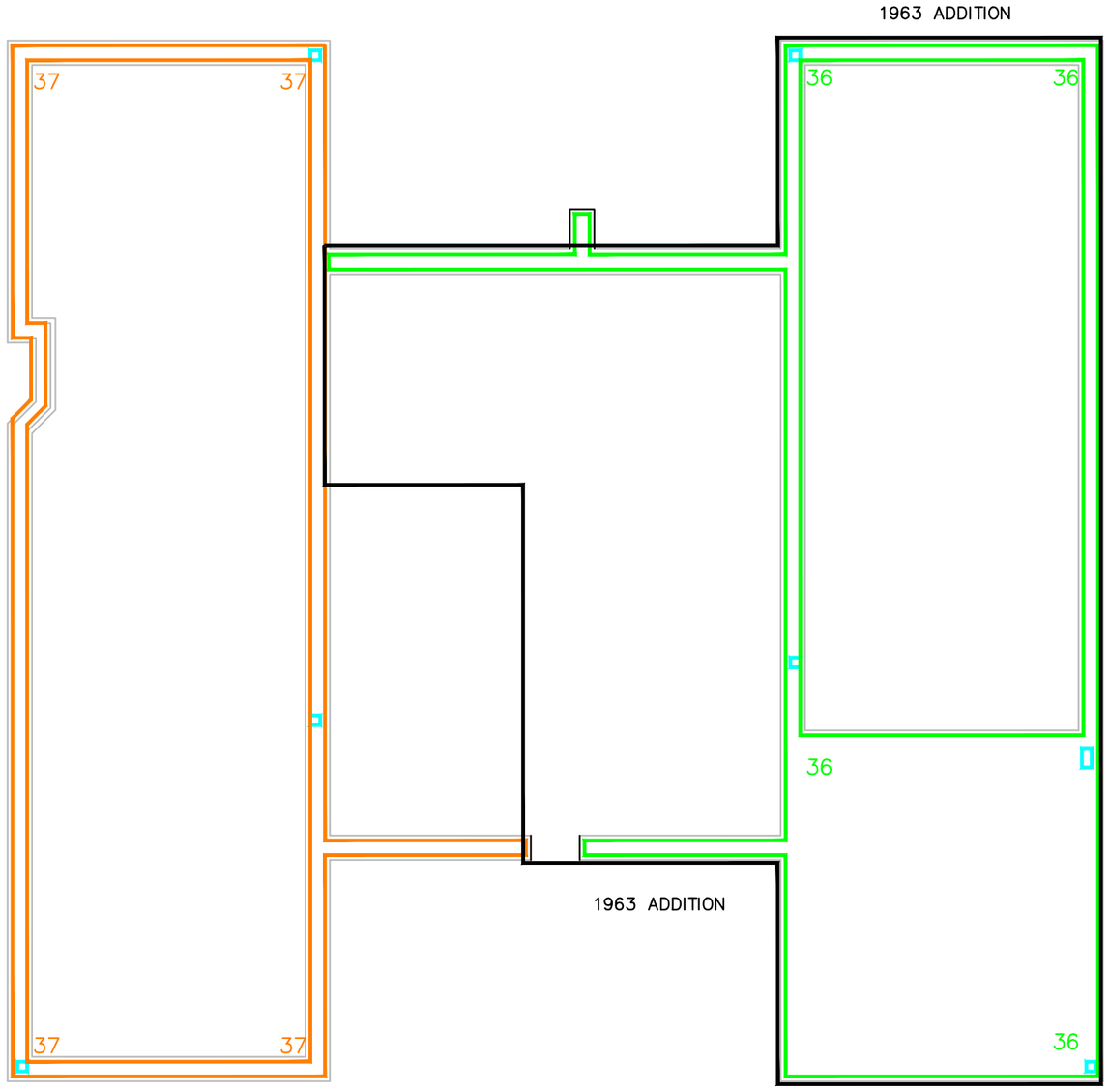
ASBESTOS – BULK SAMPLE LOCATIONS
ROSS ELEMENTARY – ROOF LEVEL
1150 ROSS RD. – ST. LOUIS, MO. 63146

PARKWAY SCHOOLS

DWN: TDA	DES: MCD
CHKD: MCD	APPD: MCD
DATE: 08–13–20	REV: 1

PROJECT NO: 00291604
PARKWAY SCHOOL DIST.
ST.LOUIS COUNTY, MO.

B2–ROOF



ORIGINAL BUILDING BUILT IN 1962

LEGEND

36 TUNNEL SYSTEM – 1963

37 TUNNEL SYSTEM – 1962

APPROXIMATE LOCATION OF HATCH OPENING

N

0 30

FEET

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8669 Olive Boulevard St. Louis, MO 63132
Tel (314) 432-8073 Fax (314) 432-5119

TITLE:

ASBESTOS – FUNCTIONAL SPACES

ROSS ELEMENTARY – CRAWL SPACE / TUNNEL SYSTEM

1150 ROSS AVE. – CREVE COEUR, MO. 63146

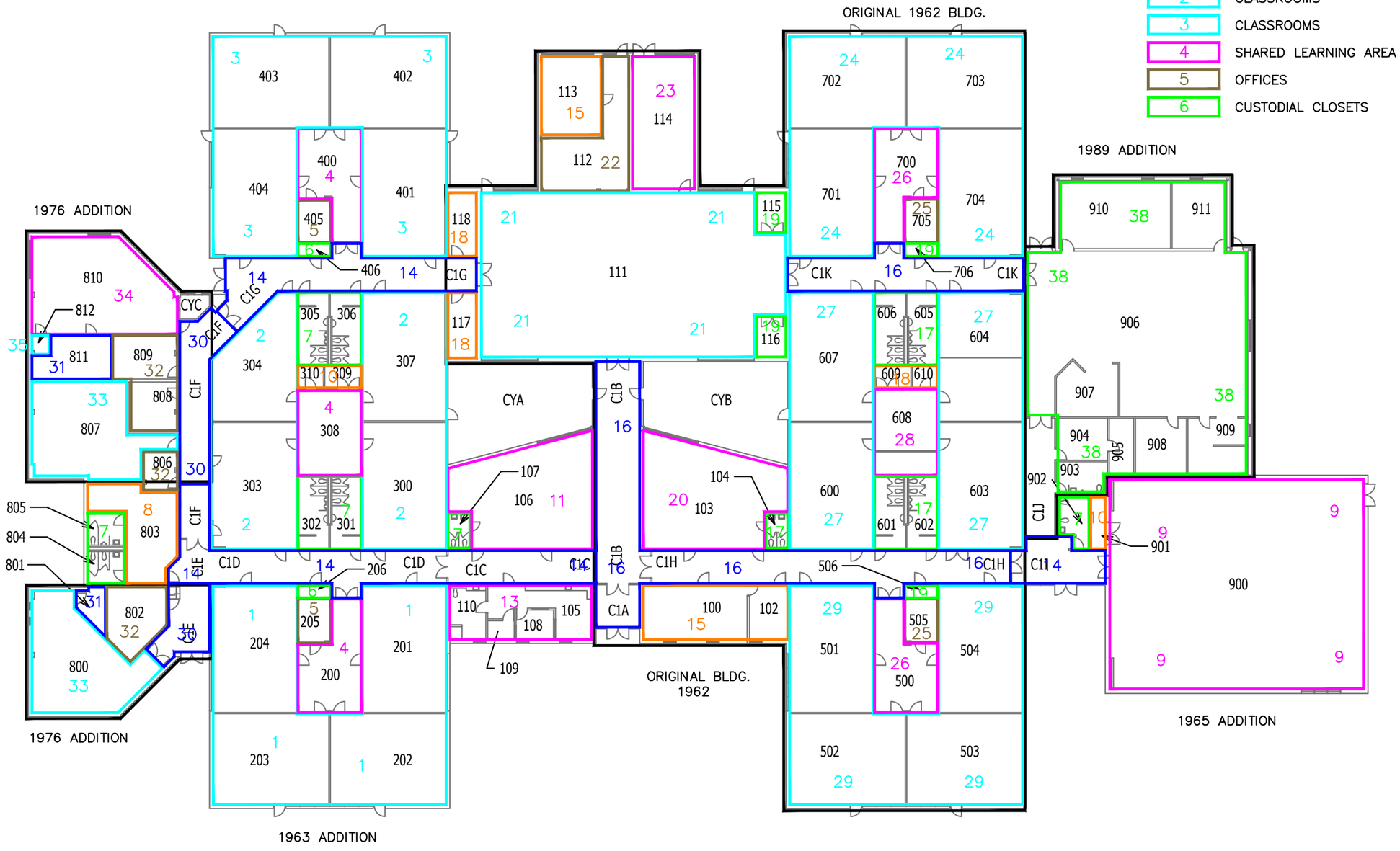
PARKWAY SCHOOLS

DWN: TDA	DES: MCD
CHKD: MCD	APPD: MCD
DATE: 02-27-15	REV: 1

PROJECT NO: 00291604

PARKWAY SCHOOL DIST. ST.LOUIS COUNTY, MO.

F1-00



LEGEND

1	CLASSROOMS	7	REST ROOMS
2	CLASSROOMS	8	STAFF LOUNGE
3	CLASSROOMS	9	GYMNASIUM
4	SHARED LEARNING AREA	10	STORAGE AREAS
5	OFFICES	11	KINDERGARTEN
6	CUSTODIAL CLOSETS	12	RESERVED
		13	NURSES STATION
		14	CORRIDORS
		15	ADMINISTRATIVE OFFICES
		16	CORRIDORS
		17	REST ROOMS
		18	STORAGE
		19	CUSTODIAL CLOSETS
		20	KINDERGARTEN
		21	COMMONS
		22	FOOD SERVING AREA
		23	MECHANICAL / BOILER ROOM
		24	CLASSROOMS
		25	OFFICES
		26	SHARED LEARNING AREA
		27	CLASSROOMS
		28	COMMON CLASSROOMS
		29	CLASSROOMS
		30	CORRIDORS
		31	STORAGE
		32	OFFICES
		33	CLASSROOMS
		34	ARTS / CRAFTS
		35	KILN ROOM
		38	LIBRARY AND OFFICES

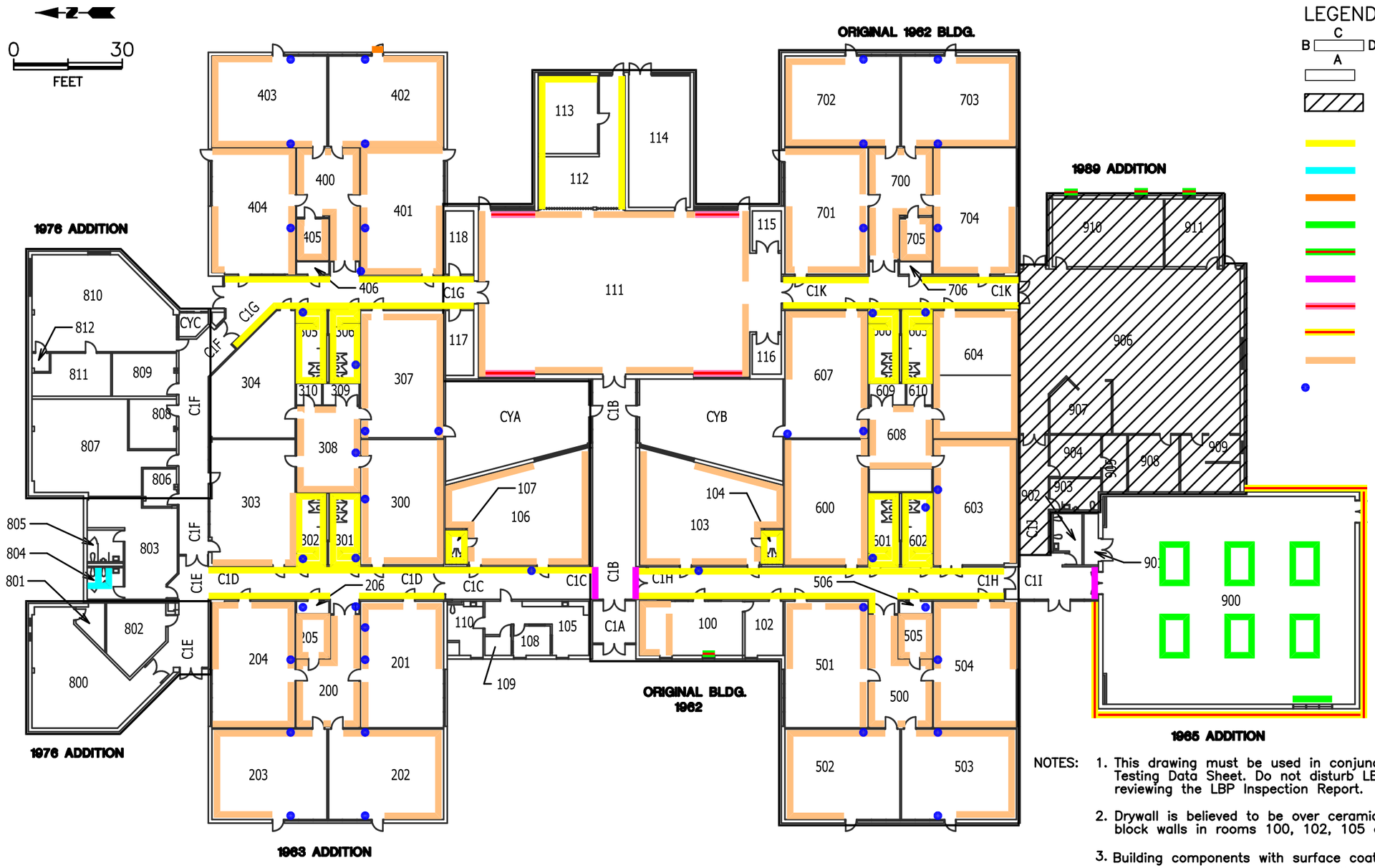
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FEET

psi Information To Build On
Engineering • Consulting • Testing
8669 Olive Boulevard St. Louis, MO 63132
Tel (314) 432-8073 Fax (314) 432-5119

TITLE:
ASBESTOS – FUNCTIONAL SPACES
ROSS ELEMENTARY – FIRST LEVEL
1150 ROSS AVE. – CREVE COEUR, MO. 63146

PARKWAY SCHOOLS

DWN: TDA	DES: MCD	PROJECT NO: 00291604	
CHKD: MCD	APPD: MCD	PARKWAY SCHOOL DIST. ST.LOUIS COUNTY, MO.	
DATE: 02-16-18	REV: 3	F1-01	



LEGEND

- ROSS AVE. IS ON "A" SIDE
- BUILDING ADDITION YEAR OF COMPLETION
- AREA NOT INCLUDED IN 2009 LBP INSPECTION
- WALL
- PARTITION
- DOOR / DOOR FRAME
- WINDOW FRAME
- WINDOW PANEL
- LINTEL
- VENTILATOR UNIT
- SOFFIT
- COVEBASE
- COLUMN

NOTES:

1. This drawing must be used in conjunction with the LBP Testing Data Sheet. Do not disturb LBP materials without reviewing the LBP Inspection Report.
2. Drywall is believed to be over ceramic glazed block walls in rooms 100, 102, 105 and 108.
3. Building components with surface coatings/paints that have lead content equal to or greater than 1.0 milligrams of lead per square centimeter (1.0 mg/cm2) or 0.5% by weight are considered Lead Based Paint (LBP) by the United States Environmental Protection Agency (USEPA) and the Department of Housing and Urban Development (HUD). The Occupational Health and Safety Administration (OSHA) considers surface coatings/paints with any detectable level of lead to be "lead containing coatings or paint" having regulatory requirements.

psi Information To Build On
Engineering • Consulting • Testing
8669 Olive Boulevard St. Louis, MO 63132
Tel (314) 432-8073 Fax (314) 432-5119

TITLE:

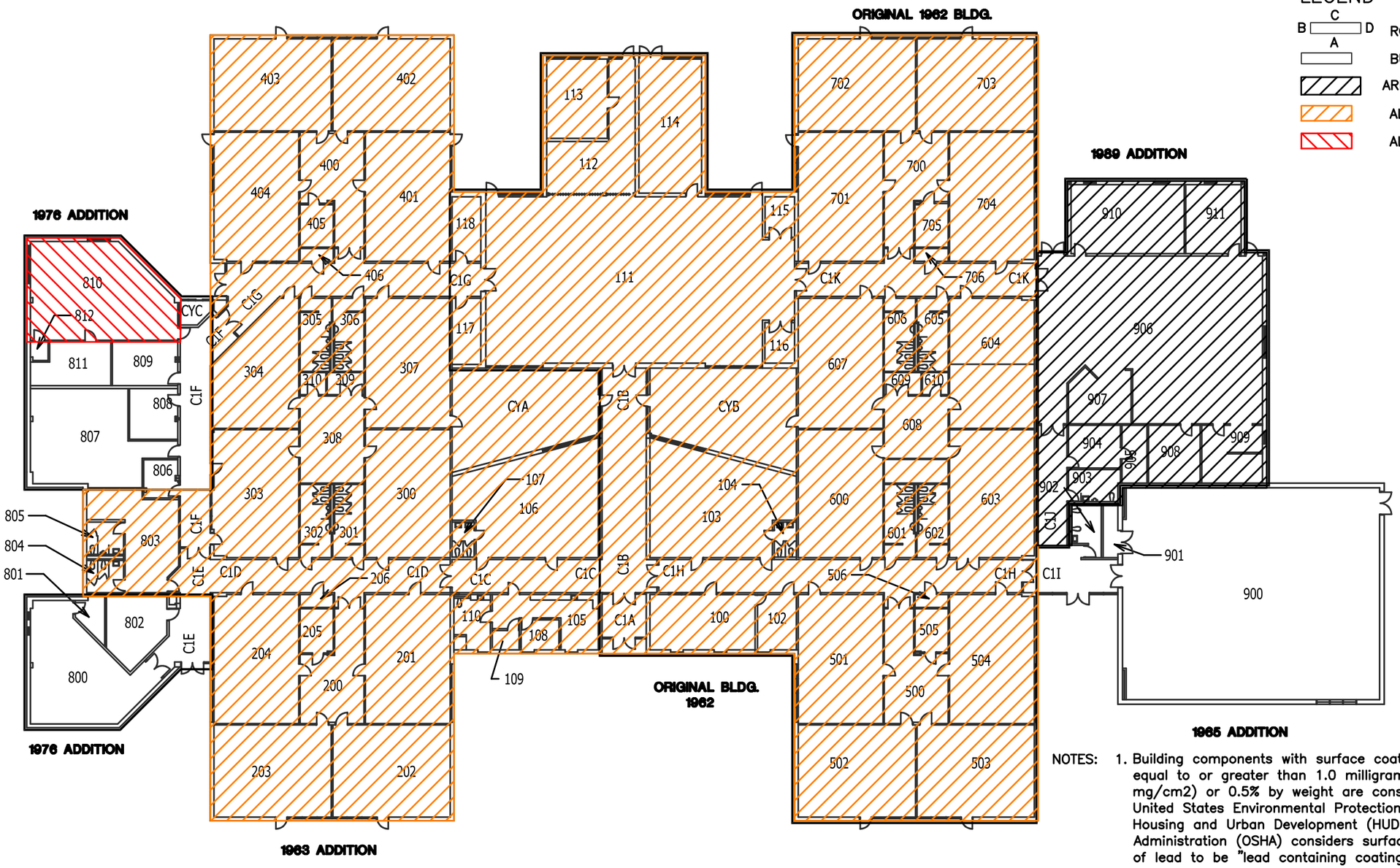
APPROXIMATE LOCATION OF LEAD BASED PAINT (LBP)
ROSS ELEMENTARY – FIRST LEVEL
1150 ROSS AVE. – CREVE COEUR, MO. 63146

PARKWAY SCHOOLS

DWN:	DES:
TDA	MCD
CHKD:	APPD:
MCD	MCD
DATE:	REV:
02-27-15	2

PROJECT NO: 00291604
PARKWAY SCHOOL DIST.
ST.LOUIS COUNTY, MO.

L1-01



NOTES:

1. Building components with surface coatings/paints that have lead content equal to or greater than 1.0 milligrams of lead per square centimeter (1.0 mg/cm2) or 0.5% by weight are considered Lead Based Paint (LBP) by the United States Environmental Protection Agency (USEPA) and the Department of Housing and Urban Development (HUD). The Occupational Health and Safety Administration (OSHA) considers surface coatings/paints with any detectable level of lead to be "lead containing coatings or paint" having regulatory requirements.

psi Information To Build On
Engineering • Consulting • Testing
8669 Olive Boulevard St. Louis, MO 63132
Tel (314) 432-8073 Fax (314) 432-5119

TITLE:

APPROXIMATE LOCATION OF LEAD BASED PAINT (LBP)
ROSS ELEMENTARY – FIRST LEVEL
1150 ROSS AVE. – CREVE COEUR, MO. 63146

PARKWAY SCHOOLS

DWN:	DES:
TDA	MCD
CHKD:	APPD:
MCD	MCD
DATE:	REV:
02–27–15	2

PROJECT NO: 00291604
PARKWAY SCHOOL DIST.
ST.LOUIS COUNTY, MO.

L2–01

SECTION 004000
PROCUREMENT FORMS AND SUPPLEMENTS

PART 1 GENERAL

1.01 CONTRACTOR IS RESPONSIBLE FOR OBTAINING A VALID LICENSE TO USE ALL COPYRIGHTED DOCUMENTS SPECIFIED BUT NOT INCLUDED IN THE PROJECT MANUAL.

1.02 FORMS

A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in the procurement requirements.

B. Substitution Request Form (During Procurement): Bidder's Discretion.

C. Bid Form: Section 004100 - Bid Form.

D. Procurement Form Supplements:
   1. Bid Security Form: AIA A310.
      a. Form AIA A310 is attached at end of Section 006000.
   2. Proposed Subcontractors Form: Section 004336 - Proposed Subcontractors Form.

E. Representations and Certifications:
   1. Bidder's Qualifications: AIA A305.
      a. Form AIA A305 is attached at end of Section 006000.

1.03 REFERENCE STANDARDS

A. AIA A305 - Contractor's Qualification Statement.

B. AIA A310 - Bid Bond.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 004100
BID FORM

THE PROJECT AND THE PARTIES

1.01 TO:

A. Parkway School District (Owner)
   1. 363 North Woods Mill Road
   2. Chesterfield Missouri 63017

1.02 FOR:

A. The project PN062501B - ROS Building Renovation and Site Improvements at Ross Elementary | 1150 Ross Road, St. Louis, MO 63146

B. Bid Number 26-27

1.03 DATE: _____ (BIDDER TO ENTER DATE)

1.04 SUBMITTED BY: (BIDDER TO ENTER COMPANY NAME, ADDRESS, AND CONTACT INFORMATION)

A. Bidder's Full Name:
   _____
   1. Address:
      _____
   2. City, State, Zip:
      _____
   3. Telephone Number:
      _____
   4. Fax Number:
      _____
   5. E-mail Address:
      _____

1.05 ACKNOWLEDGEMENTS:

A. We acknowledge:
   1. Examination of the site and all Bidding Documents and familiarity with the conditions pertaining to the site of the work and the requirements of the Bidding Documents as they pertain to the work has been made.
   2. Responsibility for performing all the work required of the Bidding Documents.
   3. Understanding that the Owner may reserve the right to reject any or all bids and to waive any informalities in the bidding.
   4. Understanding that by submitting a bid the representations in Article 2 of the Instructions to Bidders have been made.

1.06 OFFER

A. Bidders must show bid amount in both words and figures. In case of discrepancy, amount in words shall govern.

B. Having examined the Place of The Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by Architect and Owner for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work. Modifications to this bid form will not be accepted. Qualifications to the scope of work for each bid package bid will not be accepted. By submitting a bid, Bidder is agreeing to perform the complete scope of work for the bid package being bid as outlined in the project documents for the Sum:

C. **COMBINATION BID (*please note all bid package numbers included in combined bid*)**
   1. <u>BASE BID:</u>

Bidder agrees to perform all work for Bid Package Nos. _____, exclusive of alternate bids, for the Sum:

_____

dollars ($_____), in lawful money of the United States of America.

D. **Bid Package 01A - GENERAL TRADES**

1. BASE BID:
   Bidder agrees to perform all work for Bid Package 01A, exclusive of alternate bids,for the Sum:

   _____

   dollars ($_____), in lawful money of the United States of America.

E. **Bid Package No. 23A - MECHANICAL**

1. BASE BID:
   Bidder agrees to perform all work for Bid Package 23A, exclusive of alternate bids, for the Sum :

   _____

F. We have included the required security Bid Bond or cashier's check at 10 percent of the Bid Sum as required by the Instruction to Bidders.

G. All applicable federal taxes are included and State of Missouri taxes are included in the Bid Sum except those exempted by Missouri statutes.

1.07 ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for sixty days from the bid closing date.

B. If this bid is accepted by Owner within the time period stated above, we will:
   1. Execute the Agreement in the form available to Contractor as part of the Bidding Documents without further modifications within seven days of receipt of Notice of Award.
   2. Furnish the required bonds within seven days of receipt of Notice of Award.
   3. Commence work within three days after written Notice to Proceed of this bid.

C. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to Owner by reason of our failure.

D. In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

1.08 CONTRACT TIME

A. If awarded the Contract for Work bid upon herein, work will start on date designated in a written Notice to Proceed order issue by the Construction Manager and will be completed in accordance with the contract documents, with all phass of work completed and operatinal and ready for acceptance by the Owner no later than as required by the Contract Agreement.

1.09 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.
   1. Addendum # _____ Dated _____.
   2. Addendum # _____ Dated _____.
   3. Addendum # _____ Dated _____.
   4. Addendum # _____ Dated _____.

1.10 BID FORM SUPPLEMENTS

A. The following Supplements are attached to this Bid Form and are considered an integral part of this Bid Form:

1. Document 004322 - Unit Prices Form: Include a listing of unit prices specifically requested by Contract Documents.
2. Document 004336 - Proposed Subcontractors Form: Include the names of all Subcontractors and the portions of the Work they will perform.

1.11 BID FORM SIGNATURE(S)

A. _____

(Bidder - print the full name of your Proprietorship, Partnership, or Corporation)

B. _____

(Authorized signing officer, Title)

C. _____

D. (Typed or printed name of authorized signing officer)

1.12 IF THE BID IS A JOINT VENTURE OR PARTNERSHIP, ADD ADDITIONAL FORMS OF EXECUTION FOR EACH MEMBER OF THE JOINT VENTURE IN THE APPROPRIATE FORM OR FORMS AS ABOVE.

END OF SECTION

SECTION 004301
BID FORM SUPPLEMENTS COVER SHEET

PARTICULARS

1.01 TO (OWNER): PARKWAY SCHOOL DISTRICT

A. 363 North Woods Mill Road

B. Chesterfield, Missouri 63017

1.02 BID NUMBER 27-26

1.03 PROJECT NUMBER: PN062501B

1.04 PROJECT NAME: ROS BUILDING RENOVATION AND SITE IMPROVEMENTS

1.05 PROJECT LOCATION: ROSS ELEMENTARY SCHOOL

1.06 DATE: _____

1.07 SUBMITTED BY: (BIDDER TO INSERT FULL COMPANY NAME AND ADDRESS)

A. _____

B. _____

C. _____

D. _____

E. In accordance with Section 002113 - Instructions to Bidders and Section 004100 - Bid Form - , we include the Supplements To Bid Form listed below. The information provided shall be considered an integral part of the Bid Form.

1.08 SUPPLEMENTS TO BID FORM

SIGNATURE(S)

2.01 _____

2.02 (BIDDER - PRINT THE FULL NAME OF YOUR PROPRIETORSHIP, PARTNERSHIP, OR CORPORATION)

2.03 _____

2.04 (AUTHORIZED SIGNING OFFICER, TITLE)

2.05 _____

2.06 (TYPED OR PRINTED NAME OF AUTHORIZED SIGNING OFFICER)

END OF SECTION

SECTION 004322
UNIT PRICES FORM

PARTICULARS

1.01 THE FOLLOWING IS THE LIST OF UNIT PRICES REFERENCED IN THE BID:

A. SUBMITTED BY: (Bidder Name)_____

B. TO (Owner): Parkway School District
   1. 363 North Woods Mill Road
   2. Chesterfield, Missouri 63017

C. dated _____ and which is an integral part of the Bid Form.

1.02 THE FOLLOWING ARE UNIT PRICES FOR SPECIFIC PORTIONS OF THE WORK AS LISTED, AND ARE APPLICABLE TO AUTHORIZED VARIATIONS FROM THE CONTRACT DOCUMENTS.

A. Quantities indicated below are for bid evaluation purposes only.

B. The unit quantity will be multiplied by the unit price and the product added to the base bid and any accepted alternate bids to determine the low bidder.

C. Actual quantities supplied or placed in the Work shall determine actual adjustment to the Contract Sum.

1.03 UNIT PRICE LIST:

A. ITEM DESCRIPTION : UNIT QUANTITY : UNIT PRICE

B. Item A - Excavating Unsuitable Soil & Replacement With Granular Fill; Section 312316 - Excavation and Section 312323 - Fill : Quantity 500 cubic yards : $_____/cubic yard.

C. Item B - Excavating Unsuitable Soil In Trench & Replacement With Granular Fill; Section 312316.13 - ____ : Quantity ____ cubic yards : $_____/cubic yard.

D. Item C - Provide and Install Geotechnical Stabilization Fabric; Section 312323 - Fill and Section 312316.13 - Trenching : Quantity 5,000 square feet : $_____/square yard.

END OF SECTION

SECTION 005200
AGREEMENT FORM

PART 1 GENERAL

1.01 FORM OF AGREEMENT

A. **TRADE AGREEMENT (Missouri)**, is the form of Agreement between the Construction Manager and the Contractor, as assigned at time of award by the Owner.

B. The Agreement to be executed is attached at the end of this document.

1.02 RELATED DOCUMENTS

A. Document 007200 - General Conditions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

Poettker Construction

TRADE CONTRACT

Missouri (Construction Manager)

This Document has important legal and insurance consequences; consultation with an attorney and insurance consultants and/or carriers is encouraged with respect to its completion or modification.

THIS AGREEMENT, made as of [MONTH] [DATE], [YEAR]:

Between the
Construction Manager: **POETTKER CONSTRUCTION COMPANY**
As Assignee of Owner **400 S. Germantown Road**
Breese, Illinois 62230

And the Trade Contractor: **«CONTRACTOR_NAME»**
«CONTRACTOR_ADDRESS1»
«CONTRACTOR_ADDRESS2»
«CONTRACTOR_CITY», «CONTRACTOR_STATE»
«CONTRACTOR_POSTAL_CODE»

The Construction Manager has entered into a contract with Owner whereby Construction Manager is to provide construction management services. Said contract is referred to herein as the "Construction Manager Contract".

For the Project: **«PROJECT_DESCRIPTION»**
«PROJECT_DESCRIPTION_2»
«PROJECT_ADDRESS1»
«PROJECT_ADDRESS2»
«PROJECT_CITY»«PROJECT_STATE» «PROJECT_POSTAL_CODE»

Owner: **«OWNER_NAME»**
«OWNER_ADDRESS1»
«OWNER_ADDRESS2»
«OWNER_CITY» «OWNER_STATE» «OWNER_POSTAL_CODE»

The design team representatives include:

The Project Architect: **«ARCHITECT_NAME»**
« ARCHITECT_ADDRESS1»
« ARCHITECT_ADDRESS2»
« ARCHITECT_CITY» « ARCHITECT_STATE»
«ARCHITECT_POSTAL_CODE»

Introduction

For the purpose of this Trade Contract (hereinafter sometimes referred to as the "Contract" or "Agreement"), **POETTKER CONSTRUCTION COMPANY** is hereinafter referred to as the "**Construction Manager**", and **«CONTRACTOR_NAME»,** the trade contractor, is hereinafter referred to as "**Contractor**".

The Construction Manager and Contractor agree as follows.

TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 SCOPE OF WORK

3 PAYMENTS

4 PROSECUTION OF THE WORK

5 CHANGES IN THE WORK

6 INSURANCE AND INDEMNITY

7 RESERVED

8 WARRANTY

9 CONTRACTORS OBLIGATIONS

10 TERMINATION

11 CLAIMS

12 PREVAILING LAW

13 INVALID PROVISION

14 DEFINITIONS

15 Article 1

THE CONTRACT DOCUMENTS

1.1. This Trade Contract has been awarded to Contractor by the Owner and Construction Manager after advertisement for bids. By submitting its bid and being awarded this Trade Contract, Contractor acknowledges and agrees that (i) Contactor is signing this Trade Contract as a trade contractor of the Construction Manager; and (ii) upon signing this Trade Contract, Contractor shall be a trade contractor of Construction Manager pursuant to this Trade Contract and Contractor will not have any rights under the Trade Contract against the Owner; all of Contractor's obligations under this Contract shall be enforceable by Construction Manager; and any claims of Contractor shall be against the Construction Manager.

1.2. The "Contract Documents" consist of (1) this Agreement; (2) the agreement between Construction Manager and Owner, (3) Invitation to Bid; (4) Instructions to Bidders; (5) Bid Specifications; (6) Addenda, if any; (7) Architectural and/or Engineering Drawings; (8) Change Directives; (9) Change Orders; (10) other documents listed by Exhibits attached to this Agreement; (11) the Construction Manager Contract; and (12) Modifications to this Agreement made or issued after execution of this Agreement. These documents form this Agreement, and are as fully a part of this Agreement as if attached to this Agreement or repeated herein. This Agreement represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral.

1.3. The Contractor agrees anything that may be called for in the specifications and not shown on the drawings, or shown on the drawings and not called for by the specifications, shall be of like effect as if called for and shown in both. In the event of any discrepancies or conflicts in the Contract Documents, the Contractor shall perform or include the most stringent requirement. If Contractor discovers any ambiguities or discrepancies, Contractor shall immediately submit the matter to Construction Manager for determination.

1.4. Notwithstanding anything to the contrary herein, the obligations of the parties under this Agreement are expressly conditioned on the approval of this Agreement and countersignature by the Parkway School District Board of Education.

Article 2

SCOPE OF WORK

2.1 The Construction Manager engages Contractor as an independent contractor, to perform the «DETAIL_DESCRIPTION» scope of the work (hereinafter called "Contractor's Work").

2.2 Contractor's Work includes, but is not limited to the following: «SCOPE_OF_WORK_DESCRIPTION »

2.3 The following Exhibits are attached and part of this Agreement with the Contractor:

N/A

2.4 The following items are specifically excluded from this Agreement, as they are performed by other trade contractors on the Project: «SCOPE_OF_WORK_EXCLUSIONS»

2.5 Contractor shall complete the Contractor's Work per the plans and specifications. Contractor represents and warrants that the Contract Sum includes all labor, equipment, tools, supplies and materials furnished, fabricated, delivered, unloaded, stored, distributed, and installed, with all freight, surcharges, taxes, insurance, and cost escalation included.

2.6 The Contractor agrees to perform the Contractor's Work under the general direction of the Construction Manager and subject to the final approval of the Architect/Engineer and/or such additional or other specified representative(s) of the Owner, in accordance with the Contract Documents.

2.7 Contractor shall furnish competent onsite supervision when Contractor's Work is performed at the site, and as necessary to complete the Contractor's Work.

2.8 Completion of all work related to Contractor's scope of work in accordance with applicable specified codes, state and federal regulations and safety requirements, and all local governing ordinances and authorities.

2.9 Contractor shall inspect existing conditions in areas of their work prior to mobilization and start-up. Commencing the Contractor's Work shall be deemed Contractor's acceptance of existing conditions.

2.10 Contractor is responsible for clean-up and disposal of all debris created under this scope of work into dumpsters provided by others, or as specified in paragraph 2.2 of this Agreement.

2.11 Contractor shall begin to procure submittals at the earlier of: (a) the time of formal Notice of Intent, or (b) upon receipt of this Agreement. Submission of all required shop drawings, product data, and other submittals required by the specifications will be required within two (2) weeks of contract date, or as noted in paragraph 2.2. Any costs incurred by the Contractor related to submittal procurement will not be paid if this Agreement is not executed for any reason.

2.12 Contractor shall coordinate the Contractor's Work with other affected trades prior to beginning work in this Agreement.

2.13 Contractor is responsible for all applicable sales tax applicable to Contractor's Work. If the Project is tax exempt, a certificate will be made available to the Contractor, and sales, use and other exempt tax should be excluded from the Contract Sum.

2.14 Contractor shall coordinate execution of work with jurisdictional agencies and Construction Manager's superintendent for testing required by the Contract Documents for Contractor's Work. Contractor shall provide adequate notice to Construction Manager as required to coordinate said inspections and testing procedures without delay to the Project Schedule.

2.15 Contractor is responsible for providing all required equipment for hoisting, setting, cutting, anchoring and all other required installation activities related to this scope of work, including coordinating, handling and receiving of material shipments supplied by others to be installed under this Agreement.

2.16 Contractor shall coordinate with all utility companies, both existing and proposed, in order to prevent elevation interference conflicts.

2.17 If deemed necessary by Construction Manager's superintendent or if Contractor is on the weekly Detail Schedule in order to coordinate work, Contractor shall have a representative attend coordination meetings, job-site safety meetings and all related project meetings as necessary to coordinate their scope of work with other trades. Should Contractor fail to have a representative with authority present at these meetings, Construction Manager may fine Contractor $500 per offense.

2.18 Contractor shall comply with all requirements of the National Pollutant Discharge Elimination System (NPDES) Permit and governing laws, Storm Water Pollution Prevention Plan (SWPPP) as defined in the Contract Documents, Best Management Practices (BMP's) as defined by the governing authority. Contractor will be held accountable for deficiencies in these areas as it relates to its scope of work, which could involve fines or penalties imposed by the Owner or jurisdictional agencies.

2.19 Contractor shall comply with all immigration enforcement rules and regulations pertaining to their labor, including, cooperation and participation in an employee identity verification and security badge system. Failure to cooperate and participate in this program could involve fines assessed by the Construction Manager against Contractor, of which, the Contractor will be held responsible for reimbursement.

2.20 By bidding the project, the Contractor understands that this is a schedule driven project. The Contractor is hereby committing adequate forces as well as night shift work and/or overtime as may be required to meet the construction start date, the date for substantial completion and date for final completion of all construction indicated in the Contract Documents, and Construction Manager's Project Schedule. The Contractor agrees to complete punch lists work in a timely manner and on or before the date of final completion established by the Construction Manager. The Contractor agrees it has sole responsibility to provide all necessary labor, equipment materials, tools, and whatever else is necessary to perform the Contractor's Work without interruption and on or before the stipulated dates indicated in the Contract Documents and Project Schedule provided by the Construction Manager. Failure to do so may subject the Contractor to liquidated damages as specified in the Contract Documents.

2.21 Should any questions arise with respect to the interpretation of the drawings and specifications, they shall be referred to the Construction Manager. If the Construction Manager and Contractor cannot mutually agree upon the correct interpretations of such questions, they shall be submitted to the Architect/Engineer and their decision shall be final and binding. If there is no Architect/Engineer for this Project, the Construction Manager's decision shall be followed by the Contractor. Each party shall at all times during the work have a duly appointed representative on the job site who is authorized to act for the respective party concerning this Contract.

2.22 Contractor shall require everyone on the project site wear a hard hat at all times. Additionally, all of Contractor's subcontractors shall comply with all applicable regulations and requirements for safety and health including but not limited to federal, state, municipal, and with Construction Manager's safety policies. The most stringent requirement takes precedence.

2.23 The Contractor represents and warrants to the Construction Manager that the Contractor is financially solvent, able to pay its debts as they mature, and possessed of sufficient working capital to complete the Contractor's Work; that the Contractor is able to furnish the tools,

materials, supplies, equipment and labor, and is experienced in and competent to perform Contractor's Work; that the Contractor is qualified to do the Contractor's Work herein and is licensed and authorized to do business in the State where the Project is located; and that the Contractor holds a license, permit, or other special license to perform the Contractor's Work as required by law.

2.24 The Contractor warrants that the Contract Documents are full, complete and sufficient to have enabled the Contractor to determine the price of the Contractor's Work, to enter into this Agreement and that the Contract Documents are sufficient to enable it to complete the Contractor's Work outlined herein and the Contract Documents and otherwise to complete all of its obligations hereunder for an amount not in excess of the price herein on or before the date of completion established in the Contract Documents.

2.25 The Contractor has visited the site and is fully familiar with all conditions affecting the Project. Further, the Contractor warrants that it has satisfied itself as to the nature, location and character of the job site, including without limitation the surface and subsurface conditions of the job site and all structures and obstructions thereon and thereunder, the nature, location and character of the area in which the Project is located, including its climatic conditions, available labor supply and labor costs, available equipment supply and equipment costs and the quality and quantity of all materials, supplies, tools, equipment, labor and professional services necessary to complete the Contractor's Work in the manner and within the cost and timeframe required by the Contract Documents.

2.26 The Contractor represents that it has no knowledge of any discrepancies, omissions, ambiguities or conflicts in the Contract Documents as they pertain to the Contractor's Work.

2.27 Contractor binds itself to the Construction Manager for the performance of Contractor's Work in the same manner as the Construction Manager is bound to the Owner for such performance under Construction Manager's Contract with the Owner such that Contractor will meet and comply with all requirements, responsibilities, obligations and restrictions of the Construction Manager under Construction Manager's Contract with the Owner. The pertinent parts of the Construction Manager Contract will be made available upon Contractor's request. The Construction Manager shall have the benefit of all rights, remedies, and redress against the Contractor that the Owner has against the Construction Manager.

2.28 All representations, indemnifications, and warranties made in, required by or given in accordance with this Agreement, as well as all continuing obligations indicated in the Agreement, will survive Final Payment, completion and Final Acceptance of the Work and termination or completion of the Agreement, and any task orders there under.

Article 3

PAYMENTS

3.1 Provided that no reason exists for withholding payment pursuant to paragraph 3.10 or otherwise under the provisions of this Agreement, the Construction Manager agrees to pay to the Contractor for the satisfactory completion of Contractor's Work, the sum of **$«SCOPE_OF_WORK_CONTRACT_AMOUNT»** ("Contract Sum").

3.2 Subject to the other terms and conditions of this contract, payment shall be made in monthly payments of 95% of the value of the work performed in any preceding month, in accordance with estimates prepared by the Contractor and approved by the Construction Manager and Owner. The remaining 5% value of work shall be retained until Final Payment, unless otherwise provided in the Contract Documents.

3.3 Unless otherwise provided in the Contract Documents, applications for payment may include materials and equipment not yet incorporated into the Project but delivered to and suitably stored onsite or offsite at a location agreed upon in writing, including applicable insurance, storage and costs incurred in transporting to an offsite storage facility. Approval of payment applications for stored materials and equipment stored offsite shall be conditioned on submission by the Contractor of bills of sale and proof of required insurance, or such other procedures satisfactory to the Construction Manager to establish the proper valuation of the stored materials and equipment, the Owner's title to such materials and equipment, and to otherwise protect the Construction Manager and Owner's interests therein, including transportation to the site.

3.4 Contractor shall provide completed lien waivers and supplier affidavit forms, in a form satisfactory to the Construction Manager with each estimate.

3.5 Payment of the approved portion of the Contractor's monthly estimate shall be conditioned upon receipt by the Construction Manager of its payment from the Owner, and Contractor agrees that payment by the Owner is a condition precedent to the Construction Manager's obligation to pay the Contractor. After Construction Manager receives payment from Owner for the approved portion of Contractor's monthly estimate, Construction Manager will make payment to Contractor within 15 days of its receipt of Owner's payment for Contractor's approved amount, provided no reason exists for Construction Manager to withhold payment from Contractor pursuant to this Contract.

3.6 Approval and payment of Contractor's monthly estimate is specifically agreed not to constitute or imply acceptance by the Construction Manager or Owner of any portion of the Contractor's Work. In no case shall the Construction Manager be held responsible for payment to the Contractor for work not paid by the Owner to the Construction Manager.

3.7 Contractor shall submit monthly estimates to the Construction Manager by the 20th of each month. All such estimates shall be sent electronically to ap@poettkerconstruction.com, copying the Construction Manager's Project Manager by email. In the event the Contractor does not submit such monthly estimates to the Construction Manager by the 20th of the month, then the Construction Manager may, at its option, include in its monthly estimate to the Owner, for Contractor's Work performed during the preceding month, such amount as

Construction Manager may deem proper for the work of the Contractor for the preceding month; and the Contractor agrees to accept such approved portion thereof in lieu of monthly payment based upon the Contractor's estimate.

3.8 In the event it appears to the Construction Manager that the labor, material and other bills incurred in the performance of Contractor's Work are not being currently paid, the Construction Manager, may take such steps as Construction Manager deems necessary to insure that the money paid with any progress payment will be utilized to pay such bills, including directing that any amounts due to the Contractor under this Agreement be paid jointly to both the Contractor and the unpaid vendor or subcontractor.

3.9 The Construction Manager may deduct from any amounts due or to become due to the Contractor any sum or sums owing by the Contractor to the Construction Manager pursuant to this Agreement or any other agreement between Construction Manager and Contractor. In the event of any breach by the Contractor of any provision or obligation of this Agreement or any other agreement between Construction Manager and Contractor, or in the event of the assertion or threat by other parties of any claim or lien against the Owner, the Construction Manager, Construction Manager's Surety, or the Project, which claim or lien arises out of the Contractor's performance of this Agreement or any other agreement between Construction Manager and Contractor, the Construction Manager shall have the right, but is not required, to retain out of any payments due or to become due to this Contractor an amount sufficient to completely protect (and if necessary, reimburse) the Construction Manager from any and all loss, damage or expense therefrom, until the claim or lien has been adjusted by the Contractor to the satisfaction of the Construction Manager. This paragraph shall be applicable even if the Contractor has posted a full payment and performance bond.

3.10 For the purpose of evaluating partial billings and payment, an itemized Schedule of values (SOV) of the various portions of the Contractor's Work, aggregating the total Contract Sum, shall be submitted for approval prior to the first payment application. This SOV shall include as separate and distinctive items, the various subcontractors, equipment suppliers, major material suppliers, and major labor items. Any materials listed from Contractor's stock, shall not exceed $10,000 unless approved by Construction Manager. The approved SOV shall then be used by the Contractor on all monthly estimates. The Contractor shall include a line item in the SOV labeled "Close out and Close out Documents" of not less than five percent (5%) of the Contract Sum.

3.11 Prior to making any payments to the Contractor, the Construction Manager must receive and approve proof of insurance as required in Article 6 of this Agreement.

3.12 Payments otherwise due may be withheld by Construction Manager when defective Contractor Work has not been remedied, a claim has been, or it is reasonably anticipated that a claim may be submitted to Contractor, Contractor has failed to make payments to its subcontractors for materials or labor, or it is reasonably anticipated that the this Agreement cannot be completed for the balance remaining unpaid. If the foregoing causes are rectified, the withheld payment shall be made promptly. If any lien or claim arises after final payment is made, Contractor shall pay the claim and obtain a release of the lien or claim, or provide a bond that fully discharges and fully protects Construction Manager and Owner from the claim or lien. If Contractor fails to do so within a reasonable time, Construction Manager may pay the amount, which will be reimbursed by the Contractor.

3.13 The Contractor shall submit a separate retention only final estimate upon completion and Final Acceptance of Contractor's Work. This shall be considered the Final Payment estimate.

3.13.1 Final Payment shall be paid to the Contractor upon approval by the Owner, Architect and the Construction Manager of the Contractor's Work and no later than fifteen (15) days after payment having been received by the Construction Manager for all of Contractor's Work and satisfactory evidence having been received by the Construction Manager that all payrolls, including customary fringe benefits and payments due under collective bargaining agreements, bills for materials and equipment, all known indebtedness related to Contractor's Work, and all subcontractors and suppliers have been paid to date and are waiving their lien rights upon the final payment of a specific balance due. Acceptance of final payment by the Contractor shall constitute a waiver of claims by the Contractor, except those previously made in writing and identified by the Contractor as unsettled at the time of final application for payment.

3.13.2 All final lien waivers, manufacturer and supplier warranties and other final project documents required by the Contract Documents and this Agreement in relation to the Contractor's Work shall be submitted and approved prior to Contractor's Final Payment estimate. Final Payment will not be issued until all required final documentation is approved by the Construction Manager, Owner, and Architect.

Article 4

PROSECUTION OF THE WORK

4.1 Time is of the essence for both parties, and they mutually agree to see to the performance of their work and the work of their subcontractors so that the entire project may be completed promptly, in a good and workmanlike manner and in accordance with the Contract Documents. The Contractor shall, at all times, provide the materials, equipment, shoring, scaffolding, tools, labor and competent supervision necessary to complete Contractor's work in a timely manner. The Contractor shall provide the Construction Manager with scheduling information and Contractor's proposed weekly schedule for the Contractor's Work, including durations and manpower. The Construction Manager shall then prepare the Detail Schedule of the Contractor's Work as it relates to the overall Project Schedule and, as may be necessary, revise such Detail Schedule as the Contractor's Work progresses. Contractor acknowledges that revisions may be made in the Project Schedule and Detail Schedule and agrees to make no claim

for acceleration or delay by reason of such revisions so long as such revisions are of the type normally experienced in the scope and complexity of Contractor's Work.

4.2 The Contractor shall prosecute Contractor's Work in a prompt and diligent manner in accordance with the Project Schedule and/or Detail Schedule without hindering the work or progress of the Construction Manager or any trade contractor. If work of others is damaged by Contractor, the Contractor will cause such damage to be corrected to the satisfaction of and without cost to the Construction Manager and Owner. If Contractor's Work is damaged by others, then Contractor waives any right to recover overhead or profit in connection with the repair or replacement of such Contractor's Work unless and to the extent such overhead or profit is paid by any applicable insurance proceeds. In the event Contractor fails to maintain its part of the Project Schedule and/or Detail Schedule, it shall, without additional compensation, work such overtime as the Construction Manager may direct until Contractor's Work is in accordance with such schedules. Additionally, any costs required to bring Contractor's Work into conformity with such schedules shall be without additional compensation.

4.3 The Contractor shall be responsible for and will prepare for performance of Contractor's Work, including without limitation thereto, the submission of shop drawings, samples, tests, field dimensions, determination of labor requirements and ordering of materials as required to meet the Project and/or Detail Schedules. Contractor shall notify Construction Manager when portions of the Contractor's Work are ready for inspection.

4.4 The Contractor shall keep and maintain daily progress logs of the Contractor's Work, including labor, equipment, material, and deliveries of own forces and any subcontractor forces; as well as progress of materials or equipment to be provided under this Agreement that may be in the course of preparation or manufacture. Contractor shall furnish such logs to Construction Manager as requested.

4.5 The Contractor shall cooperate with the Construction Manager and other trade contractors whose work may interfere with the Contractor's Work and participate in the preparation of coordinated drawings and work schedules in areas of congestion, specifically noting and advising the Construction Manager of any interference by other trade contractors or subcontractors. If the Contractor's Work includes the installation of materials or equipment not supplied by Contractor, then Contractor shall be responsible for requesting copies of all shop drawings, samples or other submittals relating to such materials or equipment and approving such submittals prior to commencement of Contractor's Work. Commencement of Contractor's Work shall be deemed to be an approval of all such shop drawings, samples and/or other submittals.

4.6 The Contractor shall keep the job site orderly and clean at all times. The Contractor's tools and materials shall only be stored on the job site at such locations and in such manner as is approved by the Construction Manager. If the Contractor fails to clean and organize the job site contrary to provisions hereof, the Construction Manager shall be permitted to perform such necessary clean-up and deduct the cost of such work from amounts due to the Contractor.

4.7 The Contractor shall give adequate notices pertaining to the Contractor's Work to proper authorities and secure and pay for all necessary licenses, permits and royalty fees to carry on Contractor's Work; the furnishing of which is required by the Contract Documents. The Contractor shall defend all suits or claims for infringement of any patent rights involved in the work of the Contractor.

4.8 The Contractor shall comply and cause all of its subcontractors to comply with all Federal, State and local laws and regulations, Social Security Laws and Unemployment Compensation Laws, Immigration Laws, Workers' Compensation Laws, Safety Laws and wage, salary and price regulations insofar as applicable to the performance of this Agreement. Contractor shall also maintain its own safety program for compliance with such laws and shall further comply with the Construction Manager's safety requirements and the Construction Manager's compliance plans regarding any such laws to the extent they are brought to its attention.

4.8.1 Contractor agrees it will comply with Missouri's prevailing wage statutes at Chapter 290 of the Revised Statutes of Missouri and any implementing regulations in Missouri's Code of State Regulations, and any county-wide, local, or contract document requirement for payment of prevailing wages. Contractor agrees that for any laborer engaged in construction of public work as defined by statute, regulation, ordinance, or contract document, it will pay not less than the general prevailing rate of hourly wages for Work of a similar character in the locality where the Work is performed and not less than the general prevailing rate of hourly wages for legal holiday and overtime Work each as set forth in Wage Order 29, or the most recent Wage Order in effect as of the date hereof, as promulgated by the Missouri Department of Labor. Contractor shall ensure that its subcontractors comply with the requirements of the laws referenced in this section and any contract documents regarding prevailing wages and shall indemnify, defend and hold harmless Construction Manager and Owner from and against any damage, claim, cost or expense incurred as a result of Contractor's failure to so comply.

4.8.2. Contractor agrees that it shall abide by and comply with all applicable local, State and Federal laws relating to fair employment practices and prohibiting discrimination in employment contracts involving public funds, the construction or development of public Works, buildings, or facilities. The Contractor shall not discriminate on the basis of age, race, color, national origin, religion, sex, sexual orientation, or sexual identity, in the performance of this Contract.

4.9 Any duty on the part of Construction Manager in connection with the safety of persons or property at or near the job site is intended solely to benefit the Owner and is not intended to benefit Contractor or any third person or entity who may be injured or damaged as a result of the Work. Construction Manager and Contractor specifically state that they do not intend to confer any third-party beneficiary status on any other person or entity nor do they intend, by this

Agreement or their activities on the job site, to create any duty on the part of the Construction Manager as to any person or entity on the job site. The Contractor agrees that Contractor is the most knowledgeable as to how to safely perform the Contractor's Work. Although the Construction Manager may advise the Contractor if the Construction Manager believes there is some unsafe condition or activity on the job site, the sole responsibility for preventing injuries and accidents to Contractor's employees shall rest upon the Contractor.

4.10 The Contractor will not assign this Agreement, nor subcontract the whole or any part of the Contractor's Work to be performed hereunder, without the prior written consent of the Construction Manager, with the exception of those subcontractors listed by the Contractor and furnished to the Construction Manager at the time this Agreement is executed.

4.11 If the Contractor's Work includes the furnishing of architect's, engineer's or other design services, Contractor shall cause such services to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, shop drawings and other submittals prepared by such professional. The Construction Manager and the Owner shall be entitled to rely upon the adequacy, accuracy and completeness of the services performed by such design professional. The Contractor shall be responsible to the Construction Manager and the Owner for the acts and omissions of such design professional. Further, the Contractor shall be responsible for providing or causing such professional to carry and maintain professional liability insurance for claims arising from the performance of such professional services, all as set forth in Article 6 hereof. Any fees or expenses of such services are included in the Contract Sum.

4.12 The Contractor agrees that no labor dispute of any kind involving the Contractor, or its employees or agents, shall be suffered or permitted to occur or be manifested on the Project and the Contractor agrees to that end to only employ persons on the Project who will work at all times in harmony with other persons employed on the Project.

4.12.1 The Contractor agrees that its employees shall not participate in or accede to any interference with the performance of work by other persons on the project, including but not limited to work stoppages, slow downs, or other job actions, whether or not such interference is the result of any labor dispute.

4.12.2. Should there be a work stoppage, slow down or any type of interference with the performance of Contractor's Work involving the Contractor or its employees, including but not limited to informational or other picketing or hand billing, strikes, slowdowns, or other interference with work directed to or involving Contractor or its employees or operations, resulting from a labor dispute and which in the judgment of the Construction Manager will cause, or threatens to cause delay in the progress of construction, then upon twenty-four (24) hours written notice the Construction Manager shall have the right to declare the Contractor in default under this Contract and take such steps as are necessary to finish the uncompleted portion of the Contractor's Work. In such event the Construction Manager shall have the right to take possession of and use all of the Contractor's materials (exclusive of tools) intended for use on the Contractor's Work. The cost of completion including all expenses, attorneys' fees and costs incurred in resolving the labor dispute shall be charged against any money then due or thereafter to become due to Contractor under this Agreement. If such cost of completion and other charges exceed the balance due Contractor, Contractor agrees to promptly pay the difference to the Construction Manager.

4.13 The parties recognize that the employment, discipline and discharge of the Contractor's employees are the sole and exclusive province and responsibility of Contractor. Nothing herein shall be understood or construed as a request or requirement on the part of the Construction Manager that Contractor hire, discipline, or discharge any person; provided, however, that if the Owner requires the Construction Manager to remove any individual or subcontractor from the Project, then Contractor shall promptly remove such individual or subcontractor from the Project.

4.14 The Contractor, including but not limited to its agents, representatives, employees, subcontractors and suppliers (collectively "Contractor") acknowledges that the terms of this Agreement and the Contract Documents provided by the Owner may contain non-public proprietary information including without limitation, trade secrets, patented or proprietary processes of the Construction Manager or Owner, pricing and completion terms, overall project costs and general conditions all of which the Contractor agrees to keep confidential (the "Confidential Information"). Contractor shall protect the Confidential Information from disclosure except as necessary for the completion of its Work, or the work of Contractor's accountants, tax preparers and agents or as may be ordered disclosed by a court of law. For purposes of this Agreement, the term "Confidential Information" will also mean design and/or performance criteria, applications for payments, financial data, business and marketing plans, sales and pricing strategies, and any other information marked as Confidential Information. Accordingly, Contractor shall not disclose to third parties nor use any Confidential Information, except in the limited instance that such Confidential Information at the time of receipt from Construction Manager or Owner, was in Contractor's prior possession, or thereafter becomes a matter of public knowledge other than by reason of breach of this Agreement, or that may thereafter be obtained by Contractor from a third party who is not under the obligation of secrecy or confidentiality to Construction Manager or Owner; and that unless approved by Construction Manager, Contractor shall not at any time publish or otherwise disclose engagement by Construction Manager under this Agreement except as is necessary in the performance of the Work.

Article 5

CHANGES IN THE WORK

5.1 The Contractor agrees that the Construction Manager may add to or deduct from the amount of the Contractor's Work covered by this Agreement, and any changes so made in the amount of Contractor's Work involved, or any other parts of this Agreement, shall be by a written amendment (Change Order) hereto setting forth in detail the changes involved and the value thereof which shall be mutually agreed upon in signed writing between the Construction Manager and Contractor. The Contractor agrees to proceed with the Contractor's Work as changed when so ordered in writing by the Construction Manager so as not to delay the progress of the Contractor's Work, pending any determination of the value thereof, unless Construction Manager first requests a proposal of cost before the change is affected. If the Construction Manager requests a proposal of cost for a change, the Contractor shall promptly comply within 5 business days of such request.

5.2 Contractor shall be entitled to receive no extra compensation for extra work or materials or changes of any kind regardless of whether the same was ordered by the Construction Manager or any of its representatives unless a Change Order therefore has been issued in writing by the Construction Manager. If extra work was ordered by the Construction Manager and the Contractor performed same but did not receive a written order therefore, the Contractor shall be deemed to have waived any claim for extra compensation, regardless of any written or verbal protests of claims by the Contractor. The Contractor shall be responsible for any costs incurred by the Construction Manager for changes of any kind made by the Contractor that increase the cost of the work for either the Construction Manager or other trade contractors when the Contractor proceeds with such changes without a written order therefore.

5.3 The Contractor agrees that no claim for additional services rendered or materials furnished by the Contractor to the Construction Manager shall be valid unless notice is given to the Construction Manager prior to the furnishing of the services or material or unless written notice of the claim and amount thereof is given by the Contractor to the Construction Manager on approved form not later than the last day of the calendar month following that in which the claim originated.

5.4 The Contractor will make all claims for extra compensation and for extension of time to the Construction Manager promptly in accordance with this Article and consistent with the Contract Documents.

5.5 Notwithstanding any other provision, if the work for which the Contractor claims extra compensation is determined by the Owner or Architect not to entitle the Construction Manager to a Change Order or extra compensation, then the Construction Manager shall not be liable to the Contractor for any extra compensation for such work, unless Construction Manager agrees in writing to extra compensation.

5.6 Contractor agrees that there shall be no backcharges or change orders submitted for work which is shown on the Contract Documents as work to be completed under the Contractor's Work.

5.7 Contractor agrees to submit change order proposals per Construction Manager's requirements and forms. The Construction Manager may, at any time during the progress of the Contractor's Work, alter, change, subtract from or add to the plans and specifications or scope of work without violating the contract terms thereof.

Article 6

INSURANCE AND INDEMNITY

6.1 The Contractor shall file with the Construction Manager copies of completed certificates of insurance, satisfactory to Construction Manager, to afford protection against all claims for damages to public or private property and injury to persons arising out of Contractor's Work as stated below or as provided in the Contract Documents, whichever is greater:

6.1.1. Contractor shall require all of its subcontractors providing equipment, materials or services directly to Contractor in connection with this Agreement to obtain, maintain and keep in force coverages in accordance with the greater of insurance requirements set forth in this Agreement and the Contract Documents during the time they are involved in performance of services or other work hereunder. Contractor shall obtain certificates of insurance evidencing such coverage prior to performing any of the Contractor's Work, and provide such certificates upon request of Construction Manager. Contractor shall not be excused from its obligations to cause its subcontractors of any tier to meet the greater of the insurance coverage requirements set forth in this Agreement or the Contract Documents unless Contractor shall have obtained in writing from Construction Manager a written waiver, which shall be effective only to such requirements and for such subcontractor specifically identified therein.

6.1.2. Employers' Liability and Workers' Compensation: The Contractor shall furnish evidence that it carries employers' liability and workers' compensation insurance. Employers' liability insurance limits shall not be less than $1,000,000 per accident, $1,000,000 per person for occupational disease, and $1,000,000 policy aggregate for occupational disease.

6.1.3. Commercial General Liability: Contractor shall furnish evidence that Contractor carries Commercial General Liability insurance providing for a limit of not less than $1,000,000 per occurrence/per project for all damages arising out of bodily injuries including death to persons and for all damages arising out of injury or destruction of property in any one accident, and subject to total or aggregate limit of $2,000,000 (per project) for all damages arising out of injuries to person or destruction of property during the policy period. General Liability insurance must include premises/operations, underground explosion and collapse, products and completed operations for at least three (3) years after final payment or longer if required by the Contract

Documents, as well as contractual liability coverage for the Contractor's indemnity obligations hereunder. If Contractor is required to furnish an external insulating finish system or deal with asbestos or any hazardous materials or pollutants or if specified by Construction Manager or required by the Contract Documents, Contractor shall carry environmental impairment/pollution liability insurance providing coverage on an occurrence basis for environmental hazards, including without limitation, lead, mold, asbestos and external insulating finish systems and to include sudden and accidental and environmental clean up with a combined single limit of $1,000,000. Such insurance shall be maintained at least three (3) years after final payment.

6.1.4. Automobile Liability: Contractor shall furnish evidence that Contractor carries automobile liability insurance providing a limit of not less than $1,000,000 for bodily injury, including death to persons and injury or destruction of property in any one accident. Automobile liability insurance must include owned, non-owned and hired car liability.

6.1.5. Umbrella Liability: Contractor shall furnish evidence that Contractor carries Umbrella liability insurance providing a limit of not less than $2,000,000 for bodily injury, including death to persons, and injury or destruction of property, in any one accident. The policy shall follow form with Contractor's other liability policies and shall not require horizontal exhaustion of any primary insurance carried by Owner or Construction Manager or their respective consultants or subcontractors.

6.1.6. Additional Insured and Waiver of Subrogation: The above policies of insurance shall include Construction Manager, the Owner and the Architect/Engineer as additional insured parties on a primary and non-contributory basis, including without limitation completed operations coverage, as respects all work performed by Contractor and shall include coverage for the contributory negligence of the additional insured parties. The Contractor's liability insurance and umbrella insurance coverage shall be exhausted before any of the Owner's or Construction Manager's insurance shall be available. Additional insured endorsement should be CG2010 (11/85) or equivalent, and a copy of such endorsement shall be furnished with the certificate of insurance. Contractor must waive all rights against Construction Manager, Owner and Architect/Engineer and their agents, officers, directors and employees for recovery of damages to the extent these damages are covered by commercial general liability, commercial umbrella liability, business auto liability or workers' compensation and employers' liability insurance maintained, per requirements stated above. Certificates of insurance must provide for said waiver of rights of subrogation to the extent permitted by law and must provide for 30 days written notice to Construction Manager prior to change or cancellation of any insurance policy coverage evidenced by said certificate.

6.1.7. Professional Liability: If the Contractor's work includes the furnishing of architect's, engineer's or other design services, then the Contractor or such architect, engineer or design professional, shall carry and maintain professional liability insurance for claims arising from the performance of such services with a minimum limit of Two Million Dollars ($2,000,000.00) per claim and in the aggregate and with a deductible not to exceed Twenty Five Thousand Dollars ($25,000.00). Such insurance shall be maintained until at least one (1) year after final payment.

6.2 Insurance Form and Duration: All of insurance herein specified shall be in a form acceptable to Construction Manager and shall be carried until all Contractor's Work is satisfactory as evidenced by Final Acceptance. Coverage must be commercial general liability "occurrence" form. "Claims-made" form will not be accepted. Minimum required limits can be a combination of Primary and Umbrella policies. Prior to starting work, the Contractor shall obtain and until final payment is made, maintain and pay for such insurance coverages of the types and with the minimum limits set forth herein. Products and completed operations insurance shall be maintained until at least three years after final payment. Contractor shall furnish certificates of insurance required hereunder to the Construction Manager before beginning work. However, the failure to provide such certificates of insurance prior to beginning Contractor's Work, shall, in no manner, be deemed a waiver of the requirement to provide such insurance and the failure of the Construction Manager to insist upon the providing of such certificates of insurance shall, in no manner, be deemed to be a waiver of the requirement of providing such insurance. Contractor acknowledges that the cost of the insurance required under this Agreement is included in the Contract Sum. The foregoing policies shall contain a provision that coverages afforded under the policies will not be canceled or not renewed until at least thirty (30) days' prior written notice has been given to the Construction Manager.

6.3 In the event Contractor fails to obtain or maintain the greater of any insurance coverage required under this Agreement or the Contract Documents, Construction Manager may purchase such coverage and charge the expense thereof to Contractor or terminate this Agreement.

6.4 Indemnity: To the fullest extent permitted by law, the Contractor shall indemnify, defend (with counsel satisfactory to the Construction Manager) and hold harmless the Construction Manager, Owner, Architect/Engineer and the consultants, agents, board members, officers, and employees of any of them from and against claims, damages, losses and expenses, including, but not limited to, attorneys' fees, expert witness fees, investigation costs and related expenses arising directly or indirectly out of the obligations herein undertaken or arising out of operations conducted by the Contractor, the Contractor's subcontractors, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, except claims, damages or litigation to the extent caused by or resulting from the gross negligence, recklessness or intentional misconduct of the party indemnified hereunder, including claims or litigation caused by or resulting from the sole negligence of any such indemnified party. Such obligation shall not negate, abridge or otherwise reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Paragraph. The parties intend that Contractor shall be obligated to indemnify the Construction Manager, Owner, Architect/Engineer and the consultants, agents and

employees of any of them for such parties' contributory negligence and the Contractor's commercial general liability insurance shall provide coverage for such indemnity obligations as well as coverage for the indemnified parties' contributory negligence as provided above. If the required insurance is not maintained as required, then the Contractor's indemnity obligation shall apply as though the required insurance were in effect. In any and all claims against the Owner and/or Construction Manager or any of their respective agents, board members, officers, directors, shareholders or employees by any employee of the Contractor, anyone directly or indirectly employed by him or anyone for whose acts Contractor may be liable, the indemnification obligation under this Paragraph 6.4 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor under Worker's Compensation acts, disability benefit acts or other employee benefit acts. The obligations of the Contractor under this Paragraph 6.4 shall not extend to the liability of the Architect/Engineer, its agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications, or (2) the giving of or failure to give directions or instructions by the Architect/Engineer, its agents or employees.

Article 7

BONDS

7.1 A Performance Bond and a Labor and Material Payment Bond in forms satisfactory to the Owner shall be furnished in the full amount of this Agreement.

Article 8

WARRANTY

8.1 The Contractor agrees to promptly make good without cost to the Owner or Construction Manager any and all defects due to faulty workmanship and/or materials which may appear within the greater of (1) one year from the date of completion and Final Acceptance of the entire Project by the Owner or (2) as otherwise specified and established in the Contract Documents. If there is no limitation on the guaranty or warranty period established in the Contract Documents, then no limitation shall apply. The Contractor further agrees to execute any special guarantees as provided by the terms of the Contract Documents and included in Contractors Work, prior to final payment.

Article 9

CONTRACTOR'S OBLIGATIONS

9.1 Contractor binds itself to the Construction Manager such that Contractor's performance of Contractor's Work shall be such as Contractor will meet and comply with all requirements, responsibilities, obligations and restrictions of the Construction Manager under Construction Manager's contract with the Owner.

9.2 Reserved.

9.3 Construction Manager shall not issue or give any instruction, order or directions directly to employees or workmen of the Contractor other than to the persons designated as the authorized representative(s) of the Contractor.

9.4 Liquidated damages for delay, if provided for in the Contract Documents, may be assessed against the Contractor to the extent caused by the Contractor or any person or entity for whose acts the Contractor may be liable. The Construction Manager shall make no demand for liquidated damages in any sum in excess of the amount specifically named in this Agreement or the Contract Documents. This provision does not preclude any claim the Construction Manager may have for direct damages under law.

9.5 The Contractor will furnish those temporary facilities and services required by the Contractor, including but not limited to, drinking water, office and any other shelter, engineered layout, necessary temporary construction utilities including hook-ups, items not specifically identified as Construction Manager-furnished items in Article 9, and as noted in paragraph 2.2. Adequate storage area, if available, will be allocated by the Construction Manager for the Contractor's materials and equipment during the course of the Project. The Contractor is responsible for safe and secure storage of materials and equipment, including enclosures and/or containers to be located onsite.

9.6 Reserved.

9.7 The Construction Manager shall have no obligation to make payment to Contractor for its work hereunder until Construction Manager has received payment therefore from Owner or its agent.

Article 10

TERMINATION

10.1 Should the Contractor fail at any time to supply a sufficient number of properly skilled workmen or sufficient materials and equipment of the proper quality, or fail in any respect to prosecute the Contractor's Work with promptness and diligence, or fail to promptly correct defective work or fail in the performance of any of the agreements herein contained, the Construction Manager may, at its option, perform the Contractor's obligations and utilize the Contractor's equipment and materials on the job site in connection therewith. The Construction Manager may provide such labor, materials and equipment and deduct the cost thereof, together with all loss or damage occasioned thereby, from any money then due or thereafter to become due to the Contractor under this Agreement.

10.2 If the Contractor at any time shall refuse or neglect to supply sufficient properly skilled workmen, or materials or equipment of the proper quality and quantity, or fail in any respect to prosecute Contractor's Work with promptness and diligence, or cause by any action or omissions the stoppage

or interference with the work of the Construction Manager or other trade contractors, or fail in the performance of any of the covenants herein contained, or in any other agreement between Contractor and Construction Manager, or be unable to meet its debts as they mature, the Construction Manager may at its option at any time after serving written notice of such default with direction to cure in a specific period, but not less than two (2) working days, and the Contractor fails to cure the default, terminate the Contractor's employment by delivering written notice of termination to the Contractor. Thereafter, the Construction Manager may take possession of the plant and work, materials, tools, appliances and equipment of the Contractor at the building site, and through himself or others provide labor, equipment and materials to prosecute Contractor's Work on such terms and conditions as shall be deemed necessary, and shall deduct the cost thereof, including without restriction thereto all charges, expenses, losses, costs, damages, and attorney's fees, incurred as a result of the Contractor's failure to perform, from any money then due or thereafter to become due to the Contractor under this Agreement. Such charges and expenses shall include the time spent by Construction Manager's administrative personnel including without limitation company executives and Project Managers.

10.3 If the Construction Manager so terminates the employment of the Contractor, the Contractor shall not be entitled to any further payments under this Agreement until Contractor's Work has been completed and accepted by the Owner and Construction Manager with respect thereto and Construction manager has received payment for such Work from Owner. In the event that the cost of completion and other charges provided in paragraph 10.2 above exceed the balance due to the Contractor, the Contractor agrees promptly to pay the difference to the Construction Manager.

10.4 Construction Manager shall have the right to terminate this Contract with no further obligation to Contractor beyond fair compensation for such Contractor's actual services rendered through the date of termination if (a) Contractor files for protection under the federal bankruptcy laws or if any involuntary bankruptcy proceeding is filed against it which is not dismissed within 10 days after filing; (b) Contractor makes a transfer or assignment of its assets for benefits of creditors; (c) the Owner requires Construction Manager to remove Contractor from the Project; or (d) the Owner terminates its contract with the Construction Manager for any reason, with or without cause.

Article 11

CLAIMS

11.1 The Contractor shall make all claims in writing to the Construction Manager not later than the last day of the calendar month following that in which the claim originated.

11.2 All claims, disputes and other matters arising out of, or relating to, this Agreement or the breach thereof where the claimant seeks to recover less than Two Hundred and Fifty Thousand Dollars ($250,000)(not including interest and attorney's fees) shall be decided through arbitration in accordance with the Construction Industry Arbitration Rules of American Arbitration Association then in force, as modified herein, unless the parties mutually agree otherwise. All claims, disputes and other matters where the claimant seeks more than Two Hundred and Fifty Thousand Dollars ($250,000) (not including interest and attorney's fees) arising out of, or relating to, this Agreement or the breach thereof shall be decided through litigation commenced and pursued in the Circuit Court of St. Louis County, Missouri. The prevailing party in any such arbitration or court action shall be entitled to recover its attorneys' fees, expert witness fees, investigation costs and related expenses from the other party.

11.3 Should the Construction Manager enter into arbitration or litigation with the Owner or others regarding disputes arising out of or relating to this Agreement, the Contractor consents to being joined as a party to such arbitration or litigation. Contractor shall be bound by the result of any arbitration or litigation to the same degree as the Construction Manager.

11.4 Contractor represents, warrants, stipulates, and agrees that it is solely and exclusively in charge of and responsible for its own equipment, scaffolds, working structures and machinery, and is solely and exclusively responsible for the maintenance and safe working operations and conditions of said equipment, scaffolds, working structures and machinery. Contractor represents, warrants, stipulates, and agrees that it is solely and exclusively responsible for notifying its employees of the proper and safe utilization of all equipment, scaffolds, working structures and machinery; for notifying its employees of safe operating conditions and procedures, and that Construction Manager does not assume any responsibility for any such equipment, scaffolds, working structures or machinery, or such notification.

11.4.1 Contractor hereby represents, warrants, stipulates, and agrees that any and all equipment, scaffolds, working structures and machinery furnished by Contractor and/or used by Contractor's employees are in compliance with, and at all times will be kept in compliance with, any and all applicable federal, state, and local laws, ordinances, regulations, statutes, codes and safety standards, including, but not limited to, all of the Rules, Regulations and Safety Standards under the Federal Occupational Safety and Health Act and any applicable state Safety and Health Act. Contractor expressly assumes any and all liability for any and all claims or damages resulting from a violation of any such standards.

11.5 Contractor shall indemnify and hold Owner, Construction Manager and their respective officers, directors, shareholders, members, servants, agents, and employees harmless from any and all liability, penalties, demands, claims, causes of action, expenses, suits, damages or injury of any kind (including the cost of defense, settlement, and attorney's fees, expert witness fees, investigation costs and related expenses), which any or all of them may hereafter suffer, incur, be responsible for or pay out as a result of any breach by Contractor of any representation, warranty, stipulation or agreement of Contractor hereunder.

11.6 In any action by any employee of Contractor against Construction Manager or Owner under any state or municipal statute or law, Contractor shall assume the defense of such action, retain counsel of Construction Manager's and Owner's choosing, and pay all of the expenses of such defense, whether or not Contractor is obligated to indemnify Construction Manager or Owner under the provisions of Article 6 hereof.

11.7 The Contractor shall carry on Contractor's Work and maintain its progress during any mediation or litigation .

Article 12

PREVAILING LAW

12.1 This Agreement shall be governed by the laws of the State of Missouri.

Article 13

INVALID PROVISION

13.1 If any provision of this Agreement or the application thereof to any parties hereunder or any other persons shall to any extent be held by a court of competent jurisdiction to be invalid or unenforceable, the remainder of this Agreement or the application of such provision to the parties or such persons or circumstances other than those to which it is held invalid or unenforceable shall not be affected thereby, and each other provision of this Agreement shall be valid and enforceable to the fullest extent permitted by law.

Article 14

DEFINITIONS

14.1 As used throughout this Agreement, the following terms and expressions have the meanings and interpretation set forth below.

- "**Agreement**" and "**Contract**" mean this written Trade Contract executed between Construction Manager and Contractor.
- "**Construction Manager**" means the entity identified as such on the face page of this Agreement.
- "**Contractor**" means the entity identified as such on the face page of this Agreement.
- "**Detail Schedule**" refers to the weekly look-ahead schedule providing greater detail to the work to be performed in the Project Schedule.
- "**Estimate**" refers to the Contractor's estimate of Work completed to date, as submitted monthly to the Construction Manager for review and approval.
- "**Exhibit**" refers to additional requirements as attached to this Agreement.
- "**Final Acceptance**" refers to the Owner's complete and final acceptance of the Project as a whole.
- "**Final Payment**" refers to the payment based on the Contractor's final Estimate, including only the sum of the reserved balance from previous payments.
- "**Owner**" refers to the entity identified as Owner on the face page of this Agreement.
- "**Project Schedule**" means the overall schedule identifying all scopes of work for the entire Project, including the Work provided by Contractor.
- "**Site**", "**Worksite**" and/or "**Jobsite**" refer to Owner's premises.
- "**Contractor**" means the entity identified as such on the face page of this Agreement.
- The "**Work**" shall mean all services, labor, material, equipment and actions necessary for the Contractor's performance of this Agreement. In certain context, the Work may also include the entire completed construction or the various separately identifiable parts thereof required to be performed or furnished in accordance with this Agreement.

THIS AGREEMENT CONTAINS A BINDING ARBITRATION CLAUSE WHICH MAY BE ENFORCED BY THE PARTIES.

[SIGNATURES APPEAR ON NEXT PAGE]

IN WITNESS WHEREOF the parties hereto have executed this Agreement the day and year first above written.

«CONTRACTOR_NAME»

By_____ Date_____

*Printed Name:*_____

*Title:*_____

POETTKER CONSTRUCTION COMPANY,
CONSTRUCTION MANAGER, AS ASSIGNEE OF THE OWNER

By_____ Date_____

*Printed Name:*_____

*Title:*_____

PARKWAY SCHOOL DISTRICT,
OWNER

By_____ Date_____

*Printed Name:*_____

*Title:*_____

SECTION 006000
PROJECT FORMS

PART 1 GENERAL

1.01 PROJECT FORMS

A. The Forms to be executed that are referenced in Section 005000 - Contracting Forms and Supplements and in the various sections of this Project Manual are attached at the end of this document.

B. The forms attached are as follows:
   1. Contractor's Qualification Statement: AIA A305
   2. Bid Bond: AIA A310
   3. Performance and Payment Bond: AIA A312
   4. Owner's Standard Schedule of Values Form
   5. Owner's Standard Application for Payment Form
   6. Substance Abuse and Safety Program Supplier/Vendor/Visitor Acknowledgement Form
   7. OSHA 10-Hour Construction Safety And Health Training Log Form
   8. Affidavit of Compliance With the Prevailing Wage Law
   9. Affidavit of Record Document Completion
   10. Asbestos and Lead Based Paint Notification to Contractors
   11. Notification of Asbestos and Lead Based Paint Containing Materials Contractor Acknowlegment
   12. Certificate of Visual Inspection
   13. Certificate of Insurance Form and minimum coverages.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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Contractor's Qualification Statement

THE PARTIES SHOULD EXECUTE A SEPARATE CONFIDENTIALITY AGREEMENT IF THEY INTEND FOR ANY OF THE INFORMATION IN THIS A305-2020 TO BE HELD CONFIDENTIAL.

SUBMITTED BY:
(Organization name and address.)

SUBMITTED TO:
(Organization name and address.)

TYPE OF WORK TYPICALLY PERFORMED
(Indicate the type of work your organization typically performs, such as general contracting, construction manager as constructor services, HVAC contracting, electrical contracting, plumbing contracting, or other.)

THIS CONTRACTOR'S QUALIFICATION STATEMENT INCLUDES THE FOLLOWING:
(Check all that apply.)

- [X] Exhibit A – General Information
- [X] Exhibit B – Financial and Performance Information
- [X] Exhibit C – Project-Specific Information
- [X] Exhibit D – Past Project Experience
- [ ] Exhibit E – Past Project Experience (Continued)

CONTRACTOR CERTIFICATION
The undersigned certifies under oath that the information provided in this Contractor's Qualification Statement is true and sufficiently complete so as not to be misleading.

_____ _____
Organization's Authorized Representative Signature **Date**

_____
Printed Name and Title

NOTARY
State of:
County of:
Signed and sworn to before me this day of

_____
Notary Signature

My commission expires:

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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AIA® Document A305® – 2020 Exhibit A

General Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by and dated the day of in the year
(In words, indicate day, month and year.)

§ A.1 ORGANIZATION
§ A.1.1 Name and Location
§ A.1.1.1 Identify the full legal name of your organization.

§ A.1.1.2 List all other names under which your organization currently does business and, for each name, identify jurisdictions in which it is registered to do business under that trade name.

§ A.1.1.3 List all prior names under which your organization has operated and, for each name, indicate the date range and jurisdiction in which it was used.

§ A.1.1.4 Identify the address of your organization's principal place of business and list all office locations out of which your organization conducts business. If your organization has multiple offices, you may attach an exhibit or refer to a website.

§ A.1.2 Legal Status
§ A.1.2.1 Identify the legal status under which your organization does business, such as sole proprietorship, partnership, corporation, limited liability corporation, joint venture, or other.

.1 If your organization is a corporation, identify the state in which it is incorporated, the date of incorporation, and its four highest-ranking corporate officers and their titles, as applicable.

.2 If your organization is a partnership, identify its partners and its date of organization.

.3 If your organization is individually owned, identify its owner and date of organization.

ADDITIONS AND DELETIONS:
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.4 If the form of your organization is other than those listed above, describe it and identify its individual leaders:

§ A.1.2.2 Does your organization own, in whole or in part, any other construction-related businesses? If so, identify and describe those businesses and specify percentage of ownership.

§ A.1.3 Other Information

§ A.1.3.1 How many years has your organization been in business?

§ A.1.3.2 How many full-time employees work for your organization?

§ A.1.3.3 List your North American Industry Classification System (NAICS) codes and titles. Specify which is your primary NAICS code.

§ A.1.3.4 Indicate whether your organization is certified as a governmentally recognized special business class, such as a minority business enterprise, woman business enterprise, service disabled veteran owned small business, woman owned small business, small business in a HUBZone, or a small disadvantaged business in the 8(a) Business Development Program. For each, identify the certifying authority and indicate jurisdictions to which such certification applies.

§ A.2 EXPERIENCE

§ A.2.1 Complete Exhibit D to describe up to four projects, either completed or in progress, that are representative of your organization's experience and capabilities.

§ A.2.2 State your organization's total dollar value of work currently under contract.

§ A.2.3 Of the amount stated in Section A.2.2, state the dollar value of work that remains to be completed:

§ A.2.4 State your organization's average annual dollar value of construction work performed during the last five years.

§ A.3 CAPABILITIES

§ A.3.1 List the categories of work that your organization typically self-performs.

§ A.3.2 Identify qualities, accreditations, services, skills, or personnel that you believe differentiate your organization from others.

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§ A.3.3 Does your organization provide design collaboration or pre-construction services? If so, describe those services.

§ A.3.4 Does your organization use building information modeling (BIM)? If so, describe how your organization uses BIM and identify BIM software that your organization regularly uses.

§ A.3.5 Does your organization use a project management information system? If so, identify that system.

§ A.4 REFERENCES

§ A.4.1 Identify three client references:
(Insert name, organization, and contact information)

§ A.4.2 Identify three architect references:
(Insert name, organization, and contact information)

§ A.4.3 Identify one bank reference:
(Insert name, organization, and contact information)

§ A.4.4 Identify three subcontractor or other trade references:
(Insert name, organization, and contact information)

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AIA® Document A305® – 2020 Exhibit B

Financial and Performance Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by and dated the day of in the year
(In words, indicate day, month and year.)

ADDITIONS AND DELETIONS:
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§ B.1 FINANCIAL

§ B.1.1 Federal tax identification number:

§ B.1.2 Attach financial statements for the last three years prepared in accordance with Generally Accepted Accounting Principles, including your organization's latest balance sheet and income statement. Also, indicate the name and contact information of the firm that prepared each financial statement.

§ B.1.3 Has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, been the subject of any bankruptcy proceeding within the last ten years?

§ B.1.4 Identify your organization's preferred credit rating agency and identification information.
(Identify rating agency, such as Dun and Bradstreet or Equifax, and insert your organization's identification number or other method of searching your organization's credit rating with such agency.)

§ B.2 DISPUTES AND DISCIPLINARY ACTIONS

§ B.2.1 Are there any pending or outstanding judgments, arbitration proceedings, bond claims, or lawsuits against your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, or any of the individuals listed in Exhibit A, Section 1.2, in which the amount in dispute is more than $75,000?
(If the answer is yes, provide an explanation.)

§ B.2.2 In the last five years has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management:
(If the answer to any of the questions below is yes, provide an explanation.)

.1 failed to complete work awarded to it?

.2 been terminated for any reason except for an owners' convenience?

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.3 had any judgments, settlements, or awards pertaining to a construction project in which your organization was responsible for more than $75,000?

.4 filed any lawsuits or requested arbitration regarding a construction project?

§ B.2.3 In the last five years, has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management; or any of the individuals listed in Exhibit A Section 1.2:
(If the answer to any of the questions below is yes, provide an explanation.)

.1 been convicted of, or indicted for, a business-related crime?

.2 had any business or professional license subjected to disciplinary action?

.3 been penalized or fined by a state or federal environmental agency?

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AIA® Document A305® – 2020 Exhibit C

Project Specific Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by and dated the day of in the year
(In words, indicate day, month and year.)

PROJECT:
(Name and location or address.)

062501B - Building Renovations & Site Improvements
Ross Elementary School
Bid No. 27-26

CONTRACTOR'S PROJECT OFFICE:
(Identify the office out of which the contractor proposes to perform the work for the Project.)

TYPE OF WORK SOUGHT
(Indicate the type of work you are seeking for this Project, such as general contracting, construction manager as constructor, design-build, HVAC subcontracting, electrical subcontracting, plumbing subcontracting, etc.)

CONFLICT OF INTEREST
Describe any conflict of interest your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, or any of the individuals listed in Exhibit A Section 1.2, may have regarding this Project.

§ C.1 PERFORMANCE OF THE WORK
§ C.1.1 When was the Contractor's Project Office established?

§ C.1.2 How many full-time field and office staff are respectively employed at the Contractor's Project Office?

§ C.1.3 List the business license and contractor license or registration numbers for the Contractor's Project Office that pertain to the Project.

§ C.1.4 Identify key personnel from your organization who will be meaningfully involved with work on this Project and indicate (1) their position on the Project team, (2) their office location, (3) their expertise and experience, and (4) projects similar to the Project on which they have worked.

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§ C.1.5 Identify portions of work that you intend to self-perform on this Project.

§ C.1.6 To the extent known, list the subcontractors you intend to use for major portions of work on the Project.

§ C.2 EXPERIENCE RELATED TO THE PROJECT

§ C.2.1 Complete Exhibit D to describe up to four projects performed by the Contractor's Project Office, either completed or in progress, that are relevant to this Project, such as projects in a similar geographic area or of similar project type. If you have already completed Exhibit D, but want to provide further examples of projects that are relevant to this Project, you may complete Exhibit E.

§ C.2.2 State the total dollar value of work currently under contract at the Contractor's Project Office:

§ C.2.3 Of the amount stated in Section C.2.2, state the dollar value of work that remains to be completed:

§ C.2.4 State the average annual dollar value of construction work performed by the Contractor's Project Office during the last five years.

§ C.2.5 List the total number of projects the Contractor's Project Office has completed in the last five years and state the dollar value of the largest contract the Contractor's Project Office has completed during that time.

§ C.3 SAFETY PROGRAM AND RECORD

§ C.3.1 Does the Contractor's Project Office have a written safety program?

§ C.3.2 List all safety-related citations and penalties the Contractor's Project Office has received in the last three years.

§ C.3.3 Attach the Contractor's Project Office's OSHA 300a Summary of Work-Related Injuries and Illnesses form for the last three years.

§ C.3.4 Attach a copy of your insurance agent's verification letter for your organization's current workers' compensation experience modification rate and rates for the last three years.

§ C.4 INSURANCE

§ C.4.1 Attach current certificates of insurance for your commercial general liability policy, umbrella insurance policy, and professional liability insurance policy, if any. Identify deductibles or self-insured retentions for your commercial general liability policy.

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§ C.4.2 If requested, will your organization be able to provide property insurance for the Project written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis?

§ C.4.3 Does your commercial general liability policy contain any exclusions or restrictions of coverage that are prohibited in AIA Document A101-2017, Exhibit A, Insurance A.3.2.2.2? If so, identify.

§ C.5 SURETY

§ C.5.1 If requested, will your organization be able to provide a performance and payment bond for this Project?

§ C.5.2 Surety company name:

§ C.5.3 Surety agent name and contact information:

§ C.5.4 Total bonding capacity:

§ C.5.5 Available bonding capacity as of the date of this qualification statement:

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AIA® Document A305® – 2020 Exhibit D

Contractor's Past Project Experience

	1	2	3	4
PROJECT NAME				
PROJECT LOCATION				
PROJECT TYPE				
OWNER				
ARCHITECT				
CONTRACTOR'S PROJECT EXECUTIVE				
KEY PERSONNEL (include titles)				
PROJECT DETAILS	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work
PROJECT DELIVERY METHOD	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:
SUSTAINABILITY CERTIFICATIONS				

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AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)
Parkway School District
455 North Woods Mill Road
Chesterfield, Missouri 63017
Telephone Number: 314-415-8100

BOND AMOUNT: $

PROJECT:
(Name, location or address, and Project number, if any)
062501B - Building Renovations & Site Improvements
Ross Elementary School
1150 Ross Road
St. Louis, Missouri 63146
Bid No. 27-26

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such

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User Notes: (1817262403)

statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this day of ,

	(Contractor as Principal) *(Seal)*
(Witness)	*(Title)*
	(Surety) *(Seal)*
(Witness)	*(Title)*

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AIA® Document A312® – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)
Obligee 1:
Parkway School District
455 North Woods Mill Road
Chesterfield, Missouri 63017

Obligee 2:
Poettker Construction Company
(Construction Manager: As Assignee of Owner)
400 South Germantown Road
Breese, Illinois 62230

CONSTRUCTION CONTRACT
Date:
Amount: $ 0.00
Description:
(Name and location)
062501B – Building Renovations and Site Improvements
Ross Elementary School
1150 Ross Road
St. Louis, Missouri 63146
Bid No. 26-27

BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: ☐ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	

(Any additional signatures appear on the last page of this Performance Bond.)

ADDITIONS AND DELETIONS:
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This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

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User Notes: (1815638137)

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

.1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

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§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and

.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

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§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:	_____	Signature:	_____
Name and Title:		Name and Title:	
Address:		Address:	

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User Notes: (1815638137)

AIA® Document A312® – 2010

Payment Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)
Obligee 1:
Parkway School District
455 North Woods Mill Road
Chesterfield, Missouri 63017

Obligee 2:
Poettker Construction Company
(Construction Manager: As Assignee of Owner)
400 South Germantown Road
Breese, Illinois 62230

CONSTRUCTION CONTRACT
Date:
Amount: $ 0.00
Description:
(Name and location)
062501B - Building Renovations & Site Improvements
Ross Elementary School
1150 Ross Road
St. Louis, Missouri 63146
Bid No. 26-27

BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: ☐ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL
Company: *(Corporate Seal)*

Signature: _____
Name and Title:

SURETY
Company: *(Corporate Seal)*

Signature: _____
Name and Title:

(Any additional signatures appear on the last page of this Payment Bond.)

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

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User Notes: (1651601519)

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

.2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

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User Notes: (1651601519)

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- **.1** the name of the Claimant;
- **.2** the name of the person for whom the labor was done, or materials or equipment furnished;
- **.3** a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- **.4** a brief description of the labor, materials or equipment furnished;
- **.5** the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- **.6** the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- **.7** the total amount of previous payments received by the Claimant; and
- **.8** the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

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User Notes: (1651601519)

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:	_____	Signature:	_____
Name and Title:		Name and Title:	
Address:		Address:	

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User Notes: (1651601519)

SCHEDULE OF VALUES - CONTINUATION SHEET

PAGE NO: 1 TO:

FROM: 0
0
0

APPLICATION NUMBER: 0

PERIOD TO: 1/0/1900

PROJECT NO.: 0

CONTRACT NO.: 0

PROJECT NAME: 0

CONTRACT FOR: 0

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED			TOTAL COMPLETE AND STORED TO DATE (D+E+F)	% GC	BALANCE TO FINISH (C-G)	RETAINAGE 5%
			PREVIOUS APPLICATIONS	THIS APPLICATION					
				WORK IN PLACE	STORED MATERIALS				
001	Project Closeouts	-				-	#DIV/0!	-	-
						-	#DIV/0!	-	-
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Contract Totals or Page 1 Total		$ -	$ -	$ -	$ -	$ -	#DIV/0!	$ -	$ -

Application and Certificate for Payment

TO: Poettker Construction Company	PROJECT NO.:		APPLICATION NO:
400 S Germantown Rd.	PROJECT NAME:		
Breese, IL 62230			PERIOD TO:
FROM:	ARCHITECT:		CONTRACT FOR:
			CONTRACT DATE:
			CONTRACT NO.:

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.

Schedule of Values - Continuation Sheet is attached.

1. Original Contract Sum		
2. Net Change by Change Order	$	-
3. Contract Sum to Date (Line 1 & 2)	$	-
4. Total Completed & Stored to Date (Column G on SOV)	$	-
5. Retainage		
a. 5 % of Completed Work (Column D + Column E on SOV)	$ -	
b. 5 % of Stored Material (Column F on SOV)	$ -	
Total Retainage (Lines 5a + 5b or Total in Column I of SOV)	$	-
6. Total Earned Less Retainage (Line 4 Less Line 5 Total)	$	-
7. Less Previous Certificates for Payment (Line 6 from prior certificates)	$	-
8. Current Payment Due	$	-
9. Balance to Finish, Including Retainage (Line 3 less Line 6)	$	-

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work coverd by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certifictes for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of

County

Subscribed and sworn to before me this day of

Notary Public _____

My Commission expires:

CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on evaluations of the Work and the data comprising this application, the Construction Manager and Architect certify to the Owner that to the best of the thier knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED . . . . . .

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and in the Schedule of Values - Continuation Sheet that are changed to conform with the amount certified.)

CONSTRUCTION MANAGER

By: _____ Date:

ARCHITECT

By: _____ Date:

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only ot the Contrator named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$0.00	$0.00
Total approved this month	$0.00	$0.00
TOTALS:	$0.00	$0.00
NET CHANGES BY CHANGE ORDER:	**$0.00**	

Substance Abuse and Safety Program
Supplier/Vendor/Visitor Acknowledgement

I,_____, acknowledge and understand that a Substance Abuse and Safety Program is in effect on this job site and that I will be expected to abide by these job site rules.

I agree not to use, possess, sell or distribute alcoholic beverages, drugs, or drug paraphernalia, drug look-alikes, firearms, weapons, explosives, ammunition, or other prohibited items on this job site. I understand that violations will result in expulsion from this job site.

I understand my involvement in an accident or other circumstances may cause the Owner, Contractor or Subcontractor to require me to have urine, blood, or saliva drug and/or alcohol test as called for in the Program. While my cooperation is voluntary, I understand that failure to cooperate will result in expulsion from this job site. This document does not supersede other job site rules, but is in addition to them.

ACKNOWLEDGEMENT AND ACCEPTANCE:

Signature _____ Date_____

Print Name _____

Company _____

SECURITY BADGE & OSHA 10 HOUR CONSTRUCTION SAFETY & HEALTH TRAINING LOG

Parkway Project Number _____

The undersigned certify that they have obtained a security badge from the Owner's security office and that they have successfully completed the OSHA 10 Hour Safety Training program pursuant to Section 292.675 RSMo and understand that they shall carry the issued security badge and documentation of successful completion of the OSHA 10 Hour Safety Training program at all times while working on the Project site.

Print Name	Signature	First Date On Site	Company	Owner's Security Badge Number	OSHA 10 Hour Training Certification Number

DIVISION OF LABOR STANDARDS

MISSOURI DEPARTMENT OF LABOR AND INDUSTRIAL RELATIONS

AFFIDAVIT
COMPLIANCE WITH THE PREVAILING WAGE LAW

I, _____, upon being duly sworn upon my oath state that: (1) I am the
(Name)

_____ of _____; (2) all requirements of
(Title) *(Name of Company)*

§§ 290.210 to 290.340, RSMo, pertaining to the payment of wages to workers employed on public works projects have been fully satisfied with regard to this company's work on _____;
(Name of Project)

(3) I have reviewed and am familiar with the prevailing wage rules in 8 CSR 30-3.010 to 8 CSR 30-3.060; (4) based upon my knowledge of these rules, including the occupational titles set out in 8 CSR 30-3.060, I have completed full and accurate records clearly indicating (a) the names, occupations, and crafts of every worker employed by this company in connection with this project together with an accurate record of the number of hours worked by each worker and the actual wages paid for each class or type of work performed, (b) the payroll deductions that have been made for each worker, and (c) the amounts paid to provide fringe benefits, if any, for each worker; (5) the amounts paid to provide fringe benefits, if any, were irrevocably made to a fund, plan, or program on behalf of the workers; (6) these payroll records are kept and have been provided for inspection to the authorized representative of the contracting public body and will be available, as often as may be necessary, to such body and the Missouri Department of Labor and Industrial Relations; (7) such records shall not be destroyed or removed from the state for one year following the completion of this company's work on this project; and (8) there has been no exception to the full and complete compliance with the provisions and requirements of Annual Wage Order No. _____ Section _____ issued by the Missouri Division of Labor Standards and applicable to this project located in _____ County, Missouri, and completed on the ____ day of _____, _____.

The matters stated herein are true to the best of my information, knowledge, and belief. I acknowledge that the falsification of any information set out above may subject me to criminal prosecution pursuant to §§290.340, 570.090, 575.040, 575.050, or 575.060, RSMo.

_____
Signature

Subscribed and sworn to me this ____ day of _____, _____.

My commission expires _____, _____.

_____
Notary Public

_____
Receipt by Authorized Public Representative

Missouri Department of Labor and Industrial Relations is an equal opportunity employer/program.

AFFIDAVIT
RECORD DOCUMENT COMPLETION

Before me, the undersigned Notary Public, in and for the County of _____, in the State of _____, personally came and appeared (Name), _____-(Title)_____ of the (Name of Company)_____ (a corporation)(a partnership)(a proprietorship) and after being duly sworn did depose and say that the Record (Drawings)(Specifications) have been marked-up in the Owner's electronic document management system with all known as-constructed variations from the Bid Documents, with the exception of those variations officially issued in the form of sketches, drawings, or specification changes by the Architect and Owner through Supplemental Instructions, Change Directives, or Change Orders, which variations have been completed by the Architect in the performance of their contractual services to the Owner, as required in the Specifications for the Project known as:

(Owner's Project Number)_____

(Project Title)_____

(Project Facility Name)_____

Signature: _____ Date: _____

Subscribed and sworn to me this _____ day of _____ , _____

My commission expires _____ , _____

Notary seal and signature:

ASBESTOS AND LEAD BASED PAINT
NOTIFICATION TO CONTRACTORS
At
Parkway School District
Building: *#*, *Name of Building/School*
Address of Building/School
Address of Building
Date

Contact Name
Name of Contractor
Address
Address

Dear *Contact Name*:

As a contractor for the Parkway School District (PSD), your employees and subcontractors have access to and will be working in the PSD building (*School Name*) All PSD buildings, except for Early Childhood North, Southwest Middle and Oakbrook Elementary contain some amount of asbestos containing building materials. All Parkway School District Buildings built in or previous to 1978 were tested for the presence of lead based paint. In compliance with U.S. Environmental Protection Agency asbestos notification requirements (40 CFR 763.84), and the Lead Renovation Repair and Painting Rule (40 CFR 745) the PSD is submitting this notification package to *Name of Contractor*. Attached is the *Name of Building/School* asbestos and lead based paint information package for you to review with your employees and subcontractors prior to beginning work in *Name of Building/School*. The asbestos materials identified in this notification are for interior building materials only. Exterior and inaccessible building materials may not have been sampled or identified as asbestos or lead containing. Should exterior or hidden suspect building materials be encountered, work in this area should not begin until additional sampling and materials identification is performed by PSD. This package includes asbestos and lead based paint summary sheet(s) for *Name of Building/School* and the Contractor Notification Signature Sheet that must be signed by all *Name of Contractor* personnel and subcontractor personnel that will be working at *Name of Building/School*. Each employee must sign the signature sheet to be able to conduct work in the buildings. Employees are required to sign signature sheet only one time.

Asbestos & Lead Based Paint Notification
Name of Contractor
Name of Building/School
Date

Asbestos and lead based paint materials denoted on the asbestos and lead based paint summaries are not to be disturbed. Only Certified Lead Renovators can perform work with lead based paint using approved renovation, repair and painting practices. If your employees should discover any disturbed asbestos containing materials or lead based paint; or if they disturb these materials while they are in the building; all work must stop and *Name of Contractor* must notify me (573-201-5067) immediately. Additional notification must be made to the district construction supervisor or maintenance supervisor that manages the project. If your employees discover a material that they are unsure of its asbestos or lead based paint content, they must not disturb it without authorization form PSD.

Original signed signature sheets must be submitted to the District Construction Supervisor on a weekly basis. Copies of the signature sheet may be made as needed for each successive week. A copy of the signature sheet and the asbestos and lead based paint material summaries must be available on site during any work within a specific building so that *Name of Contractor* employees, subcontractor employees, and PSD can review them at any time. PSD reserves the right to review these documents when *Name of Contractor* employees or subcontractors are working in a building. If these documents are not available, or *Name of Contractor* personnel working in the building have not signed the signature sheet, PSD can stop work until the required documents and signatures are available. If you have any questions concerning the asbestos and lead based paint summary sheets or the contractor notification signature sheets that we have included in this package please call me at 314-415-8260.

Stephanie Kline-Tissi, ASP
Safety Manager, District Operations
Parkway School District
Phone: 314-415-8260
24-Hour Emergency Number: 314-415-8200

CONTRACTOR NOTIFICATION OF ASBESTOS AND LEAD BASED PAINT CONTAINING BUILDING MATERIALS

Retain Copy in Asbestos Files

Month Ending Date: _____

Company Name: _____*Name of Contractor*_____.

Parkway Building: _____*Name of Building/School*_____

Name & Title of
Company Representative: _____*Name of Contact*_____

Type of Work to be Performed: *Type of Work to be Performed* Bid No. *Project #*

I have reviewed the Asbestos information for *Name of Building/School* and have been advised of the types and locations of asbestos materials that I may potentially come into contact with while performing my work. I have been given the opportunity to review the Asbestos Management Plan for this facility, if requested. I will perform my work without disturbing the asbestos containing materials or will inform the Construction Supervisor and the Asbestos Program Manager if unable to do so. In such case, the Asbestos Program Manager will give instructions as required prior to any work that may potentially disturb asbestos-containing materials. If asbestos-containing materials are inadvertently disturbed or if disturbed materials are discovered, work will cease immediately, and the Construction Supervisor and Safety Manager, Stephanie Kline-Tissi (573-201-5067) will be contacted. The Construction or Maintenance Supervisor managing the project will also be contacted if the Parkway supervisor is not available.

COMPANY NAME	**PRINTED NAME & SIGNATURE**	**DATE**
_____	_____	_____
	_____	
_____	_____	_____
	_____	

Asbestos & Lead Based Paint Notification
Name of Contractor
Name of Building/School
Date

COMPANY NAME	PRINTED NAME & SIGNATURE	DATE

CERTIFICATION OF VISUAL INSPECTION

Project Number: _____ Project Name: _____

Building Name: _____

Building Owner: _____

Specific Area: _____

In accordance with customary work practices, the Contractor hereby certifies that he has visually inspected the work area (all surfaces including pipes, beams, ledges, walls, ceiling and floor, decontamination unit, sheet plastic, etc.) and has found no dust, debris, or residue.

By: (Signature) _____ Date: _____

(Print Name) _____ Title: _____

Company Name: _____

OWNER REPRESENTATIVE'S COMPLETION OF VISUAL INSPECTION __ Pass __Fail

The Owner's Representative has performed a visual inspection in accordance with ASTM E1368-14 and hereby verifies that he has visually inspected the work area (all surfaces including pipes, beams, ledges, walls, ceiling and floor, decontamination unit, sheet plastic, etc.) and has found no dust, debris, or residue.

___ The contractor will apply a lock down encapsulant and clearance will be ran when dry

___ Lockdown encapsulation is not being applied - clearances to be ran now

Clearance sampling to be performed: __ Visual Inspection Only __ In-Progress __ TEM __ PCM-5 __ PCM-2

Comments: _____

_____

_____

By: (Signature) _____ Date: _____

(Print Name) _____ Time: _____

Client#: 10295 POETTKER

ACORD™ CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:	
Insurance Agent's Name Insurance Agent's Mailing Address Insurance Agent's City, State & Zip	PHONE (A/C, No, Ext):	FAX (A/C, No):
	E-MAIL ADDRESS:	
	PRODUCER CUSTOMER ID #:	

INSURED	INSURER(S) AFFORDING COVERAGE	NAIC #
Subcontractor's Name Subcontractor's Address Subcontractor's City, State, Zip	INSURER A : Insurance Company Name	
	INSURER B :	
	INSURER C :	
	INSURER D :	
	INSURER E :	
	INSURER F :	

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	**GENERAL LIABILITY**			**Policy Number**	**Eff Date**	**Exp Date**	EACH OCCURRENCE	$**1,000,000**
	X COMMERCIAL GENERAL LIABILITY						DAMAGE TO RENTED PREMISES (Ea occurrence)	$**50,000**
	CLAIMS-MADE X OCCUR						MED EXP (Any one person)	$**5,000**
							PERSONAL & ADV INJURY	$**1,000,000**
							GENERAL AGGREGATE	$**2,000,000**
	GEN'L AGGREGATE LIMIT APPLIES PER:						PRODUCTS - COMP/OP AGG	$**2,000,000**
	POLICY X PRO-JECT LOC							$
A	**AUTOMOBILE LIABILITY**			**Policy Number**	**Eff Date**	**Exp Date**	COMBINED SINGLE LIMIT (Ea accident)	$ **1,000,000**
	X ANY AUTO						BODILY INJURY (Per person)	$
	ALL OWNED AUTOS						BODILY INJURY (Per accident)	$
	SCHEDULED AUTOS						PROPERTY DAMAGE (Per accident)	$
	X HIRED AUTOS							$
	X NON-OWNED AUTOS							$
A	X **UMBRELLA LIAB** X OCCUR			**Policy Number**	**Eff Date**	**Exp Date**	EACH OCCURRENCE	$**2,000,000**
	EXCESS LIAB CLAIMS-MADE						AGGREGATE	$**2,000,000**
	DEDUCTIBLE							$
	RETENTION $							$
A	**WORKERS COMPENSATION AND EMPLOYERS' LIABILITY** Y / N			**Policy Number**	**Eff Date**	**Exp Date**	X WC STATU-TORY LIMITS OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? N **(Mandatory in NH)**	N/A					E.L. EACH ACCIDENT	$**1,000,000**
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$**1,000,000**
							E.L. DISEASE - POLICY LIMIT	$**1,000,000**

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

RE:

Poettker Construction Company, owner and architect/engineer are added as additional insureds on a primary
(See Attached Descriptions)

CERTIFICATE HOLDER

Poettker Construction Company
400 South Germantown Road
Breese, IL 62230

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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DESCRIPTIONS (Continued from Page 1)

and non-contributory basis including completed operations, under all policies listed above except Workers Compensation and Employers Liability. A waiver of subrogation applies in favor of Poettker Construction Company, owner and architect/engineer under all policies listed above where permitted by law.

SECTION 007200
GENERAL CONDITIONS

PART 1 GENERAL

1.01 FORM OF GENERAL CONDITIONS

A. The General Conditions applicable to this contract is attached at the end of this document.

1.02 RELATED DOCUMENTS

A. Document 005200 - Agreement Form.

B. Section 014216 - Definitions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

062501B - Building Renovations & Site Improvements
Ross Elementary School
1150 Ross Road
St. Louis, Missouri 63146
Bid No. 27-26

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

Bond Architects
222 S. Central Avenue; Suite 501
St. Louis, Missouri 63105
Telephone Number: 314-863-4994

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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3 CONTRACTOR

4 ARCHITECT

5 SUBCONTRACTORS

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7 CHANGES IN THE WORK

8 TIME

9 PAYMENTS AND COMPLETION

10 PROTECTION OF PERSONS AND PROPERTY

11 INSURANCE AND BONDS

12 UNCOVERING AND CORRECTION OF WORK

13 MISCELLANEOUS PROVISIONS

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14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

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User Notes: (1933796691)

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(Topics and numbers in bold are Section headings.)

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, ***expertise,*** and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect***,*** the Architect's consultants***, and any other design professionals retained by the Owner for the Project*** under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 ***and certify termination of the Agreement under Section 14.2.2.***

§ 1.1.9 Hazardous Materials

Hazardous Materials are those materials or substances regulated as a hazardous substance, hazardous material, toxin, pollutant, or hazardous waste under applicable federal, state, or local laws, ordinances, rules, or regulations governing the protection of human health or the environment.

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§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect**,** the Architect's consultants***, and any other design professionals retained by the Owner for the Project*** shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by ***certified or registered*** mail, by courier ***providing proof of delivery***, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by ***electronic transmission to the centralized electronic document management system***.

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§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Not used.**§ 2.2.2** Not used.**§ 2.2.3** Not used.**§ 2.2.4** Not used.

(Paragraphs deleted)

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site ***upon Contractor's written request for such information***. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but ***only after the Contractor diligently reviews such surveys and notifies the Owner of any discrepancies or problems observed by the Contractor. The Contractor*** shall exercise proper precautions relating to the safe performance of the Work ***when relying upon Owner supplied surveys***.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services ***reasonably necessary which are*** under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

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§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish ***free of charge*** to the Contractor ***up to twenty (20) copies*** of the Contract Documents. ***Additional copies will be furnished upon request by the Contractor at the cost of reproduction, postage, and handling.***

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is ***defective or otherwise*** not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents ***or fails to supply sufficient skilled labor, suitable materials, or appropriate equipment***, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior ***written*** approval of the Architect. ***In such case, an appropriate Change Order shall be issued*** to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity ***lawfully licensed or registered as a Contractor in St. Louis County, Missouri and the State of Missouri and*** identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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§ 3.2.2.1 In all cases where the Work abuts or interconnects with existing or other work, Contractor shall verify at the site all grades, elevations, locations, or dimensions relating to such existing or other work. Any errors in the Work due to Contractor's failure to verify all such grades, elevations, locations, or dimensions shall be promptly rectified at Contractor's sole cost, without any additional cost to the Owner.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The ***Owner and*** Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the ***Owner or*** Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

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§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the ***Owner or*** Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

§ 3.6.1 The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.6.2 As set forth in 144.030RSMo and 144.062RSMo, Contractors who purchase materials and/or supplies for the purpose of construction, repairing, or remodeling facilities for the Owner are exempt from paying sales tax on those materials and/or supplies. The official state tax exemption certificate will be furnished to the Contractor by the Owner.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 ***The Owner shall secure and pay the building permit from St. Louis County, Missouri or the local municipality, whichever has jurisdiction, the building permit from the local Fire District, and the permit and connection fees required by the Metropolitan St. Louis Sewer District, as applicable. The Contractor will be required to pick up the permits from the government agencies. The Contractor will be reimbursed by the Owner for the actual direct cost of these permits without any additional costs except for a reasonable amount of project management time required to pick up the permits. The*** Contractor shall secure and pay for ***any*** other permits, fees, licenses, and inspections by government agencies necessary for proper execution, completion***, and occupancy*** of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than ***7*** days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. ***The Contractor's failure to advise the Owner and the Architect of such concealed conditions within 7 days of discovery by the Contractor or any party claiming under the Contractor shall preclude the Contractor's right to seek costs related to such conditions.*** If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

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§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the ***Owner*** may notify the Contractor, stating whether the Owner (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the ***Owner*** to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the ***Owner's*** approval. The ***Owner's*** approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect ***and the Owner*** reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

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§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.10.4 Whenever it becomes apparent from the latest schedule or otherwise that any completion date on the original schedule, subject to adjustment as provided under the Contract Documents, may not be met, the Contractor shall take some or all of the following actions at no additional cost to the Owner to put the Project back on schedule: (1) increase construction manpower in such quantities as will eliminate the backlog of work; (2) increase the number of working hours per shift, shifts per working day, working days per week, or the amount of construction equipment, or a combination of the aforesaid, which will substantially eliminate the backlog of work; (3) reschedule activities to achieve maximum practical accomplishment of activities. If the Contractor fails to take any of the above within seventy-two (72) hours after receiving written notice from the Owner or Architect of the slip in schedule, the Owner may, but shall not be obligated, to take action to attempt to put the Project back on the original schedule, subject to the adjustments permitted hereunder, and deduct the cost of such actions from the Contract Sum.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, ***illustrations,*** diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect ***and the Owner*** is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect ***and the Owner are*** not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect ***and the Owner*** without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect ***and the Owner***, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the ***Owner*** or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect ***and the Owner***.

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§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's ***and the Owner's*** approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect ***and the Owner*** of such deviation at the time of submittal and (1) the Architect ***and the Owner have*** given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's ***and the Owner's*** approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect ***and the Owner*** on previous submittals. In the absence of such notice, the Architect's ***and the Owner's*** approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. ***Such design professionals shall obtain and maintain through their provisions of Work under this Agreement, professional errors and omissions liability insurance in the amount of two million dollars ($2,000,000) per claim and three million dollars ($3,000,000) in the aggregate.*** Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect ***and the Owner*** will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect ***and the Owner*** at the time and in the form specified by the Architect ***and the Owner***.

§ 3.13 Use of Site

The Contractor shall confine operations ***and the storage of materials and equipment*** at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The

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Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall ***continuously*** keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located. ***Other representatives of the Owner, such as testing agencies and governmental agencies shall have access to the project at reasonable times for their observation, inspection, and testing. The Contractor will provide proper and safe conditions for such access.***

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify***, defend with legal counsel acceptable to the Owner,*** and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to ***personal injury,*** bodily injury, sickness, disease or death, ***the Contractor's failure to make payment to any subcontractor or supplier in connection with the Work,*** or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

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§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the ***Owner approves*** the final ***Application*** for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall ***endeavor to*** include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. ***If the Owner is unable to include the Architect in a communication with the Contractor, the*** Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor ***relating to the Architect's services or professional responsibilities or*** otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect ***unless the Architect authorizes direct communication with the Architect's consultants. If authorized by the Architect, the Owner or Contractor shall promptly notify the Architect of the substance of any direct communications between the Owner or Contractor and the Architect's consultants***. Communications by and with Subcontractors and suppliers shall be through the Contractor ***unless the Contractor authorizes direct communication with the Contractor's Subcontractors and suppliers. If authorized by the Contractor, the Owner or Architect shall promptly notify the Contractor of the substance of any direct communications between the Owner or Architect and the Contractor's Subcontractors and suppliers***. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Not used***.***

§ 4.2.6 The Architect***, in consultation with the Owner,*** has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect***, in consultation with the Owner,*** will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the ***Owner*** or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety

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precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will ***assist the Owner in preparing*** Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions***, made with the concurrence of the Owner,*** on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the ***Owner*** may notify the Contractor whether the Owner (1) has objection to any such proposed person or entity or (2) requires additional time for review. Failure of the ***Owner*** to provide notice within the 14-day period shall constitute notice of no objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner has made objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner has no objection. If the proposed but rejected Subcontractor was reasonably

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capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 ***The Contractor shall not change the initial list of Subcontractors approved by the Owner without written approval.*** The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner makes objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. ***Subcontractors shall be required, unless otherwise agreed to in writing by the Owner, to carry the same types and amounts of insurance as the Contractor, and shall name the Owner, Architect, and Architect's consultants as additional insured with respect to the Project.*** Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- **.1** assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- **.2** assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

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§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each ***Owner's*** Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, ***the Owner's*** Separate Contractors, and the Owner until subsequently revised ***and agreed to by the Owner***.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify ***the Owner and*** the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

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§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the ***Owner*** and ***approved*** by the Owner, Contractor, and Architect stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the ***Owner or*** Architect ***or both*** and ***approved*** by the Owner***, Contractor,*** and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with ***preparing a proposal for*** the change in the Work involved and advise the ***Owner*** of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6.1 The Contractor shall promptly proceed with the change in the Work described in the Construction Change Directive only if the Contractor is explicitly directed to proceed in the Construction Change Directive.

§ 7.3.6.2 If the Construction Change Directive does not contain an explicit direction to proceed, the Contractor shall promptly proceed with the change in the Work only upon receipt of a Change Order that references the Construction Change Directive.

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§ 7.3.7 A Construction Change Directive ***approved*** by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The ***Owner*** will make an interim determination for those costs that the ***Owner*** determines to be reasonably justified. The ***Owner's*** interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner***, Architect,*** and Contractor agree concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the ***Owner*** will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect***, in consultation with the Owner*** may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect ***and the Owner*** and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner. ***The date of commencement of the Work shall not be changed by the effective date of such insurance.***

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented

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in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 Not used.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the ***Owner*** before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the ***Owner***. This schedule, unless objected to by the ***Owner***, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the ***Owner*** and supported by such data to substantiate its accuracy as the ***Owner*** may require, and unless objected to by the ***Owner***, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the ***Owner*** an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner ***may*** require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the ***Owner***, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 The Owner will not withhold retainage on account of progress payment provided the Contractor shall have met identified target dates in the Contractor's CPM network analysis schedule for the Project.

§ 9.3.1.4 The Owner reserves the right to withhold retainage on account of progress payments in the amount not to exceed five percent (5%) of the total completed and stored to date amount as identified in the Application for Payment if the Contractor has not met identified target dates in the Contractor's CPM network analysis schedule for the Project.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

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§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The ***Owner*** will, within seven days after receipt of the Contractor's Application for Payment, either ***approve the Application for Payment*** or withhold ***the*** Application for Payment, and notify the Contractor of the ***Owner's*** reason for withholding certification in whole ***or in part*** as provided in Section 9.5.1.

§ 9.4.2 ***Not used.***

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The ***Owner*** may withhold ***an Application*** for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the ***Owner's*** opinion the ***Work has not progressed to the point indicated or quality of the Work is not in accordance with the Contract Documents***. If the ***Owner*** is unable to ***approve*** payment in the amount of the Application ***for Payment***, the ***Owner*** will notify the Contractor as provided in Section 9.4.1. If the Contractor and ***Owner*** cannot agree on a revised amount, the ***Owner*** will promptly issue ***an Application*** for Payment for the amount for which the ***Owner*** is able to ***approve***. The ***Owner*** may also withhold ***an Application*** for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of ***an Application*** for Payment previously issued, to such extent as may be necessary in the ***Owner's*** opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When ***the Contractor*** disputes the ***Owner's*** decision regarding ***an Application*** for Payment under Section 9.5.1, in whole or in part, ***the Contractor*** may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding ***approval*** are removed, ***approval*** will be made for amounts previously withheld.

§ 9.5.4 If the ***Owner*** withholds ***an Application*** for ***Payment*** under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Contractor ***and the Contractor*** shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 ***The*** Owner shall make payment ***on an approved Application for Payment*** in the manner and within the time provided in the Contract Documents.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

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§ 9.6.3 The ***Owner*** will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 ***An Application for*** Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend**,** indemnify***, and hold harmless*** the Owner ***as provided in Section 3.18 for*** any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the ***Owner*** does not ***approve an Application*** for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount ***approved*** by the ***Owner*** or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner ***and the Owner's failure to cure such a delinquent payment within the seven (7) day period***, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect ***and the Owner*** will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's ***and the Owner's*** inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

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§ 9.8.3.1 If the Architect's and the Owner's inspection discloses and item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents, but does not preclude the Owner from occupying or utilizing the Work or designated portion thereof for its intended use, then the Architect shall append the items to the list prepared by the Contractor. The appended list of items to be completed or corrected prior to final payment shall be attached to the Certificate of Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the ***Owner*** will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items ***and fix the value of the amount of retainage to be withheld until the Contractor shall finish all items*** on the list ***of items to be completed or corrected prior to final payment*** accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.4.1 Warranties required by the Contract Documents shall commence on the date of acceptance by the Architect and the Owner for any items on the list of items to be completed or corrected prior to final payment.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the ***Architect*** and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance, the ***Owner*** will promptly make such inspection. When the ***Owner*** finds the Work acceptable under the Contract Documents and the Contract fully performed, the ***Owner*** will promptly ***approve the*** final ***Application*** for Payment ***upon receipt. If the Owner does not find the Work acceptable or completed, the Owner shall notify the Contractor of the details in which the inspections reveal that the Work is incomplete or defective. The Contractor shall immediately take such measures as are necessary to complete the Work or remedy the incomplete or defective Work.***

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the ***Owner*** (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers'

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warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the ***Owner*** prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

§ 9.11 Liquidated Damages and Incentives

§ 9.11.1 Because the Owner has scheduled use of the completed project, time is an essential and material factor of this Agreement. Failure to complete the work on or before the date of Substantial Completion will subject the Owner to loss and damage. Since the measure of such loss or damage is not readily ascertainable, it is hereby established that the loss according to the Owner from any failure on the part of the Contractor to date shall be liquidated and fixed at sum of $N/A per calendar day or portion of day that the work remains incomplete past the date of Substantial Completion in accordance with the terms of this Agreement.

§ 9.11.2 The Owner shall reward the Contractor for early completion of the project before the date of Substantial Completion at the sum of $N/A per calendar day up to a sum that shall not exceed $N/A.

§ 9.11.3 The Contractor agrees that this is a reasonable amount for liquidated damages due to delays and is not a penalty. Owner may deduct this sum from any sum that may be due to the Contractor.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable ***and necessary*** precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

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§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.4.1 When use or storage of explosives, hazardous materials, equipment, or unusual methods are necessary, the Contractor shall give the Owner advance notice and shall receive written approval from the Owner for such use or storage.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.1.1 The Owner will notify the Contractor prior to beginning the Work of the location for known asbestos containing materials and lead containing materials within the limits of the Work. The Contractor shall be required to notify all of the Contractor's employees, Subcontractors, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable that may come in contact with asbestos containing materials and lead containing materials within the limits of the Work. Information presented to the Contractor by the Owner identifying the location for all known asbestos containing materials and lead containing materials within the limits of the Work shall be displayed prominently at the work site for all workers to review.

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§ 10.3.1.2 Prior to being allowed on the work site, the Contractor's employees, Subcontractors, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable that may come in contact with the asbestos containing materials and lead containing materials shall be required to sign an acknowledgement form indicating that they have been informed of the presence and location for all known asbestos containing materials and lead containing materials and that the known asbestos containing materials and lead containing materials shall not be disturbed in any manner.

§ 10.3.1.3 The Contractor shall indemnify and hold harmless the Owner for any disturbance of the disclosed known asbestos containing materials and lead containing materials by the Contractor's employees, Subcontractors, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable that may come in contact with the asbestos containing and lead containing materials under the Contractor's obligations in Section 3.18. Failure to fulfill the Contractor's requirements under Section 10.3.1.2 shall not relieve the Contractor of obligations under this Section10.3.1.3 or Section 3.18

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

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ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 ***There are no waivers of subrogation.***

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§ 11.3.2 Not used.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails***, after discovery of the condition*** to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. ***The waiver of the rights by the Owner to require correction of non-conforming work and make a claim for breach of warranty by the Contractor is not***

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applicable to non-conforming work discovered after the one year period, but within statutory limitation period provided by law. If the Contractor fails to ***commence and continue correction of such*** nonconforming Work ***with diligence and promptness*** within ***the ten-day period*** after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 ***A new*** one-year period for correction of Work shall ***exist for all corrective work performed by the Contractor pursuant to this Section 12.2, but such a new one-year period shall apply only to the specific item, component, or system corrected.***

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the state of Missouri.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public

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authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the ***Owner and*** Architect timely notice of when and where tests and inspections are to be made so that the ***Owner and*** Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the ***Owner*** will, upon written authorization, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the ***Owner and*** Architect of when and where tests and inspections are to be made so that the ***Owner and*** Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the ***Owner and*** Architect.

§ 13.4.5 If the ***Owner and*** Architect ***are*** to observe tests, inspections, or approvals required by the Contract Documents, the ***Owner and*** Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing ***governed by the law of the state of Missouri.***.

§ 13.6 Equal Opportunity

§ 13.6.1 The Contractor shall maintain policies of employment as follows:

§ 13.6.1.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex, or national origin. Such action shall include, but not be limited to: employment, promotions, demotions, transfers, recruitment, recruitment advertising, layoffs, terminations, rates of pay or compensation, and selection of training, including apprenticeships. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

§ 13.6.1.2 The Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex, or national origin.

§ 13.7 Domestic Products Procurement

§ 13.7.1 The Owner encourages Contractors and Subcontractors to purchase or lease products manufactured, assembled, or produced in the United States when providing goods and services to the Owner.

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§ 13.7.2 As set forth in 171.181 RSMo, the Owner will give preference to commodities manufactured, mined, produced, or grown within the state of Missouri and will give preference to all firms, corporations, or individuals doing business as Missouri firms, corporations, or individuals when quality and price are approximately the same.

§ 13.8 Americans with Disabilities Act

§ 13.8.1 The Owner is bound by and complies with the Americans with Disabilities Act (ADA). The Owner has designated the following individual to oversee the ADA requirements for the Owner: John Blanton, Manager of Planning and Construction Services, 314-415-8289.

§ 13.9 Alternative Dispute Resolution

§ 13.9.1 Alternative Dispute Resolution (ADR) methodologies will be encouraged in place of more formal dispute resolution procedures. ADR will assist in promoting and maintaining an amicable working relationship between parties. ADR is to be a voluntary, non-binding procedure available for use by the parties to this Contract to resolve any dispute that may arise during performance of the Work.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for ***authorized*** Work ***properly*** executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the

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Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

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§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the ***time period specified by the laws of the state of Missouri.***

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction. ***The Contractor shall make allowance in the Contract Time and schedule for 10 adverse weather condition days. Claims for additional costs or time extensions due to adverse weather conditions will not be entertained until after these 10 adverse weather condition days have been claimed and resolved according to Section 15.2***

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver excludes

.1 damages incurred by the Owner or Contractor as the result of either party's gross negligence or willful misconduct, and

.2 damages incurred by the Owner or Contractor covered by insurance in accordance with requirements as outlined in Article 11.

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This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to ***litigation*** of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to binding dispute resolution.

§ 15.2.6 Not used.

§ 15.2.6.1 Not used.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 ***Binding mediation will not be allowed under this Contract as a method to resolve any claim, dispute or other matter in question arising out of or related to this Contract.*** Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to ***non-binding alternative dispute resolution methods or by*** binding dispute resolution.**§ 15.3.2** The parties shall endeavor to resolve their Claims, ***disputes, or other matter in question arising out of or related to the Contract*** by ***non-binding alternative dispute resolution methods.*** A request for ***non-binding alternative dispute***

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resolution methods shall be made in writing, delivered to the other party to the Contract. The request may be made concurrently with the filing of binding dispute resolution proceedings.

(Paragraph deleted)
§ 15.3.3 ***Not used.***

§ 15.3.4 ***Not used.***
§ 15.4 Arbitration
§ 15.4.1 ***Arbitration will not be allowed under this Contract as a method to resolve any Claim, dispute or other matter in question arising out of or related to this Contract.***

§ 15.4.1.1 ***Not used.***

§ 15.4.2 ***Not used.***

§ 15.4.3 ***Not used.***

§ 15.4.4 ***Not Used***
§ 15.4.4.1 ***Not used.***

§ 15.4.4.2 ***Not used.***

§ 15.4.4.3 ***Not used.***

§ 15.5 Binding Dispute Resolution
§ 15.5.1 Any unresolved controversy or claim arising out of or related to the contract, or the breach thereof, shall be settled by litigation in accordance with the laws of the state of Missouri, except controversies or claims relating to aesthetic effect as provided in Section 4.2.13 and except those waived as provided for in Sections 9.10.4, and 9.10.5, and 15.1.7. Such controversies or claims upon which the Initial Decision Maker has given notice and rendered a decision as provided in Section 15.2.5 shall be subject to litigation.

§ 15.5.2 Any litigation shall be filed in the Circuit Court of St. Louis County in the state of Missouri.

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SECTION 011010
PROJECT SUMMARY - BID PACKAGES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 INSURANCE, DESIGNATED PURCHASER

A. Owner and Contractor shall purchase and maintain insurances as indicated by Sections 005000 Agreement and 007000 General Conditions.

1.03 SUMMARY

A. Section Includes:
   1. Project Information
   2. Work covered by Contract Documents
   3. Sequence of Work
   4. Phased Construction
   5. Access to site.
   6. Coordination with occupants
   7. Work restrictions
   8. Specification and drawing conventions.

1.04 PROJECT INFORMATION

A. Project Identification: ROS Building Renovation and Site Improvements

B. Project Location: 1150 Ross Ave, St. Louis, MO 63146

C. Owner:
   1. Parkway Schools
      363 N. Woods Mill Road,
      Chesterfield, MO 63017
      Owner's Representative: John Blanton, Manager Planning & Engineering

D. Construction Manager:
   1. Poettker Construction Company
      400 S. Germantown Road
      Breese, IL, 62230
      Construction Manager Representative: Ben Evelsizer, Pre Construccction Manager

E. Architect:

F. Project Description:
   1. Building Renovations, Additions and Site Improvements.

1.05 DESCRIPTION OF WORK

A. The contract work is to be performed in strict accordance with the drawings and specifications herein enumerated.

B. This project may have scopes of work included in bid packages released prior to these construction documents. It is the bidders responsibility to review and compare previously bid and awarded scopes of work with these documents, and submit RFC's to the Construction Manager as needed to clarify the intended scopes of work to be included by the below bid package contractors.

C. Bid Categories: The bidding documents consider the preparation of bids for specific portions of the work separated by bid package. Each bid package covers the contract work for various bid categories summarized below. The scope of work for each bid package includes furnishing any and all materials, equipment's and labor necessary, inherent or incidental, to fulfill the requirements summarized below and in accordance with the drawings and specifications as described herein. A bid proposal may be submitted for any one bid package referenced herein.

1.06 GENERAL PROVISIONS ALL BID CATEGORIES

A. The following conditions are hereby incorporated into each and every bid package:
   1. Each Contractor shall review all drawings to verify and confirm work involved within each Bid Package. Drawings are to be bid on and used as a whole; base bid should not rely on select drawings. It is the responsibility of each Contractor to become familiar with all Bid Packages and all Project Documents included in the project and identify any discrepancies of misunderstanding that may exist prior to issuance of respective bids.
   2. Each Contractor shall be knowledgeable of and responsible for all project documents and the effect and relationship each Bid Package scope of work has on the other Bid Packages to ensure proper, timely and adequate interfaces.
   3. Each contractor shall provide a bid security of ten percent (10%) of the bid as a Bid Bond or a Cashier’s Check. Any bid submitted without a bid security may not be accepted.
   4. By submitting a Bid, each Contractor acknowledges and agrees that if an item or work is specified in any of the sections that pertain to the awarded Bid Package, it is included by that Contractor.
   5. In each Bid Package the term “Provide” shall be defined as “Furnish and Install” unless specifically noted otherwise.
   6. Each Contractor shall provide complete submittal packages for all materials installed under their bid package for review and approval by the Architect/Engineer before work begins. All deliverables shall be uploaded to Procore. Submittals shall be broken down into individual documents as specified in the submittal log found in Procore. Submittals shall be submitted within fourteen (14) business days from contract award unless otherwise agreed upon by the Construction Manager.
   7. Each Contractor shall maintain complete as-built drawings of all systems installed under their awarded Bid Package/Contract. These drawings shall be kept in the construction trailer, updated weekly, and made available for inspection at any time..
   8. Each Contractor shall provide necessary labor, materials, tools, supervision, taxes (excluding state sales tax), insurance, equipment, placing, hoisting, scaffolding, protection, storage containers, transportation, permits (if not provided by Owner), licenses, fees, inspections necessary to perform and complete the work specified in their awarded Bid Package.
   9. All work is to be performed in accordance with current codes and standards, i.e. federal, state and local codes/ordinances.
   10. Each Contractor shall provide a performance and payment bond. Bonds shall be obtained and presented to the Construction Manager prior to the execution of the Contract.
   11. Each Contractor shall provide all layouts, including engineered layouts, required to complete their work under an awarded Bid Package. For site related work, each Contractor shall be responsible for layout and control work from established controls. If applicable, once the building pad is cut, building corners and a benchmark will be established by the Construction Manager.
   12. Unless specified otherwise, the **Construction Manager** shall provide general use dumpsters/trash containers for general refuse generated as a result of the work of this project. All Contractors shall break down boxes/packaging materials prior to placing them in a dumpster or trash container.
   13. Unless specified otherwise, the **Construction Manager** shall provide clean-up for awarded Bid Package(s), including broom clean areas, and dispose of debris daily into dumpsters and/or trash containers.

14. Each Trade Contractor shall, immediately prior to turnover and acceptance, remove all stickers, protective films, packaging materials, and other temporary or protective coverings from their installed work. This preparation is required to ensure all features of work are ready for final cleaning by the **General Trades Contractor**, unless otherwise noted herein.
15. Each Contractor shall be responsible for its own temporary power requirements to complete the work within their Bid Package, including generators if required. Any temporary electric requirements beyond that provided by standard wall outlet shall be provided by the Contractor requiring special temporary electric.
16. Any Work claimed by a given trade, or labor union, working under a Contractor's Bid Package shall be provided by that Contractor at no additional cost to the Owner or Construction Manager.
17. Each Bid Package is responsible for any overtime associated with work outside normal working hours required to maintain the construction schedule.
18. All work on site is to be performed safely in accordance with all OSHA standards and the Construction Manager's Published Safety Program. It is the responsibility of each Contractor to inform and educate all personnel working on site of the aforementioned requirements and ensure these policies are enforced each day.
19. Each Contractor shall furnish, install, maintain, and remove all OSHA required safety protection/railings at work under an awarded Bid Package as required.
20. All Contractors are responsible for providing adequate fall protection systems for crews working under each respective scope of work.
21. Each Contractor shall provide necessary labor for all work jurisdictionally claimed by building trades in its employ for the work integral to the Bid Categories.
22. **Construction Manager** shall provide temporary fencing only as indicated on the site logistics plan. All other fencing, temporary partitions, and barricades for segregation of work is to be provided by the contractors. If a site logistics plan is not provided, Contractor shall be responsible for all temporary fencing and barriers required.
23. Unless specified otherwise, **Construction Manager** shall provide grass cutting/maintenance of work areas within temporary fencing during the course of construction. Contractor shall be responsible for maintenance of new groundcover/landscaping as specified in the project documents.
24. Each Contractor responsible for providing Delegated Design within the project are to provide Professional Liability Insurance for own scope of work.
25. Davis Bacon Wage Rates: Each contractor shall pay at a minimum the current prevailing wage rates listed for the county for the work is being performed. The applicable wage rate determination has been provided in the Project Manual. Please contact Missouri Department of Labor at 800-735-2966 for wage rates or clarifications.
26. Each Contractor shall assist in the coordination of testing (by Owner) required for its scope of work.
27. Each Contractor shall notify the Construction Manager of scheduled inspections during the construction process.
28. All construction traffic to utilize the parking/laydown areas as directed by the Construction Manager. No construction traffic is allowed on other parking lot areas, bus lanes, or alongside adjacent streets without approval by the Construction Manager.
29. Each Contractor shall provide all traffic control measures necessary to perform and protect work required for awarded Bid Package and to protect the public.
30. Contractors are not to have vehicle traffic from 7:30am through 8:40am and 2:30pm and 3:30 pm while students are in attendance.
31. Each Contractor shall be responsible for keeping surrounding streets clean from all mud and debris as a result from the work of their Bid Package.
32. Each Contractor is responsible for repairing any erosion and siltation control measures damaged by own equipment or manpower.

33. Each Contractor shall provide all wall, floor, and roof sleeves as required for work included in an awarded Bid Package, including required fire safing at fire rated walls and floors, and acoustic insulation/caulking at all non-rated sleeve locations/openings. Coordinate any necessary penetrations through foundation, floor, wall, or roof with other Bid Package contractors as required. Each Contractor shall provide size of openings and any sleeves necessary for awarded Bid Package.
34. Each Contractor shall provide penetration firestopping for all penetrations created by their bid package scope of work through rated walls and horizontal assemblies. Firestopping materials and installation shall comply with an approved UL-listed system appropriate for the specific conditions, regardless of plan details.
35. Each Contractor shall provide sleeves and waterproof seals at all exterior wall and roof penetrations.
36. Each Contractor is responsible for safe delivery, staging, and protection for all material related to their awarded Bid Package. Each Contractor is responsible for loading and unloading all material as necessary, as well as lifting material and equipment onto the roof if necessary. Contractors are responsible to receive, unload and set any owner supplied material that is a part of the scope of work and bid package.
37. All material and equipment shown, noted, or otherwise indicated to be salvaged must be removed diligently and stored in a location for re-use as determined by Construction Manager.
38. Each Contractor performing excavation shall be responsible for the removal and hauling of excavated spoils to an on-site stockpile location as directed by the Construction Manager. If on-site stockpiling is not feasible, the Contractor shall be responsible for the off-site removal and proper disposal of all excavated materials.
39. By submitting a Bid, each Contractor acknowledges and agrees that if an item or work is specified in any of the sections that pertain to the awarded Bid Package, it is included by that Contractor.
40. Each Contractor shall use caution around existing and new finishes and must provide protection as needed to avoid property damage. Each Contractor shall correct any damages to existing/new finishes resulting from its work. All existing building features, structures, site features and landscaping not shown to be altered or removed, including but not limited to, pavement, drives, storm drainage, utilities, lawn areas, ground cover, etc. which are damaged or destroyed during the course of the work shall be repaired or replaced to the Owner's satisfaction without additional cost to the Owner, Architect, or Construction Manager. The awarded Bid Package Contractor shall be responsible for damages caused by its own forces or any subcontractor, sub-subcontractors, or suppliers.
41. Each Contractor shall attend Pre-installation meetings for critical activities associated with its scope of work. Reference Section 014000 - Quality Requirements for schedule of critical activities.

1.07 SPECIAL CONDITIONS

A. The Scope of Work in each bid package includes the following Special Conditions in addition to all work shown or described in the individual Bid Packages and shown in the Project Documents. The following items are to be included within the bid of each Contractor and will subsequently be considered part of all awarded Contracts.
   1. It is the responsibility of each Contractor bidding this project to become familiar with all Bid Packages included in this project as well as all the Project Documents.
   2. If the term "General Contractor" is found in the contract documents, it is understood that it refers to the individual Contractor performing the work of the specified Bid Package.
   3. It is understood by all bidders there is not a "General Contractor" overseeing the work of this project. As such, all Contractors shall coordinate with each other to ensure all building systems are coordinated properly.
   4. All work to be governed and controlled by applicable federal, state, and local requirements for air pollution and disturbance of surrounding areas.

5. Each Contractor shall be responsible for locating existing utilities prior to starting any ground disturbance activities. Any and all fees associated with utility location services shall be include in the base bid of applicable bid packages.
6. If a Contractor should find it necessary to work over the weekend, they are to notify the Construction Manger prior to 4:00 PM on the Thursday before the weekend to be worked.
7. The storage of materials and equipment at the site shall be permitted only to the extent approved in advance by the Construction Manager in conformance with the limit established by any local ordinances and laws. If materials and equipment stored obstruct the progress of any portion of the work, they shall be removed or relocated by the respective Contractor as may be directed by the Construction Manager, without reimbursement of cost.
8. Location for Contractor's items of plan and tools such as hoists, mixers, cutters, trailers, etc. shall be approved in advance by the Construction Manager.
9. Each Contractor shall be represented at the site by a competent full-time superintendent/foreman from the beginning of its work until acceptance unless otherwise instructed by the Construction Manager. On-site representative shall have the authority to make decisions and/or clarifications regarding the awarded scope of work.
10. The Architect/Owner and its representatives shall at all times have access to the work whether it is in preparation or in progress and each Contractor shall provide proper and safe facilities for such access and inspections or testing.
11. Each Contractor's allowable mark-up on change order work shall be limited to the following:
    a. Ten percent (10%) for work to be performed (labor and/or material) by contractor's own employees.
    b. Five percent (5%) for work to be performed by each subcontractor tier.
    c. One percent (1%) for increase in bond.
    d. One percent (1%) for increase in insurance.
    e. Total mark-ups shall not exceed twenty percent (20%), regardless of the number of tiers of subcontractors or sub-subcontractors involved.
12. Each Contractor shall become familiar with the subsurface investigation of this project as well as all other sections. Transforming of stakes and any other surveying work is the responsibility of the respective contractor.
13. Temporary toilets will be provided by the Construction Manager.
14. Each awarded Bid Package Contractor shall attend weekly job progress and coordination meetings with the Construction Manager when Contractor is listed on the 4-week lookahead schedule. If a Contractor fails to attend the weekly jobsite meetings as scheduled, the Construction Manager at his/her discretion may back charge the Contractor $500.00 per each occurrence. Also, if a Contractor fails to attend the weekly meeting, they will waive all rights for future claims on items discussed and agreed to in the meeting.
15. Since this is an open site, every effort must be made to close up all excavations on the same day they are started. However, if an open excavation cannot be backfilled on the same day, the responsible Contractor shall protect the general public by utilizing safety barricades as outlined in OSHA standards and the Construction Manager's Safety program including but not limited to perimeter snow fence, covering the opening, etc. This protection must be maintained throughout the excavation and backfill period and in place at the end of each working day. The cost for this shall be included in the Contractor's bid.
16. Out of sequence work requested by the Owner, Architect or Construction Manager to meet job occupancy requirement or to allow beneficial use of the building to the Owner is included in the respective Contractor's bid. No change orders will be issued for out of sequence work.
17. Each Contractor shall provide daily work tickets for approval by Construction Manager's on-site Superintendent for any authorized extra work. Failure to provide such tickets may result in the Contractor performing such work at its own risk for no additional cost.

18. Each Contractor will be required to provide adequate resources, including work overtime, at its own expense, in order to maintain the project schedule and milestones established herein. The Construction Manager's 4-week look ahead schedule shall be reviewed at weekly progress meetings, upon conclusion of each meeting, if no comments or corrections were requested by the Contractor, the Contractor accepts the durations on the 4-week schedule and shall meet these performance commitments. Contractors will also be required to work overtime, at their own expense, to make up for delays or failure to meet performance commitments.
19. Each Contractor shall coordinate the work of their Bid Package with the work of other Bid Packages so that all work is completed in accordance with the Project Documents and the project schedule is maintained. Rework that is required due to insufficient coordination with other contractors will be performed at the Contractor's expense.
20. All Contractors shall perform their work in such a manner, and in such a sequence that is most beneficial to the overall project. The Construction Manager may direct the sequence of the work at no additional cost.
21. Each Contractor shall provide Safety PPE for all workers on site under its Contract as required by OSHA and the Construction Manager's Safety Program.
22. Each Contractor shall provide bidding and construction documents for their own use and the use of any subcontractors. It is the responsibility of each Contractor to keep Construction Documents updated with current revisions, bidding and post bidding addendums, RFIs, ASIs, etc.
23. Each Contractor is responsible for all hoisting and unloading of their material and equipment. Contractors are responsible to receive, unload and set any owner supplied material that is a part of the scope of work and bid package.
24. Each Contractor shall provide cranes/hoists/elevators/manlifts/etc. as needed to complete their scope of work.
25. Notes included in each Bid Package description are for clarification and delineation of the scope of work. Bid Packages are to be considered all-inclusive of the specification sections referenced within each package. Work referenced but not explicitly called out is to be considered part of the respective Bid Packages as required to complete each Bid Package scope of work.
26. Drawing and/or technical specification sections indicated as relating to a specific Bid Package shall in no way limit contractual obligation of the respective Contractors to only those drawings and specification sections listed. Each awarded Bid Package Contract will be based upon and will incorporate the complete Project Documents.
27. Prior to interior concrete saw cutting, contractors shall provide their own floor scan to ensure existing underground utilities are not damaged. Any damage that takes place will be the responsibility of the contractor who damaged the work.
28. Each Contractor shall ensure that all subgrade meets proper compaction in accordance with project requirements prior to the placement of any finish surface, regardless of whether special inspections are specified or performed.

1.08 BID PACKAGE 01 – GENERAL TRADES

A. **ALTERNATES**
   1. Alternates associated with this Bid Package include the following:
      a. None at this time

B. **ALLOWANCES**
   1. Allowances associated with this Bid Package include the following:
      a. None at this time

C. **SPECIFICATIONS**
   1. Specifications that relate to this bid package include all of Division 00 and Division 01 specification sections and particularly specification sections:

D. **SCOPE OF WORK GENERAL**

1. All notes on the plans pertaining to the below scope of work shall be included as part of this bid package.
2. This contractor understands this project may be completed in multiple phases in accordance with the overall project schedule over multiple mobilizations. This contractor shall review the overall project schedule and phases to ensure that appropriate manpower will be provided for each phase.
3. All Bid Packages to include all General Provisions and Special Conditions as noted in Articles 1.6 & 1.7 above.
4. This Contractor shall provide all work from the specification sections listed within this Bid Package unless specific exclusions are otherwise noted.
5. This Contractor shall field verify existing conditions prior to the commencement of work. Any discrepancies shall be brought to the attention of the Architect/Engineer/Construction Manager.
6. This Contractor is responsible for dust control and sound control measures required for the execution of this Bid Package scope of work.
7. Each Contractor shall be responsible for the daily collection and consolidation of all waste generated by their work to a designated central pile or trash receptacle, provided by **Construction Manager**, within each work space.
8. Contractor shall take care not to damage previously completed work. Any damage caused to existing building/structures by work of this Bid Package shall be repaired by this Bid Package Contractor.
9. Each Trade Contractor shall be responsible for additional costs associated with work resulting from its use of equipment/material other than that specified in the project documents. Costs for other trade contractors work to accommodate these variations shall be the responsibility of the responsible trade contractor. Approval of shop drawings does not relieve the trade contractor of this responsibility.

E. **GENERAL TRADES**

1. This Contractor shall provide all temporary fire extinguishers and stands for the project in accordance with OSHA guidelines during construction.
2. Construction Manager shall provide general use dumpsters for all trades throughout each phase of construction, ensuring adequate capacity, timely removal, and replacement to maintain a clean and safe worksite. Where specified, other trades may be responsible for providing their own dumpsters for the haul-off and disposal of waste generated by their work.
3. Each Prime Contractor shall be responsible for daily clean-up of its work areas to maintain a clear, safe, and organized job site. Each Contractor shall comply with all applicable safety regulations and maintain a clean and orderly site to minimize risks to workers and other personnel.

F. **GENERAL CONCRETE**

1. Investigations into non-conforming materials will be conducted at the expense of the Prime Contractor responsible for that scope of work. The Prime Contractor must be responsible for the investigation and must make written recommendations to adequately mitigate or remediate the non-conforming material. The owner, owner's representative, and/or construction manager may accept, accept with reduced payment, require mitigation, or require removal and replacement of non-conforming material at no additional cost the owner or construction manager.
2. Any loads of concrete being tested are not permitted to be placed until all testing is completed and verified meeting project specifications.
3. All steel reinforcement must be in place and secure prior to concrete placement. Wet-setting or pulling up reinforcement into position will not be permitted.
4. Supports for wire mesh must be spaced at a maximum distance of [3] feet. Closer spacing of supports may be necessary based on means and method of concrete placement and/or finishing.
5. Supports for steel reinforcement must be spaced at a maximum spacing of [4] feet.

6. Damaged wire mesh, steel reinforcement, and/or reinforcement supports are not permitted within the concrete.
7. Applying water or water-based products on the surface of fresh concrete is not permitted as a finishing aid. Only products designed as a finishing aid are acceptable to assist in finishing.
8. Contractors performing work near adjacent structures are responsible for providing protection to the adjacent structure in order to prevent any damage.
9. Contractors must follow the Construction Manager's Hot and/or Cold Weather Concrete Plan unless the contractor submits an alternate plan that is approved by the Construction Manager.
10. Freshly placed concrete must maintain a minimum temperature of 50°F for 3 days after placement.
11. All site concrete (pavement, sidewalks, curbing, etc.) will require a cure and seal product with a minimum of 25% solids be applied per the manufacturer's recommendations unless a more stringent requirement is stated per the contract documents.

G. **CONCRETE**
1. This Contractor shall provide housekeeping pad extensions under new equipment to 6" beyond equipment base where indicated.
2. This Contractor shall provide new housekeeping pads under new equipment to 6" beyond equipment base where indicated.

H. **SITE CONCRETE**
1. This Contractor shall provide all site-related concrete, including but not limited to the following features where indicated:
   a. Cast-in-place sidewalks, ramps, stairs, and tactile warning surfaces.
   b. Door stoops, aprons, frost walls, and lean concrete under stoops and aprons
   c. Concrete pavement.
   d. Concrete curbs
   e. Playground perimeter curbs
2. This Contractor shall provide a new cast-in-place concrete retaining wall, complete and in place, including excavation, backfill, reinforcement, footings, formwork, layout, and bracing as required for complete installation. This Contractor shall provide wall drainage as indicated. This Contractor shall provide expansion and control joints as required.
3. This Contractor shall provide excavation, backfill, and spoil removal for any concrete placed under this scope of work.
4. This Contractor shall provide all fine grading and aggregate base course for site concrete.
5. This Contractor shall ensure all subgrade meets compaction requirements prior to placement of site concrete.
6. This Contractor shall provide all concrete reinforcement required for site concrete placed under this scope of work.
7. This Contractor shall provide all expansion materials and joint sealants for site concrete as specified.
8. This Contractor shall provide a smooth formed finish on all concrete exposed to view, including the retaining wall, and shall repair any defects, including tie holes and form pin holes, immediately after form removal in accordance with the project documents.
9. Tactile warning surfaces shall be cast-in-place, ADA-compliant, plastic tactile warning tiles. Stamped or applied concrete dome patterns shall not be an acceptable substitute.

I. **HANDRAILS**
1. This Contractor shall provide all site handrails and guard rails where specified. Contractor shall provide core drill and grout for installation of handrails that are cast into concrete. Contractor shall provide expansion anchors for post-installed hand rails.
2. This Contractor shall paint new handrails as indicated.

J. **JOINT SEALANTS**

1. **Typical:** Sealants shall not be applied directly to weather barriers or dimensional wood blocking; provide proper substrate preparation, primers, or bond-break materials as required.
2. Contractor shall provide complete systems including sealants, backer rods, bond breakers, primers, and accessories.
3. This Contractor shall provide joint sealants at concrete expansion joints installed under this projec scope of work.
4. This Contractor shall provide joint sealants at all locations where new concrete or asphalt paving abuts the existing building, including foundation walls, slabs, sidewalks, and aprons, to maintain a weathertight and watertight transition between new and existing construction.

K. **PROJECT SIGNAGE & GRAPHICS**

1. Contractor shall provide all building signage, plaques, and panel signage including room identification, restroom, door signs, stairwell signs, storm shelter signage, etc. where indicated per project requirements.
2. This Contractor shall provide restroom identification sign and pictogram signs where indicated in the project documents.
3. This Contractor shall provide door frame signs at every interior door frameS within the limits of work as specified.
4. This Contractor shall provide all code compliance Door & Window Decals indicated in the project documents. If existing decals scheduled for re-use cannot be relocated, contractor shall provide new decals. Contractor shall coordinate location and finish of details with architect and local jurisdictions as required to ensure full compliance with local building codes.
5. This Contractor shall provide all wall coverings, including custom vinyl graphics, where indicated.
6. This Contractor shall provide custom wall graphics where indicated in the project documents.
7. This Contractor shall provide all vinyl window graphics, including custom graphics, where indicated.

L. **PLAYGROUND CIVIL**

1. This Contractor remove existing playground equipment, playground surfacing mulch, signage, associated appurtenances, and related items to the extents indicated in the Contract Documents. Existing mulch shall be transported and stockpiled at the Owner-designated location behind Fern Ridge High School. This Contractor shall remove all playground equipment foundations, footings, and below-grade supports encountered within the limits of work unless specifically noted otherwise in the Contract Documents.
2. This Contractor shall provide all excavation, earthwork, and rough grading required for the new playground areas, including preparation of subgrades and establishment of design elevations indicated in the Contract Documents.
3. This Contractor shall furnish and install all playground underdrain systems, drainage piping, drainage stone, geotextiles, outlets, fittings, and related components where indicated in the Contract Documents or as required to provide a complete and functional installation.
4. This Contractor shall furnish and install the compacted aggregate subdrainage layer beneath playground surfacing systems to the elevations indicated in the Contract Documents, maintaining sufficient depth and tolerances required for the specified poured-in-place surfacing and associated playground systems.
5. This Contractor shall coordinate with the **Playground Equipment & Surfacing Installer (N.I.C.)** to establish and maintain proper aggregate and finish-grade elevations necessary to achieve required critical fall heights, accessibility requirements, equipment installation criteria, and manufacturer recommendations.

6. This Contractor shall complete grading operations and turn over playground areas at the required subgrade and aggregate elevations necessary to facilitate installation of playground equipment, foundations, footings, and related work by others
7. The **Playground Equipment & Surfacing Installer (N.I.C.)** shall be responsible for final adjustment and fine grading of aggregate surfacing materials disturbed by the installation of playground equipment, footings, foundations, and related work, as required to restore design elevations, critical fall height requirements, and finished surfacing elevations

M. **SITEWORK GENERAL**

1. All work shall stay within the limits of disturbance (LOD) as shown on the plans and minimize disturbance within the work area wherever possible. Any excessive disturbance or disturbance outside of the LOD will be repaired and/or restored by this contractor at no additional cost to the owner.
2. Contractor shall familiarize itself with existing site conditions to coordinate their work. This includes bringing site back to its original condition after underground utility work takes place. This also includes recognizing overhead utility locations and coordinating and/or providing line protection with local utility company to ensure safe working conditions.
3. This Contractor shall be responsible for providing and maintaining all necessary traffic control measures to ensure the safe and efficient diversion of vehicular and pedestrian traffic away from the designated work area throughout the duration of this scope of work. This includes, but is not limited to signage, barricades, cones, delineators, flagging personnel, and any other traffic control devices or personnel required to comply with applicable federal, state, and local regulations, as well as industry best practices. Upon completion of the work, the Contractor shall promptly remove all traffic control devices and restore the site to its original condition, unless otherwise directed.
4. This Contractor shall provide and maintain tree protection where indicated in the project documents.
5. Contractor is responsible for protecting existing site items shown to remain to prevent damage.

N. **EROSION CONTROL**

1. This Contractor shall provide, maintain, and remove all erosion control BMPs including silt fence, inlet protection, check dams, temporary seeding, erosion control blankets, etc. as required by project SWPPP and as directed by local agencies.
2. This Contractor shall provide SWPPP inspections as required and provide required inspection forms to local agencies in accordance with the project documents.
3. This Contractor shall provide approved Land Disturbance Special Inspector as required to satisfy all permitting requirements.
4. This Contractor shall provide street cleaning, as required, during land disturbance activities.
5. This Contractor shall provide and maintain construction entrance in accordance with the SWPPP requirements.
6. This Contractor shall provide washdown station per SWPPP requirements.
7. This Contractor shall provide temporary storm sewers, and dewatering, as required throughout the project to ensure proper site drainage.
8. This Contractor shall provide temporary stabilization of disturbed areas until final landscaping and groundcover is installed. Contractor shall re-grade areas of disturbance immediately prior to installation of permanent landscaping and groundcover as required for subgrade preparation.
9. This Contractor shall provide and maintain a minimum surplus (10%) of erosion control measures on site.

O. **SITE DEMOLITION**

1. This Contractor shall provide all site related demolition work shown in the site demolition (C Series) documents unless specified otherwise herein.

2. This Contractor shall remove, salvage, and re-install site furnishings designated for re-use where indicated.
3. This Contractor shall provide haul-off and lawful disposal of all demolished materials and equipment removed under this scope of work.
4. This Contractor shall perform saw cutting of existing pavement and sidewalks along straight lines or at the nearest joint, ensuring precise and clean edges for subsequent construction activities.
5. This Contractor shall remove all sidewalks, pavement, curbs and hardscapes where indicated in the project documents.
6. This Contractor shall remove and salvage the existing paver system to the extent required for installation of new utilities. This Contractor shall reinstall salvaged pavers upon completion of utility replacement. If pavers are not acceptable for reuse, this Contractor shall replace them with new pavers matching the existing pavers.
7. This Contractor shall remove concrete door stoops indicated in the project documents.
8. This Contractor shall remove all site furnishings wherever indicated in the project documents.
9. This Contractor shall demolish retaining walls where indicated and provide appropriate benching or shoring as required. The Contractor shall ensure that all demolition, benching, and shoring activities are performed in accordance with the project documents and applicable safety standards.
10. This Contractor shall remove existing traffic/parking signage where indicated in the project documents.
11. This Contractor shall remove all site fencing wherever indicated in the project documents.
12. This Contractor shall demolish existing playground equipment and furnishings where indicated in the project documents.
13. This Contractor shall remove existing trees and shrubs, including stumps and root balls wherever shown, scheduled or otherwise indicated.
14. This Contractor shall protect limbs of trees to remain in work areas. Any limbs in conflict with work areas are to be pruned prior to commencement of work.
15. This Contractor shall provide root pruning as required for new trenches created by this scope of work.
16. This Contractor shall remove fiber mulch surface from playgrounds and haul to parkway school district grounds and storage area where indicated in the project documents.
17. **Mechanical Contractor (Electrical Subcontractor)** shall disconnect and render safe any electrified site furnishing and/or site lightings scheduled for removal. This Contractor shall remove furnishings, fixtures, poles, and foundations once they are rendered safe.
18. This Contractor shall be responsible for the demolition of all site storm sewer, sanitary sewer, and domestic water service utilities as specified in the project documents.

P. **EARTHWORK**

1. This Contractor shall provide all clearing, grubbing, and removal of vegetation at areas indicated.
2. This Contractor shall provide rough grading of site to within +/- 0.1’ of specified grades, accounting for pavement and subbase thickness where applicable. Contractor shall haul-off or import materials as required to achieve proposed grade elevations.
3. This Contractor shall perform rough grading to establish the specified elevations for retaining wall construction, incorporating safe benching distances and designated reinforcement zone fill areas as indicated in the project documents.
4. This Contractor shall provide excavation, spoil removal, and grading including compaction to the density indicated for proposed playgrounds.
5. This contractor shall provide compacted drainage base at proposed playgrounds in accordance with the project documents.
6. The contractor shall provide topsoil at disturbed areas.

Q. **TRAFFIC SIGNAGE**

1. This Contractor shall provide all traffic and site signage, including excavation, concrete bases, and sign posts where indicated.
2. This Contractor shall install salvaged/relocated signage where indicated in the project documents. Where required, contractor shall provide new posts, mounting hardware, and foundations for relocated site signage
3. This Contractor shall provide all precast concrete wheel stops wherever shown, scheduled, or otherwise indicated in the project documents.
4. This Contractor shall provide new bollards and guardrails to match existing where indicated.

R. **ASPHALT PAVING**

1. This Contractor shall include a minimum of two (2) mobilizations to complete asphalt paving work.
2. This Contractor shall provide all asphalt paving, including final grading from a ±0.10’ rough grade, granular base courses, binder courses, and surface courses to specified thicknesses, as indicated in the project documents, ensuring compliance with all pavement type requirements.
3. This Contractor shall provide asphalt pavement patches at utility trenches where indicated.
4. This Contractor shall provide any street paving patches at utility trenches per governing authorities standard details/requirements.

S. **PAVEMENT MARKINGS**

1. This Contractor shall provide all pavement markings where indicated in the project documents.
2. This Contractor shall paint new and existing curbs where indicated in the project documents.

T. **LANDSCAPING**

1. This Contractor shall provide sod at all disturbed areas, per the specified requirements, once ground disturbing activities are completed on the project.
2. This Contractor shall provide final grading and subgrade preparation for sodded areas in accordance with the project documents.
3. This Contractor shall provide topsoil for all disturbed areas in accordance with the project documents. Existing topsoil stockpiled on-site may be reused if it meets the specified requirements. If additional topsoil is needed to meet the project specifications, this Contractor shall import and place it as required.
4. This Contractor shall provide new trees, shrubs and plantings, including amended planting soils, staking, and guying as required, where indicated in the project documents.
5. This Contractor shall provide fertilizer for sodded areas prior to placement of sod where specified.
6. This Contractor shall provide watering of all new sod areas as required to establish healthy, uniform growth, for a minimum period of 30 days following installation or until final acceptance by the Owner's representative, whichever is longer..
7. This Contractor shall provide landscaping maintenance as required by project documents.
8. This Contractor shall provide hardwood mulch where indicated in the project documents.

U. **FENCING & GATES**

1. This Contractor shall furnish and install decorative metal fencing in accordance with specified tolerances as indicated in the project documents. Where fencing is located at playgrounds, the Contractor shall ensure installation complies with playground-specific requirements, adhering to applicable playground industry guidelines, and shall provide all necessary materials, supports, and anchorage to achieve a complete and compliant installation.
2. This Contractor shall provide chain-link fencing and gates where indicated in the project documents.

3. This Contractor shall provide all drilling, epoxy, and leveling grouting for surface mounted fence posts in accordance with the project documents.
4. This Contractor shall provide egress hardware on decorative fencing in accordance with the project documents.
5. This Contractor shall provide sono-tubes and layout for fence posts sleeves as required.

V. **SEGMENTED RETAINING WALLS**

1. This Contractor shall provide all delegated design submittals for retaining walls in accordance with the project documents and local approving agencies.
2. This Contractor shall verify retaining wall design and layout with proposed grading to ensure the retaining wall base is below proposed grade.
3. This Contractor shall remove the existing segmented retaining walls to the extent required for new utility lines. The removal process shall prioritize safety and include temporary shoring or slope protection measures as necessary to maintain the stability and integrity of adjacent subgrades throughout the retaining wall replacement work.
4. This Contractor shall replace the portion of segmented retaining walls removed for installation of new utilities. Existing retaining wall blocks may be reused. If existing blocks are unsuitable for reuse, this Contractor shall provide new segmented retaining wall blocks to match existing. This Contractor shall provide new reinforcing grid, as required, to restore retaining wall integrity to original condition.
5. This Contractor shall provide new manufactured modular block retaining walls where indicated in the project documents. In addition to modular block wall, retaining wall system scope of work to includes excavation, as required for reinforced backfill zone, excavation for compacted base, compacted base, drainable backfill, and subdrainage systems.

W. **UTILITIES GENERAL**

1. All utility related work must comply with St. Louis County and Metropolitan Sewer District specifications and requirements.
2. Contractor shall coordinate and arrange for the disconnection of any utilities and equipment with the Owner and Utility Companies as required.
3. This Contractor shall provide backfill at utility trenches in accordance with the project documents.
4. This Contractor shall provide all trench protection required for utility work.
5. This Contractor shall provide all temporary fencing or barriers required for trench utility work in accordance with OSHA and Construction Manager’s Safety Program requirements.
6. Contractor shall be responsible for maintaining all required separations of water and sanitary/storm/combined sewer.
7. This Contractor shall provide saw-cutting, demolition, and replacement of any pavement and sidewalks removed for installation of utilities under this scope of work.
8. Contractor shall adjust the tops and appurtenances of all utility structures (including but not limited to manholes, valve boxes, catch basins, cleanouts, and similar utility access structures) impacted by regrading activities to match new finished grades wherever they occur.

X. **WATER UTILITIES**

1. This Contractor shall provide complete replacement of the existing domestic water utility service into the building, upstream of the meter, where indicated in the project documents.
2. This Contractor shall utilize the existing utility connection/tap; new taps are not anticipated under this scope of work.
3. This Contractor shall field verify existing domestic water line size prior to replacement to match existing size.
4. This Contractor shall provide all domestic water utility scope of work required for a complete system, in compliance with local utility provider requirements.
5. This Contractor shall provide service pipe and property valve work in accordance with utility provider requirements and the project documents.

6. This Contractor shall provide all licenses, testing, and certifications required by local agencies.
7. This Contractor shall be responsible for disinfection of new water utility piping systems in accordance with the project documents.

Y. **SANITARY SEWERAGE**

1. This Contractor shall provide complete sanitary sewer replacement scope of work in accordance with the project documents.
2. This Contractor shall reuse the existing sanitary sewer connection; removal and replacement shall begin upstream of the existing tap.
3. This Contractor shall field verify the alignment of the existing sanitary lateral with CCTV prior to construction/removal of the existing line.
4. This Contractor shall provide all sanitary sewer excavation, spoil hauling, and backfilling of utility trenches in accordance with the project documents.
5. This Contractor shall provide all licenses, testing, and certifications required by local agencies.
6. This Contractor shall provide all necessary testing of sanitary sewers as required by the project documents or local authority having jurisdiction.

Z. **STORMWATER UTILITIES**

1. This Contractor shall provide temporary storm water control measures at areas of storm water removal/modification, as required, to prevent ponding during construction until tie-in of the new permanent storm sewer system is complete.
2. This Contractor shall implement temporary stabilization measures throughout the duration of the work to prevent erosion and maintain site stability.
3. This Contractor shall provide a complete storm sewer system as specified in the project documents, including all necessary excavation, backfilling, piping, storm structures, and associated components, in accordance with design requirements, industry standards, and applicable regulations.
4. This Contractor shall modify or replace existing storm sewer structures as required to adjust for new grades in accordance with the project documents.
5. This Contractor shall provide a new playground storm and subdrainage system in accordance with the project documents.
6. This Contractor shall provide drainage tile for the cast-in-place retaining wall and connect it to the storm sewer system.

1.09 BID PACKAGE 23A – MECHANICAL

A. **ALTERNATES**

1. Alternates associated with this Bid Package include the following:
   a. None at this time

B. **ALLOWANCES**

1. Allowances associated with this Bid Package include the following:
   a. None at this time

C. **SPECIFICATIONS**

1. Specifications that relate to this bid package include all of Division 00 and Division 01 specification sections and particularly specification sections:
   a.

D. **SCOPE OF WORK GENERAL**

1. All notes on the plans pertaining to the below scope of work shall be included as part of this bid package.
2. This contractor understands this project may be completed in multiple phases in accordance with the overall project schedule over multiple mobilizations. This contractor shall review the overall project schedule and phases to ensure that appropriate manpower will be provided for each phase.

3. All Bid Packages to include all General Provisions and Special Conditions as noted in Articles 1.6 & 1.7 above.
4. This Contractor shall provide all work from the specification sections listed within this Bid Package unless specific exclusions are otherwise noted.
5. This Contractor shall field verify existing conditions prior to the commencement of work. Any discrepancies shall be brought to the attention of the Architect/Engineer/Construction Manager.
6. This Contractor is responsible for dust control and sound control measures required for the execution of this Bid Package scope of work.
7. Each Contractor shall be responsible for the daily collection and consolidation of all waste generated by their work to a designated central pile or trash receptacle, provided by **Construction Manager**, within each work space.
8. Contractor shall take care not to damage previously completed work. Any damage caused to existing building/structures by work of this Bid Package shall be repaired by this Bid Package Contractor.
9. Each Trade Contractor shall be responsible for additional costs associated with work resulting from its use of equipment/material other than that specified in the project documents. Costs for other trade contractors work to accommodate these variations shall be the responsibility of the responsible trade contractor. Approval of shop drawings does not relieve the trade contractor of this responsibility.

E. **FIRESTOPPING**
1. Each Trade Contractor shall provide penetration firestopping through rated walls and horizontal systems wherever a penetration is created by its bid package scope of work. Each Trade Contractor is responsible for providing UL approved details and materials for all applicable conditions regardless of details in plans.

F. **MECHANICAL DEMO**
1. This Contractor shall be responsible for the complete demolition and removal of mechanical systems, including but not limited to all fixtures, piping, ductwork, cabling, hangers, supports, and accessories. All demolished materials shall be transported and disposed of in dumpsters provided by the **Construction Manager** unless noted otherwise herein.
2. This Contractor shall perform all demolition scheduled, shown, or indicated to be performed by the “contractor” on MD sheets to dumpsters provided by **Construction Manager** unless noted otherwise.
3. This Contractor shall remove all existing Mechanical/HVAC equipment wherever shown, scheduled, or otherwise indicated in the project documents. The Contractor shall handle hoisting, haul-off, and lawful disposal of all demolished equipment in accordance with applicable regulations.
4. Contractor shall cut, cap, and make safe any utility connections to existing mechanical units schedule for demolition.
5. Contractor shall provide demolition of existing ductwork, air devices, hangers, wiring, etc. shown hatched and as required to dumpsters provided by General Trades.
6. This Contractor shall remove existing temperature sensors and associated control wiring back to source where indicated in the project documents. Existing sensors shall be salvaged and turned over to the Owner.
7. This Contractor shall remove existing gas piping, valves, and accessories where indicated.
8. This Contractor shall remove existing flue ductwork and termination and prepare opening for new roof penetrations. Any excess penetrations shall be capped and rendered weathertight.
9. This Contractor shall remove existing control wiring where indicated.

G. **GAS PIPING**

1. This Contractor shall provide all natural gas piping required by the project documents including all fittings, valves, tees, reducers, and final connections to meter and equipment.
2. This Contractor shall provide gas pipe roof supports for new gas lines on the roof as required.
3. This Contractor shall make all final connection of gas piping to fuel fired equipment in accordance with the project documents.
4. This Contractor shall provide seismic gas shut off valve assembly where indicated.

H. **MECHANICAL GENERAL**

1. This Contractor shall patch existing walls to match existing finish at new penetrations created under this scope of work. Patchwork to include any required joint sealants/fire rated sealants to match/maintain partition type/function.
2. Contractor shall be responsible for all Mechanical work shown on the mechanical (M) drawings shown, scheduled, or otherwise indicated to be performed by the “Contractor” unless specifically excluded herein.
3. This Contractor shall provide complete HVAC scope of work in accordance with all division 23 specifications unless specified otherwise in this specification section.
4. This Contractor shall provide all mechanical system equipment and components as specified and as indicated in the project specifications and schedules.
5. Contractor shall provide all hangers/piping support required for piping and ductwork installed under this scope of work including any seismic restraints if required by federal, state, or local codes.
6. Contractor shall provide all vibration and seismic controls for HVAC piping and equipment in accordance with the project documents. Contractor shall provide all identifications for HVAC piping and equipment in accordance with the specifications.
7. Contractor shall provide all ductwork, piping and equipment identification required by the project documents.
8. Contractor shall render any penetrations through exterior walls and roofs permanently watertight.
9. Contractor shall provide all joint sealants at fixtures, piping, and ductwork penetrations created by this scope of work in accordance with the project documents.
10. This Contractor shall provide pipe supports for mechanical system related piping and ductwork as required.

I. **MECHANICAL EQUIPMENT**

1. This Contractor shall provide all equipment mounting frames, support framing, and any associated supports required for new mechanical equipment installed under this scope of work.
2. This Contractor shall provide all mechanical equipment listed on mechanical equipment schedules unless noted otherwise. Contractor shall provide related equipment, services and components outlined in equipment schedule notes where indicated.
3. This Contractor shall provide trapped condensate drains to nearest existing roof drains or grade as specified.
4. This Contractor shall provide condensate neutralization kits where indicated.
5. This Contractor shall provide equipment support flashings wherever required.
6. This Contractor shall provide VFDs for new equipment.
7. This Contractor shall provide equipment support structures in accordance with project documents.

J. **VENTILATION**

1. This Contractor shall provide a new combustion flue routed through the existing flue penetration through the roof. This Contractor shall provide a new stainless steel hood and accessories. This Contractor shall render the penetration weathertight. Flues shall be terminated a minimum of 5'-0" above the roof with the manufacturer's approved termination.

2. This Contractor shall patch existing roofing materials if required. This Contractor shall engage a qualified roofing contractor to provide any necessary roof patches to maintain existing roof system integrity and the existing roof warranty.

K. **HYDRONIC PIPING**
1. This Contractor shall provide complete, code compliant, hyrdonic water system in accordance with the project documents.
2. This Contractor shall provide complete hydronic piping system for the mechanical equipment as specified in the project documents. All work shall be performed in accordance with applicable codes, standards, and project specifications.
3. Contractor shall make all taps and connections to existing lines where indicated or required by project documents.
4. This Contractor shall connect existing heating hot water piping to new hot water heating piping and equipment where indicated. This Contractor shall field verify existing piping locations and coordinate new piping installation accordingly.
5. Valves shall be installed at designated locations for system balancing, isolation, and maintenance. Proper supports and securing of piping shall follow industry standards.
6. This contractor shall perform system flushing, cleaning, and pressure testing before commissioning
7. This Contractor shall provide all piping insulation for piping installed under this scope of work.

L. **HVAC CONTROLS & BUILDING AUTOMATION SYSTEM (BAS)**
1. This Contractor shall coordinate and contract with **Automatic Controls (ACES)** to provide a complete, operational, and fully integrated HVAC instrumentation and controls system.
2. This scope includes all control wiring, thermostats, rough-in, cabling, device installation, termination, calibration, and device programming, together with monitoring system integration with the existing system.
3. This scope also includes control equipment for HVAC systems and components, including terminal heating and cooling units not supplied with factory-wired controls, as well as rough-in, cabling, and data outlets for mechanical equipment connected to the building automation system (BAS).
4. This Contractor shall coordinate final scope of work with ACES, and with the mechanical equipment provider, to ensure a complete and fully operational system.
5. This Contractor shall replace any damaged BAS cable or non-plenum-rated cable where existing to remain is indicated in the project documents.
6. This Contractor shall remove existing BAS controls at mechanical equipment scheduled for demolition and coordinate programming and demolition tasks with **ACES**. Existing temperature sensors and associated control wiring shall be removed, salvaged, and turned over to the Owner as specified.
7. This Contractor shall be responsible for all costs associated with integrating the new BAS system with the School District's control system, ensuring seamless operation within the existing infrastructure.

M. **START-UP & TESTING**
1. Contractor shall provide complete start-up, testing, and balancing of HVAC systems installed/modified under this scope of work in accordance with specification 230593.
2. Contractor shall provide final start-up and Owner training for all equipment provided under this scope of work.

N. **ELECTRICAL**
1. This Contractor shall provide all Electrical (Div. 26) scopes of work shown in the drawings, drawing notes, and specification sections, unless specified otherwise in this specification section.
2. This Contractor shall provide all seismic restraints for electrical-related equipment and system components in accordance with Seismic Design Category D requirements.

3. This Contractor shall provide all hangers and supports required for piping and conduit installed under this scope of work, including seismic restraints where required by federal, state, or local codes.
4. This Contractor shall be responsible for all electrical demolition work shown, scheduled, or otherwise indicated to be performed by the Contractor. This Contractor shall dispose of demolished elements in dumpsters provided by the **Construction Manager.**
5. This Contractor shall disconnect existing electrical connections to boilers and demolish associated circuits where indicated.
6. This Contractor shall disconnect existing electrical connections to pumps and remove associated feeders where indicated.
7. This Contractor shall demolish existing VFDs and feeders where indicated.
8. This Contractor shall provide new carbon monoxide detectors and integrate them into the existing fire alarm system.
9. This Contractor shall install VFDs and provide power terminations for new mechanical equipment where indicated.
10. This Contractor shall replace existing circuit breakers with new breakers where indicated.
11. This Contractor shall provide new circuit breakers for new equipment where indicated.
12. This Contractor shall provide new emergency power off (EPO) switches and associated wiring for the boilers.
13. This Contractor shall provide contactors and associated wiring for boiler control and EPO systems where indicated.
14. This Contractor shall coordinate final feeder and circuit breaker sizes with the boiler manufacturer.
15. This Contractor shall provide testing, commissioning, and start-up support for new VFDs, EPO switches, and the carbon monoxide detector integration, coordinated with the Mechanical Contractor and Controls Contractor as required.

1.10 PROJECT SCHEDULE

A. Contractor shall perform the contract work in accordance with the Construction Manager Schedule.

1.11 CONCURRENT WORK

A. Work to be scheduled and coordinated with other work being performed concurrently with this work.

1.12 COORDINATION OF WORK

A. Contractor shall verify dimensions and elevations of work performed under previous contracts. Contractor shall notify the Construction Manger immediately of any conflict in elevation or dimension. Verification shall be done in advance so Contractor's work is not delayed.

B. This Contractor shall be responsible for repair and/or replacement of work of other Contractors damaged by the Contractor's work.

C. Protect all work from collecting water and any water damage.

1.13 CONTRACT METHOD

A. The Owner intends to:
   1. Award separate contracts for each Bid Package in connection with this project, and assign those contracts to the Construction Manager.
   2. To provide a full-time Construction Manager acting as defined in the AIA Document A134-2009 and A201-2007.

B. Separate contracts shall be awarded for each Bid Package that represents significant elements of the work. Contractor work shall be performed concurrently with and/or in close coordination with work performed on the project by other Contractors.

C. Each Contractor is required to review all contract documents to determine scope of work, to be familiar with other Contractor responsibilities and report any inconsistencies or discrepancies immediately.

D. The extent of work of each Contract is briefly enumerated under “Statement of the Work” but is not necessarily limited to the summary description.

1.14 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall generally be performed during normal business working hours of 6:00 AM to 5:00 PM, Monday through Friday, accept when otherwise indicated.

B. Existing Utility Interruptions: Do not interrupt utilities servicing facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1.15 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The specifications are organized into Division and Sections using the 32-Division format and CSI/CSC “MasterFormat” numbering system.
   1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
   2. Division 1: Sections in Division 1 govern the execution of the Work of all Specification Sections

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
   2. Imperative mood and streamlined language are generally used in the Specifications. . Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
   3. The words “shall”, “shall be”, or “shall comply with,” depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.16 CONTRACTOR USE OF PREMISES

A. Confine operation at site to areas permitted by:
   1. Law
   2. Permits
   3. Contract
      a. Confer with Construction Manager and obtain full knowledge of all site rules and regulations affecting work.
      b. Conform to site rules and regulations while engaged in project construction.
      c. Site rules and regulation take precedence over others that may existing outside such jurisdiction.
      d. Employee List: The Construction Manager may examine Contractor’s list of employees, including those of his Sub-Contractors and their agents.
      e. Vehicle Use: Rigidly enforce the following:
         1) Keep all vehicles, mechanized or motorized equipment, locked at all times when parked and unattended on Owner’s premises.

2) Do not, under any circumstance, leave any vehicle unattended with motor or engine running, or with ignition key in place.
3) Parking: Permitted only in areas designated by Construction Manager.
4) All traffic control subject to Construction manager's site representative approval.

B. Do not unreasonably encumber site with materials and equipment

C. Assume full responsibility for protection and safekeeping of products stored on premises.

D. Move all stored products or equipment which interferes with operations of Owner or other Contractors.

E. Obtain and pay for use of additional storage or work needed for operations.

F. Use of Site: Exclusive and complete, for execution of work, except as otherwise indicated or directed by the Construction Manager.

G. Construction Manager will allow reasonable access to the site and shall not prohibit nor interfere with lawfully conducted inspections of site visits by properly identified representatives of regulatory agencies or collective bargaining units.
1. Notwithstanding the above, Owner regulation governing site security shall be observed.
2. All site visitors shall comply with personal protection regulations, including hard hats and safety eyewear.
3. Reasonable proof of identification and signature to the visitor's log shall be required of the visitors by the Construction Manager's site representative.

H. Fire Protection:
1. Fires: Each Contractor shall prohibit the lighting of fires about the premises and use due diligence to see that such prohibition is enforced. Debris and waste materials shall not be burned at the construction site but shall be promptly removed to prevent the accumulation of combustibles on the site or within the building.
2. Welding and Cutting: It shall be the responsibility of each Contractor to take precautionary measures to prevent fire.
3. Heaters: The heaters in Contractor's job offices shall be properly installed to protect combustible walls, floors, and roof. Salamander heaters or other types of open flame heaters shall not be used except whit the special permission of the Construction Manager and then only when such salamander or open flame heaters are maintained under constant supervision.
4. Flammables: Gasoline and other fuels shall be kept and handled in accord with NFPA and in UL Listed and Labeled Safety Cans and shall be stored away from hazardous work areas.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

June 29, 2026

Bond Architects
222 S. Central Avenue, Suite 501
St. Louis, Missouri 63105

Re: Asbestos Abatement Project Design
Ross Elementary School – *Building Renovations Project*
1150 Ross Road
St. Louis, Missouri 63146
Parkway Project Number: PN062501B
Pinchin File: R262.00457.001

Pinchin, LLC (Pinchin), was retained by Bond Architects to provide Asbestos Project Design Services in support of the planned revocation activities within Room 114 at the above referenced subject property.

Megan Kienker (State Missouri Asbestos Project Designer Certification No. 7118073025MOPDI21662) of Pinchin evaluated the available hazardous materials drawings, conducted a walkthrough of the planned work area, and collected additional suspect material not previously analyzed. Based on the findings of this assessment, no asbestos-containing materials (ACM) were identified that would be impacted or disturbed by the current planned renovation activities. Therefore, an asbestos abatement work plan is not required for the project as presently designed.

This determination is based on the project scope (as outlined in Exhibit A: Initial Information, Basic Services, and Additional Services, received on March 5, 2026) and conditions as understood at the time of this assessment. Should the project scope, design, or construction activities be modified in a manner that could affect building materials not previously evaluated, or if previously unidentified suspect materials are encountered during renovation or demolition activities, this determination shall be re-evaluated. Additional inspection and/or sampling may be necessary, and the need for an asbestos abatement work plan will be reassessed in accordance with applicable federal, state, and local regulations.

As a precaution, all contractors should be advised to cease work immediately and notify the appropriate project representative if additional suspect materials are encountered during construction.

Sincerely,
Pinchin, LLC

Megan Kienker
Environmental Project Manager

Kevin C. Roberts
Director of Operations

SECTION 012000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Correlation of Contractor submittals based on changes.

E. Procedures for permit, municipal surety bonds, and utility connection fee reimbursements.

F. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

A. Section 005000 - Contracting Forms and Supplements: Forms to be used.

B. Section 005200 - Agreement Form: Contract Sum, retainages, payment period, monetary values of unit prices.

C. Section 007200 - General Conditions: Additional requirements for progress payments, final payment, changes in the Work.

D. Document 012100 - Allowances: Payment procedures relating to allowances.

E. Section 012200 - Unit Prices: Monetary values of unit prices; Payment and modification procedures relating to unit prices.

F. Section 017800 - Closeout Submittals: Project record documents.

1.03 SCHEDULE OF VALUES

A. Format: Submit required information either in typewritten form or on electronic media printout.
   1. Form is included in Section 006000.
   2. A blank electronic form for electronic media printout is provided on the Owner's electronic document management system - Forms & Standards tab - Project Forms Library table.

B. Forms filled out by hand will not be accepted.

C. Submit initial Schedule of Values within 28 days after date established in Notice to Proceed to Owner's electronic document management system - Project Contracts tab - Submittal .
   1. Owner Review: After review by Owner, revise and resubmit corrected Schedule of Values within 7 days. Continue process until Owner accepts Schedule of Values in conformance with requirements of this section.
   2. Owner will not process Applications for Payment until Schedule of Values is approved.

D. Content: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section.
   1. Include separate line items for each of the following:
      a. Bonds.
      b. Insurance.
      c. General requirements.
      d. Overhead and profit.
      e. Record documents at 3 percent of Contract Sum.
      f. The amount of each Allowance identified in Section 012100.
   2. Round off figures to nearest one hundred dollars.
   3. Make sum of total costs of all items listed in Schedule of Values equal to Contract Sum.

E. Revise schedule to list approved Change Orders with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Format: Submit required information either in typewritten form or on electronic media printout.
   1. Form is included in Section 006000.
   2. A blank electronic form for electronic media printout is provided on the Owner's electronic document management system - Forms & Standards tab - Project Forms Library table.

C. Forms filled out by hand will not be accepted.

D. Execute certification by signature of authorized officer.

E. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

F. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

G. Submit two copies of each Application for Payment to the **Construction Manager**.
   1. Transmittal letter as specified for submittals in Section 013000.
   2. Include the following with the application:
      a. Two copies of updated Schedule of Values supporting Application for Payment.
      b. One copy of certified payroll forms for all Contractor and Subcontractor employees working on the Project Site during payment period.
      c. Once copy of construction progress schedule, revised and current as specified in Section 013000.
         1) Alternatively Contractor may submit progress schedule to Owner's electronic document management system - Project Contracts tab - Miscellaneous Documents Table no earlier than 5 days prior to submission of the Application for Payment and include a note stating such with the Application for Payment.
      d. One copy of partial release of liens from major Subcontractors and vendors beginning with second Application for Payment.
      e. Two copies of affidavits attesting to off-site stored products, if any.

H. When Owner requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.
   1. Substantiating information shall include actual vendor price quotes to Contractor.

I. Incorrect or incomplete Applications for Payment:
   1. Owner will promptly return to Contractor with a written description of which documents are incorrect or incomplete.
   2. If, in the opinion of the Owner, the incorrectness or incompleteness of the Application for Payment is minor in character, then the Owner will contact the Contractor to discuss the corrections necessary, make the corrections, and send a corrected copy of the Application for Payment to the Contractor to expedite the approval process.

1.05 MODIFICATION PROCEDURES

A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or Subcontractors of changes to the Contract Documents.

B. Supplementary Instructions:Construction Manager will issue a supplementary instruction prepared by the Architect for minor changes not involving an adjustment to the Contract Sum or Contract Time.
   1. Supplementary instructions will be issued through the Construction Managers electronic document management system.
   2. Supplementary instructions will be stored in the Owner's electronic document management system - Project Contracts tab - Supplementary Instructions table for this Project.

C. Owner Initiated Changes: Construction Manager will issue a Change Directive document that includes a detailed description of a proposed change with, if necessary, supplementary or revised drawings and specifications, proposed method of price quotation, and proposed change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a price quotation within 7 days.
   1. Execution of Change Directives:
      a. Change Directives will be issued through the Construction Manager electronic document management system.
      b. Approved Change Directives will be stored in the Owner's electronic document management system - Project Contracts tab - Change Requests table for this Project.
      c. Architect and Construction Manager shall review the Change Directive and:
         1) If in agreement with the proposed methods for changing the Contract Sum or Contract Time, the Architect and Construction Manager shall approve the Change Directive and initiate Change Order process.
         2) If not in agreement with the proposed methods for changing the Contract Sum or Contract Time, Architect or Construction Manager shall reject the Change Directive and provide reason for the rejection.
      d. Issuance and approval of Change Directive is not an authorization to begin the Work unless the Contract Sum adjustment type is Time & Material.
   2. Execution of Proposals in Response to Change Directives:
      a. Proposals in response to Change Directives will be issued through the Construction Manager's electronic document management system.
      b. Approved proposals will be stored in the Owner's electronic document management system - Project Contracts tab - Claims and Change Directive Response Proposals table for this Project.
      c. Contractor shall initiate New Claim or CD Proposal workflow by completing the required fields and attaching supporting documentation for proposal based on proposed method of price quotation and proposed change in Contract Time described in the approved Change Directive.
      d. Owner and Architect will review proposal and:
         1) If in agreement with the proposal, Owner will approve the proposal, notify Contractor, and initiate Change Order workflow no later than 2 work days from receipt.
         2) If not in agreement with the proposal, Owner will reject proposal and provide reason for the rejection no later than 2 work days from receipt.
         3) Contractor will resubmit the proposal upon conclusion of negotiations to satisfy the reason for rejection by the Owner or Architect.
         4) Owner will review resubmitted proposal and repeat execution steps described previously or cancel Change Directive if negotiations are unsuccessful.

D. Contractor Initiated Changes: Contractor may propose a change by submitting a Claim for change, with a statement describing the reason for the Claim, the effect on the Contract Sum or Contract Time or both, and with full documentation supporting the effect on Contract Sum or Contract Time or both and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 01 6000.
   1. Execution of Contractor's Claims:
      a. Contractor's Claims will be issued through the Owner's electronic document management system.
      b. Approved Claims will be stored in the Owner's electronic document management system - Project Contracts tab - Claims and Change Directive Response Proposals table for this Project.
      c. Owner and Architect will review Claim and:
         1) If in agreement with the Claim, Owner will approve the Claim, notify Contractor, and initiate Change Order workflow no later than 2 work days from receipt.

2) If not in agreement with the Claim, Owner will reject Claim and provide reason for the rejection no later than 2 work days from receipt.
3) Contractor will resubmit the Claim upon conclusion of negotiations to satisfy the reason for rejection by the Owner or Architect.
4) Owner will review Claim and repeat execution steps described previously or void Claim if negotiations prove Claim is invalid or if negotiations are unsuccessful.

E. Substantiation of Costs: Provide full information required for evaluation.
1. On request, Provide following data:
a. Quantities of products, labor, and equipment.
b. Taxes, insurance, and bonds.
c. Overhead and profit.
d. Justification for any change in Contract Time.
e. Credit for deletions from Contract, similarly documented.
2. Support each Claim for additional costs or time with additional information:
a. Origin of Claim.
b. Dates and times work was performed, and by whom.
c. Time records and wage rates paid.
d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

F. Change Orders: Owner will issue a Change Order document that includes a detailed description of a proposed change with, if necessary supplementary or revised drawings and specifications, proposed change in Contract Sum, and proposed change in Contract Time.
1. Execution of Change Orders:
a. Change Orders will be issued through the Owner's electronic document management system.
b. Approved Change Orders will be stored in the Owner's electronic document management system - Project Contracts tab - Change Orders table for this Project.
c. Architect and Contractor shall review the Change Order and:
1) If in agreement with the proposed methods for changing the Contract Sum or Contract Time, the Architect and Contractor shall approve the Change Order no later than 2 work days from receipt.
2) If not in agreement with the proposed methods for changing the Contract Sum or Contract Time, Architect or Contractor shall reject the Change Order and provide reason for rejection no later than 2 work days from receipt.
3) Owner will reissue Change Order for approval upon conclusion of negotiations to satisfy the reason for the rejection by the Architect or Contractor.

G. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item in order at the end of the schedule and adjust the Contract Sum.

H. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

I. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
1. All closeout procedures specified in Section 017000.

END OF SECTION

SECTION 012200
UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

C. Defect assessment and non-payment for rejected work.

1.02 RELATED REQUIREMENTS

A. Document 004322 - Unit Prices Form: List of Unit Prices as supplement to Bid Form

B. Section 012000 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.04 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.05 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. Take all measurements and compute quantities. Measurements and quantities will be verified by Owner.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

D. Measurement Devices:
   1. Weigh Scales: Inspected, tested and certified by the applicable state Weights and Measures department within the past year.
   2. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.
   3. Metering Devices: Inspected, tested and certified by the applicable state department within the past year.

E. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.

F. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

G. Measurement by Area: Measured by square dimension using mean length and width or radius.

H. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

I. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

J. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Architect prior to starting work.

1.06 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

B. Payment will not be made for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Products not completely unloaded from the transporting vehicle.
   4. Products placed beyond the lines and levels of the required Work.
   5. Products remaining on hand after completion of the Work.
   6. Loading, hauling, and disposing of rejected Products.

1.07 DEFECT ASSESSMENT

A. Replace Work, or portions of the Work, not complying with specified requirements.

B. If, in the opinion of Owner, it is not practical to remove and replace the Work, Owner will direct one of the following remedies:
   1. The defective Work may remain, but the unit price will be adjusted to a new unit price at the discretion of Owner.
   2. The defective Work will be partially repaired to the instructions of the Owner, and the unit price will be adjusted to a new unit price at the discretion of Owner.

C. The individual specification sections may modify these options or may identify a specific formula or percentage price reduction.

D. The authority of Owner to assess the defect and identify payment adjustment is final.

1.08 SCHEDULE OF UNIT PRICES

A. Item: A - Excavating Unsuitable Soil & Replacement With Granular Fill; Section 312316 - Excavation and Section 312323 - Fill.

B. Item: B - Excavating Unsuitable Soil In Trench & Replacement With Granular Fill; Section 312316.13 - Trenching.

C. Item: C - Provide and Install Geotechnical Stabilization Fabric; Section 312323 - Fill and 312316.13 - Trenching.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 002113 - Instructions to Bidders: Restrictions on timing of substitution requests.

B. Section 013000 - Administrative Requirements: Submittal procedures, coordination.

C. Section 016000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

D. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Restrictions on emissions of indoor substitute products.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
      a. The specified product becomes unavailable through no fault of the Contractor.
      b. The specified product or method of construction cannot be provided within the contract time.
         1) The request will not be considered if the product or method cannot be provided as a result of failure of the Contractor to pursue the Work promptly or coordinate activities properly.
      c. The specified product or method of construction cannot receive necessary approvalby authorities having jurisdiction, and the requested substitution can be approved.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
      a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.
   5. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

B. A Substitution Request for specified installer constitutes a representation that the submitter:
   1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
   1. Note explicitly any non-compliant characteristics.

D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. No specific form is required. Contractor's Substitution Request documentation must include the following:
      a. Project Information:
         1) Official project name and number, and any additional required identifiers established in Contract Documents.
      b. Substitution Request Information:
         1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
         2) Indication of whether the substitution is for cause or convenience.
         3) Issue date.
         4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
         5) Description of Substitution.
         6) Reason why the specified item cannot be provided.
         7) Differences between proposed substitution and specified item.
         8) Description of how proposed substitution affects other parts of work.
      c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
         1) Physical characteristics.
         2) In-service performance.
         3) Expected durability.
         4) Visual effect.
         5) Warranties.
         6) Other salient features and requirements.
         7) Include, as appropriate or requested, the following types of documentation:
            (a) Product Data:
            (b) Samples.
            (c) Certificates, test, reports or similar qualification data.
            (d) Drawings, when required to show impact on adjacent construction elements.
      d. Impact of Substitution:
         1) Savings to Owner for accepting substitution.
         2) Change to Contract Time due to accepting substitution.

E. Limit each request to a single proposed substitution item.
   1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Time Restrictions:
   1. Section 002113 - Instructions to Bidders specifies time restrictions and the documents required for submitting substitution requests during the bidding period.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

B. Submit request for Substitution for Convenience within 14 days of discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
    1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
    2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
    3. Bear the costs engendered by proposed substitution of:
        a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
        b. Other construction by Owner.
        c. Other unanticipated project considerations.

C. Substitutions will not be considered under one or more of the following circumstances:
    1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
    2. Without a separate written request.
    3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

A. Owner and Consultant may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Owner and Consultant will notify Contractor in writing of decision to accept or reject request.
    1. Ownerand Consultant's decision following review of proposed substitution will be noted on the submitted form.

3.05 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

END OF SECTION

SECTION 013000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Electronic document management system.

C. Preconstruction meeting.

D. Site mobilization meeting.

E. Progress meetings.

F. Subcontractor listing.

G. Construction progress schedule.

H. Progress photographs.

I. Submittals for review, information, and project closeout.

J. Number of copies of submittals.

K. Requests for Information (RFI) procedures.

L. Submittal procedures.

M. Substance abuse testing.

1.02 RELATED REQUIREMENTS

A. Section 007200 - General Conditions: Dates for applications for payment.

B. Section 013216 - Construction Progress Schedule: Form, content, and administration of schedules.

C. Section 016000 - Product Requirements: General product requirements.

D. Section 017000 - Execution and Closeout Requirements: Additional coordination requirements.

E. Section 017800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 017000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT MANAGEMENT SYSTEM

A. Owner maintains an electronic document management system for the processing and storage of project documentation.

B. Access requirements:

1. To access the electronic document management system effectively Construction Manager shall maintain an internet connection at Construction Manager's office from the Notice to Proceed date through the Substantial Completion date.
2. The electronic document management system is a web based application and is accessible through the internet with a web browser application.
3. Provide Windows Explorer version 8 or later on computers accessing the document management system as this is the only web browser supported by the system.
4. Owner will provide to the Contractor a maximum of 4 usernames to access the system.

C. Training:

1. Owner will provide an electronic version of the user manual to Construction Manager that instructs the user in a step-by-step basis how to set-up the user's web browser to access the system and to interact with the system.
2. Construction Manager shall be required to attend one two hour training session provided by Owner at Owner's facility.
    a. This requirement will be waived if Construction Manager has prior experience using Owner's electronic document management system.
3. Owner will schedule training session with Construction Manager within 3 days from Notice to Proceed date.
4. Construction Manager attendees:
    a. Project Manager.
    b. Project Superintendent.
    c. Contract representative if different from Project Manager.
        1) Contract representative is emloyee empowered to approve Construction Change Directives and Change Orders.
    d. Project secretary at Construction Manager 's option.

D. Support:
1. Any questions regarding functionality or problems experienced using the electronic document management system shall be directed to the Owner, not the software vendor.

E. Use:
1. The intent is to use the electronic document system for the following:
    a. Submission, review, comment, issuance, and filing of all contractual and technical submittals.
    b. Submission, review, response, issuance, and filing of all requests for information.
    c. Issuance and filing of all Supplementary Instructions.
    d. Submission, review, comment, approval, and filing of all Claims and Construction Change Directive response proposals.
    e. Issuance, approval, and filing of all Construction Change Directives.
    f. Issuance, approval, and filing of all Change Orders.
    g. Submission and filing of Construction Manager's Daily Project Reports.
    h. Preparation and filing of Subcontractor's listing.
    i. Mark-up and filing of record documents.
    j. Issuance, approval, and filing of the Certificate of Substantial Completion and list of items required to be completed for Final Payment.
    k. Submission, issuance, and filing of miscellaneous documents including, but not limited to meeting minutes, telephone conversation confirmations, written correspondence converted to electronic format, photographs, updated progress schedules, and other documents pertaining to the project as required in these specifications.
2. Issuance is defined as notification of document availability on electronice document system for action or review.
3. Owner, Architect, and Construction Manager shall be required to distribute documents to personnel under the respective authority of each that do not have access to the electronic document management system.
4. Approval of documents in the electronic document management system will be legally binding as if they had been signed by the approving party.

3.02 PRECONSTRUCTION MEETING

A. Owner will schedule a meeting after Notice to Proceed date.

B. Attendance Required:
1. Owner.
2. Architect.
3. Construction Manager.

4. Contractor's Superintendent.
5. Prime Contractors
6. Major Subcontractors.
7. Geotechnical Engineer.
8. Owner's Independent Testing Agency Representative if any.

C. Agenda:
1. Execution of Owner- Construction Manager Service Order Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Creation of Subontractor list in Owner's electronic document management system, schedule of values, and progress schedule.
5. Designation of personnel representing the parties to the Contract; Owner, Architect, and Contractor .
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
7. Scheduling.
8. Application for payment procedures.
9. Progress cleaning, waste removal, and waste recovery.
10. Procedures for maintaining record documents.
11. Hazardous materials notification and procedures.
12. Procedures for logging of worker OSHA 10 Hour Construction Safety & Health Training certification.
13. Scheduling activities of a Geotechnical Engineer.

D. Record minutes and submit within two days after meeting to Owner's electronic document management system as a Miscellaneous Document.
1. Meeting minutes will be stored in Owner's electronice document management system - Project Contracts tab - Miscellaneous Documents table for this Project.

3.03 SITE MOBILIZATION MEETING

A. Owner will schedule a meeting after Notice to Proceed date and prior to Contractor occupancy..

B. Attendance Required:
1. Contractor.
2. Owner.
3. Architect.
4. Special consultants.
5. Contractor's superintendent.
6. Major subcontractors.
7. Owner's Tenant Representative.

C. Agenda:
1. Use of premises by Owner and Contractor.
2. Owner's requirements and partial occupancy prior to completion.
3. Construction facilities and controls provided by Owner.
4. Temporary utilities provided by Owner.
5. Survey and building layout.
6. Security and housekeeping procedures.
7. Protection of existing facilities.
8. Waste removal and waste recovery collection locations.
9. Schedules.
10. Application for payment procedures.
11. Procedures for testing.
12. Procedures for maintaining record documents.
13. Requirements for start-up of equipment.

14. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within two days after meeting to participants, with one copy to Architect, Owner, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

A. Schedule and administer meetings between Notice to Proceed and start of the Work at the site at bi-weekly intervals.

B. Schedule and administer meetings throughout progress of the Work at weekly intervals.

C. The Owner reserves the right to lengthen the interval between progress meetings as project requirements dictate.

D. The Owner reserves the right to call for special progress meetings if the Construction Manager is falling behind on schedule or is in non-compliance with Contract requirements.

E. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

F. Attendance Required:
1. Contractor.
2. Owner.
3. Architect.
4. Special Consultants as needed.
5. Contractor's superintendent.
6. Major Subcontractors as needed.

G. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Schedule
    a. Identification of problems that impede, or will impede, planned progress.
    b. Review of submittals schedule and status of submittals.
    c. Review of RFIs log and status of responses.
    d. Review of off-site fabrication and delivery schedules, if any.
    e. Maintenance of progress schedule.
    f. Corrective measures to regain projected schedules.
    g. Planned progress during succeeding work period.
    h. Coordination of projected progress.
5. Maintenance of quality and work standards.
6. Effect of proposed changes on progress schedule and coordination.
7. Safety and security issues.
    a. Review of worker OSHA 10 Hour Construction Safety & Health Training certification logs status.
    b. Review of hazardous material notification acknowledgement logs status.
8. Housekeeping and existing facility protection issues.
    a. Waste removal and waste recovery.
9. Review of record document status.
10. Other business relating to the Work.

H. Record minutes and distribute copies within two days after meeting to participants, with one copy to Architect, Owner, participants, and those affected by decisions made.

3.05 CLOSE-OUT PROGRESS MEETINGS

A. Schedule and administer meetings between Substantial Completion and Final Completion at the Owner's offices at bi-weekly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Contractor's Superintendent as needed.
   4. Major Subcontractors as needed.

D. Agenda:
   1. Review minutes of previous meetings.
   2. Review of punch list Work progress.
   3. Field observations, problems, and decisions.
   4. Review of close-out submittals status.
      a. Extended warranties.
      b. Record document completion affidavits.
      c. Hazardous materials acknowledgement signature logs.
      d. OSHA ten hour construction safety training logs.
      e. Refrigerant management forms.
      f. Outstanding technical submittals.
      g. Consent of Surety.
   5. Other business relating to the close-out of the Work.

E. Record minutes and distribute copies within two days after meeting to participants, with one copy to Architect, Owner, participants, and those affected by decisions made.

3.06 SUBCONTRACTOR LISTING

A. Contractor shall provide a Subcontractor listing not later than 14 days after award of the Contract.

B. The listing will be input and stored in the Owner's electronic document management system - Project Contracts tab - Subcontractor table for this Project.

C. Provide the following information to complete the listing:
   1. Subcontractor company name.
   2. Primary contact name.
   3. Subcontract description identifying the work for which the Subcontractor is responsible.
   4. Subcontractor address.
   5. Telephone, cellular telephone, and facsimile numbers.
   6. Primary contact e-mail address.

3.07 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 013216

3.08 PROGRESS PHOTOGRAPHS

A. Submit new photographs at least once a month or more often to show progress of the work, within 3 days after being taken.

B. Photography Type: Digital; electronic files.

C. Provide photographs of site and construction throughout progress of work produced by Construction Manager photographer, acceptable to Owner.

D. Views:
   1. Provide non-aerial photographs from various views at each specified time, until date of Substantial Completion.
   2. Consult with Owner for instructions on views required.
   3. Provide factual presentation.
   4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

E. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
   1. Delivery Medium: Owner's document management system as a miscellaneous document.
   2. File Naming: Include project identification, date and time of view, and view identification.

3.09 REQUESTS FOR (RFI)

A. Definition: A request seeking one of the following:
   1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
   2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
      a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
      b. Do not forward requests which solely require internal coordination between subcontractors.
   2. Contractor's shall issue the RFI through the Owner's electronic document management system.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
      a. Approval of submittals (use procedures specified elsewhere in this section).
      b. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract and Section 012000 - Price and Payment Procedures).
      c. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
   2. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
   3. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
      a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

F. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
   1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

G. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
   1. The RFI with response will be stored in the Owner's electronic document management system - Project Contracts tab - RFI's table for this Project.

3.10 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B. Submit for Owner and Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below.

3.11 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Refrigerant management Contractor Information and Licensing Input form and Service Order form.
   8. Hazardous materials acknowledgement signature logs.
   9. Other types indicated.

B. Submit for Owner's and Architect's review and knowledge in accordance with SUBMITTAL PROCEDURES article below.

3.12 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 017800 - Closeout Submittals:
   1. Project record documents completion affidavit for drawings.
   2. Project record documents completion affidavit for specifications.
   3. Operation and maintenance data.
   4. Extended warranties (warranties greater than one year in length).
   5. Compliance with prevailing wage law affidavit.
   6. OSHA ten hour construction safety training log.
   7. Refrigerant management Equipment Installation/Removal Input form.
   8. Fire alarm system record of completion form, if scope of work modified the fire alarm system.
   9. Other types as indicated.

B. Submit for Owner's benefit during and after project completion.

3.13 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Documents for Information: Submit one electronic document to the Owner's electronic document management system.

C. Samples: Deliver the number specified in individual specification sections, but not less than two, under transmittal to the Owner's and Architect's business address; two of which will be retained by the Owner and the Architect respectively.
   1. Submit one electronic document of the delivery transmittal to the Owner's electronic document management system documenting physical sample delivery to Owner and Architect.
   2. After review, produce duplicates.
   3. Retained samples will not be returned to Contractor unless specifically so stated.

3.14 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Submit to Owner's electronic document management system as a Submittal.
      a. Submittals and sample submittal transmittals will be stored in the Owner's electronic document management system - Project Contracts tab - Submittals table for this Project.
   2. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on submittal.
   3. Apply Contractor's stamp, signed or initialed certifying that review, approval, 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.
      a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
   4. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. All submittals shall be due with 42 days from Notice to Proceed date unless specifically identified with a different due date in these specifications or under the following exceptions:
         1) The submittal cannot be made until a part of the Work is installed, in which case the submittal shall be made as specifically identified in these specifications, but in no case longer than 21 days from the completion of the installation.
         2) The submittal is a closeout submittal, in which case the submittal shall be made in accordance with the requirements of Section 017800 - Closeout Submittals.
   5. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. For each submittal for review, allow 14 days excluding delivery time to and from the Contractor.
   6. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   7. When revised for resubmission, identify all changes made since previous submission.
   8. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
   9. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
   10. Submittals not requested will be recognized, and will be returned "Not Reviewed",

B. Product Data Procedures:
   1. Submit only information required by individual specification sections.
   2. Collect required information into a single submittal.
   3. Submit concurrently with related shop drawing submittal.
   4. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.

2. Use of reproductions of the Contract Documents in digital data form to create shop drawings is only permitted with the expressed consent of the Architect under the terms and conditions solely determined by the Architect.
    a. Contractor shall contact the Architect directly to obtain the required permissions.
3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:
1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.15 SUBMITTAL REVIEW

A. Submittals for Review: Owner and Architect will review each submittal and comment on any exceptions, or take other appropriate action.

B. Submittals for Information: Owner and Architect will acknowledge receipt and review. See below for actions to be taken.

C. Owner's and Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

D. Architect's and his consultants' actions on items submitted for review or information:
1. Authorizing purchasing, fabrication, delivery, and installation:
    a. "Reviewed - No Exceptions"
    b. "Reviewed - Exceptions Noted"
        1) Contractor is authorized to proceed only if the review notations are incorporated.
2. Not Authorizing fabrication, delivery, and installation:
    a. "Reviewed - Exceptions Noted - Resubmit"
        1) Submittal is not in compliance with some requirements of the Contract Documents or is lacking information necessary to fully review the submittal.
        2) Resubmit the submittal with revised item or items, with review notations acknowledged and incorporated.
        3) Non-responsive resubmittals may be rejected.
    b. "Reviewed - Rejected"
        1) Submittal is substantially not in compliance with requirements of the Contract Documents.
        2) Submit a new submittal complying with requirements of the Contract Documents.
    c. "Not Reviewed - Not Applicable"
        1) Submittal is not required or is not applicable to the Project.
        2) Submit a new submittal with applicable documentation, if necessary.

3.16 SUBSTANCE ABUSE TESTING

A. Objective:
1. The objective of this Substance Abuse Testing Program is improved job site safety and morale.
2. This is not intended as a substitute for the Contractor's or Subcontractors' complete written substance abuse policy that is recommended to include other important features, including an employee education and awareness program, a supervisor training program, and an employee assistance program.

B. Contractual Requirements:
1. The Contractor shall have and enforce, as a minimum, a written Substance Abuse Program incorporating the testing requirements, terms and conditions set forth in this Substance Abuse Testing paragraph applicable to all its employees and prospective employees in order to be eligible to perform the Owner's work.

a. The Contractor and all Subcontractors shall comply with this Substance Abuse Testing paragraph.
b. Suppliers, vendors, and visitors are subject to confirmation of their abstinence from the possession or use of substances indicated in this Substance Abuse Testing paragraph.

2. Programs which meet the requirements of this Substance Abuse Testing paragraph include:
   a. St. Louis Construction Industry Substance Abuse Consortium.
   b. Unified Drug and Alcohol Testing Policy and Procedure for the Pipefitters Local Union Number 562 and the Mechanical Contractors Association of St. Louis
   c. Substance Abuse Testing Program for the Electricians Local Union Number 1 and the National Electrical Contractors Association of St. Louis.
   d. Drug and Alcohol Testing Program of the Carpenters' District Council of Greater St. Louis and Vicinity.
   e. Drug and Alcohol Testing Program of the Sheet Metal Workers Local Union 36.
   f. Eastern Missouri Laborers District Council Substance Abuse Consortium.
3. Submittal to the Owner of written evidence of enrollment in any of the previously listed programs shall satisfy the requirements with regard to pre-engagement and random testing.
4. The Substance Abuse Program will apply to the Contractor and Subcontractors' employees on the Owner's site of construction including workers, new hires, replacements, and supervisory personnel.
5. No employee or prospective employee of a Contractor or Subcontractor will be permitted to work on the Owner's site of construction unless such employee has submitted to testing as required and unless the results of such testing are negative as hereinafter defined.
6. The Contractor and each Subcontractor shall train its employees in methods that will allow them to recognize substance abusers.
7. Supervisory employees of the Contractor or Subcontractor shall be trained to take action, and to confront a substance abuser in a manner consistent with generally accepted training procedures.
8. The Contractor and each Subcontractor shall furnish to the Owner a copy of its Substance Abuse Program for review and acceptance, prior to commencement of the Work on the Owner's site of construction.
9. The costs of implementing the respective Substance Abuse Programs shall be borne by each respective Contractor or Subcontractor.
10. Suppliers, vendors, and visitors shall sign an acknowledgement indicating their abstinence from substance abuse, and their continued avoidance of violations of this paragraph 3.10 at the Owner's site of construction.
    a. The acknowledgement form is in Section - 006000.
11. In the event that an incident/accident occurs and causes the Owner, Contractor, or Subcontractor to believe that substance abuse testing should occur, suppliers, vendors, and visitors agree to submit to a substance abuse screen pursuant to the terms of this Substance Abuse Testing paragraph.
    a. Refusal to submit to substance abuse testing when requested will be grounds for the Owner, Contractor, or Subcontractor to have the supplier, vendor, or visitor permanently barred from the site of construction.

C. Definitions:
1. Positive Tests: Test results indicating the presence of legal or illegal substances at or above the Confirming Limits as set forth in this Substance Abuse Testing paragraph sub-paragraph E.1 below.
2. Negative Tests: Test results indicating that legal or illegal substances are at levels below the Confirming Limits as set forth in this Substance Abuse Testing paragraph sub-paragraph E.1 below.

3. Pre-Engagement Testing: Testing for all substances other than alcohol as set forth in this Substance Abuse Testing paragraph sub-paragraph E.1 below conducted by the Contractor or Subcontractors for their employees or prospective employees within 120 days prior to their appearance on the Owner's site of Construction.
    a. This requirement will be waived if the employee is an active member of an Owner approved pool.
4. Mandatory Follow-up Testing: Testing for all substances other than alcohol set forth in this Substance Abuse Testing paragraph sub-paragraph E.1 below, conducted by the respective Contractor or Subcontractor for their employees at a rate to insure that 100 percent of all workers are tested within a 2 year period.
    a. Employees tested under the Random Testing requirements shall have the 2 year period begin with the Random Testing date.
5. Random Testing: Testing for all substances set forth in this Substance Abuse Testing paragraph sub-paragraph E.1 below, conducted by the respective Contractor or Subcontractors for their employees at random times and with a random selection rate of at least 50 percent of Contractors' or Subcontractors' employees annually.
    a. The frequency of Random Testing for a Contractor or Subcontractors' job of less than 1 year will be adjusted proportionately to the duration of the job, but in any event at least one employee per month shall be tested.
    b. Employees selected for random testing shall report to the drug testing laboratory or collection site and provide a specimen the same day that they are notified that they have been selected.
6. For Cause Testing: Testing for all substances set forth in this Substance Abuse Testing paragraph sub-paragraph E.1 below, conducted by the Contractor or Subcontractors for their employees whose behavior on the Owner's site of construction causes either the Owner's or the respective Contractor's or Subcontractors' supervisory personnel to reasonably conclude that such behavior may result from substance abuse.
7. Post-Accident/Incident Testing: Testing for all substances set forth in this Substance Abuse Testing paragraph sub-paragraph E.1 below, conducted by the Contractor or Subcontractors for their employees involved in any accident involving off-site medical treatment or any property damage.
    a. In addition, first aid cases, or “near misses” in which injury or property damage is narrowly avoided may require testing as determined by the Owner, Contractor or Subcontractor.

D. Testing Requirements:
1. The Contractor or Subcontractor shall perform pre-engagement, mandatory follow-up, random, for cause, and post-accident/incident testing as follows:
    a. Drug Testing:
        1) A screening test (“quickie test”) may be performed on-site or at an approved testing facility, using a Food and Drug Administration (FDA) approved device for instant testing.
            (a) Persons with negative tests will be allowed to start work immediately.
            (b) Persons testing non-negative will not be allowed to begin work pending confirmation via the standard test.
            (c) If a screening test is used, specimens shall be collected and submitted for testing per this Substance Abuse Testing paragraph, sub-paragraph D.1.a.2) below.
            (d) Upon approval, a device from the approved listing provided by the Department of Transportation (DOT) may also be used.
        2) Standard drug testing must be conducted by a SAMHSA (Substance Abuse Mental Health Services Administration) certified laboratory with test results interpreted by a licensed medical review officer (MRO).
    b. Alcohol Testing:

1) The initial screen tests for alcohol shall be performed by using either a saliva test or a breathalyzer test comparable to the type used by law enforcement officials.
2) Alcohol confirmatory tests shall be performed by using either a blood alcohol test or a breathalyzer test comparable to the type used by law enforcement officials.

2. Evidence of Testing:
   a. Evidence of the negative test results of individual employees (the identity of employees testing positive shall be kept confidential) shall be furnished to the Owner, prior to commencement of work by the employer or individual employee and promptly after performance of any subsequent testing required by this this Substance Abuse Testing paragraph, in the form of:
      1) Electronic databases, all negative test results shall be included in an electronic database that will be accessible to employers and Owners. The database will include the employee's name, craft, identification number, and the date of the test.
      2) A certificate not older than 120 calendar days prior to the Notification To Proceed for pre-employment testing, signed by the testing laboratory, setting forth the nature and results of tests performed, including the employee's name, identification number, craft, and the date of the test.
      3) An identification card, signed by the respective Contractor or Subcontractor and issued to the individual employee, setting forth employee's name, and the date, nature and results of testing as reported on a certificate issued by the testing laboratory, the name of which shall also appear on the identification card; provided the affected employee authorized the issuance of such identification card.
      4) Documentation not older than 120 calendar days that the Contractor or Subcontractor is enrolled in an approved program identified in this Substance Abuse Testing paragraph, sub-paragraph B.2.
      5) Documentation not older than 120 calendar days of Contractor or Subcontractor company program that specifically identifies compliance with the requirements of this Substance Abuse Testing paragraph and encompasses 100 percent mandatory participation by Contractor or Subcontractor employees.

E. Threshold Limits:
   1. Under the five-panel test, the minimum substance abuse testing requirements for the following substances are:

SUBSTANCE	THRESHOLD LIMIT	GC/MS CONFIRMING LIMIT
Alcohol	0.04%	0.04%
Amphetamines	1,000 ng/ml	500 ng/ml
Cocaine Metabolites	300 ng/ml	150 ng/ml
Marijuana Metabolites	50 ng/ml	15 ng/ml
Opiate Metabolites	2,000 ng/ml	300 ng/ml
Phencyclidine	25 ng/ml	25 ng/ml

   2. The Owner will accept, although not required, ten-panel tests in lieu of five-panel tests. Under the ten-panel test, the minimum substance abuse testing requirements for the following substances are:

SUBSTANCE	THRESHOLD LIMIT	GC/MS CONFIRMING LIMIT
Alcohol	0.04%	0.04%
Amphetamines	1,000 ng/ml	500 ng/ml
Cocaine Matabolites	300 ng/ml	150 ng/ml
Marijuana Metabolites	50 ng/ml	15 ng/ml

Opiate Metabolites	2,000 ng/ml	300 ng/ml
Phencyclidine	25 ng/ml	25 ng/ml
Barbiturates	300 ng/ml	200 ng/ml
Benzodiazepines	300 ng/ml	200 ng/ml
Methadone	300 ng/ml	200 ng/ml
Methaqualone	300 ng/ml	200 ng/ml
Propoxyphene	300 ng/ml	200 ng/ml

3. Additionally, minimum-testing requirements for “Drugs of Choice” may be established on an individual job site basis. “Drugs of Choice” are defined as substances, in addition to the basic list set forth above, that may be found to be in significant use. If implemented, the Owner will pay for the additional testing.

F. Compliance Procedure:
   1. The Owner reserves the right to audit any Substance Abuse Program to verify compliance results within twenty-four (24) hours of the Owner's notification of intent to audit, and the Owner shall have free right of access to all relevant records of the Contractor and its Subcontractors and suppliers for this purpose, provided such record disclosures are within the scope of the Department of Health and Human Services (DHHS) guidelines pertaining to confidentiality of employee records.
   2. The Contractors' or Subcontractors' employees who receive a positive test result shall immediately leave the Owner's site of construction.
   3. The Contractors' or Subcontractors' employees who receive a confirmatory positive test result shall be prohibited from returning to any of the Owner's sites of construction until such time that said employee has successfully completed an assessment/substance abuse treatment program as submitted by the employer that is acceptable to the Owner, but no sooner than 60 days, tests negative, and if said employee agrees to submit to substance abuse testing, without prior notice, at least 1 time per quarter (with dated certificates), for at least 3 years from the date of return or the duration of the Contract, whichever is less.

G. Cooperation and Review:
   1. The Contractor's Substance Abuse Program (and the Substance Abuse Programs of its Subcontractors) shall be furnished to the Owner for review prior to starting the Work on site. The Owner reserves the right to review and have the Contractor's or Subcontractors' Substance Abuse Program amended prior to acceptance.
   2. The Contractor or Subcontractors shall provide the Owner with a monthly summary report of Program compliance.
   3. The requirements of this program related to post accident/incident testing after an injury or accident and for cause testing may be met through implementation of the Contractor's program. However, the Owner reserves the right in any circumstance to require that Contractor or Subcontractor employees be tested for cause or after an injury or accident.

H. Submittals:
   1. Submit to Owner as a single Submittal.
   2. Submittal will be stored in the Owner's electronic document management system in the Contractor's Contracts Page in the Contract Submittals table for this Project.
   3. Substance abuse company policies for Contractor and all Subcontractors as one submittal package.
   4. Substance abuse evidence of testing as required by this Substance Abuse Testing paragraph sub-paragraph D.2 for Contractor and all Subcontractors as one submittal package.
   5. Submit no later than 28 days from Notice to Proceed date but prior to beginning the Work on site.

6. For Contractor and Subcontractor employees that are added to workforce after initial submittal and are not in an approved program identified in this Substance Abuse Testing paragraph, sub-paragraph B.2 or an approved Contractor or Subcontractor program, submit evidence of testing as an electronic document attached to an e-mail prior to employee beginning the Work on site.

3.17 CONTRACTUAL SUBMITTAL SUMMARY

A. Section 005200 submittals:
   1. Agreement Between Owner and Contractor
      a. Submit 2 signed originals.
      b. Submit no later than 7 days after receipt of Agreement from Owner.

B. Section 007200 submittals:
   1. Performance and Payment Bonds
      a. Submit 1 signed original.
      b. Submit within 14 days of Notice To Proceed in the amount requested by the Owner.
      c. Submit within 14 days of the anniversary date of the Agreement in the amount requested by the Owner.
   2. Certificates of Insurance
      a. Submit 1 copy.
      b. Submit no later than 7 days after receipt of Agreement from Owner.
      c. Submit no later than 7 days after any change in coverage.
   3. Asbestos Notification Acknowledgement Forms
      a. Submit 1 copy.
      b. Submit form signed by all workers that will be working on the Project prior to beginning the Work.
      c. Submit updated form with signatures appended to original signed form whenever additional workers are to be added to the workforce on the Project.

C. Section 012000 submittals:
   1. Applications for Payment
      a. Submit 2 copies of partial or final Applications for Payment for each Work Order.
      b. Signed by a corporate officer.
      c. Final Application for Payment is due no later than 30 days after the Work Order is completed.
   2. Certified Payrolls
      a. Submit 1 copy.
      b. Submit with each partial or final Application for Payment for each Work Order.
      c. Submit Contractor and Subcontractors certified payrolls on forms accepted by the Missouri Department of Labor for employees working on the Work Order for which the Application for Payment is made.
   3. Prevailing Wage Compliance Affidavit
      a. Submit 1 copy.
      b. Submit with final Application for Payment for each Work Order.
   4. Partial Lien Waivers
      a. Submit 1 copy.
      b. Submit with each partial Application for Payment for each Work Order beginning with the second partial Application for Payment.
      c. Partial lien waivers are required from the Contractor and each Subcontractor.
   5. Final Lien Waivers
      a. Submit 1 copy.
      b. Submit with final Application for Payment for each Work Order.
      c. Final lien waivers are required from the Contractor and each Subcontractor.

D. Section 013000 submittals:

1. Preconstruction, Site Mobilization, and Progress Meeting Minutes
    a. Submit 1 copy.
    b. Submit no later than 2 days after meeting.
2. Permits
    a. Submit 1 copy.
    b. Submit no later than 7 days after receipt of the permit from the authority having jurisdiction.
3. Product Data, Shop Drawings, Samples, Certificates, Manufacturer's Instructions, Manufacturer's Fied Reports, and Erection Drawings
    a. Submit 1 electronic copy or 2 copies plus quantity required to be returned to Contractor.
    b. Submit when required in individual specification sections or where indicated on drawings and at appropriate times to meet construction schedule.
4. Contractor and Subcontractor Substance Abuse Policies
    a. Submit 1 copy.
    b. Submit no later than 28 days from Notice to Proceed date but prior to beginning the Work on site for Contractor and each Subcontractor.
5. Contractor and Subcontractor Substance Abuse Evidence of Testing
    a. Submit 1 copy.
    b. Submit no later than 28 days from Notice to Proceed date but prior to beginning the Work on site for Contractor and each Subcontractor.

E. Section 014100 submittals:
1. Immigration Documentation Certification
    a. Submit 1 copy.
    b. Submit prior to beginning any of the Work.
2. OSHA Ten Hour Construction Safety Training Log
    a. Submit 1 copy.
    b. Submit form completed for all workers that will be working on the Project prior to beginning the Work.
    c. Submit updated form with new workers appended to original form whenever additional workers are to be added to the workforce on the Project.
3. Refrigerant Management Owner's Standard Contractor Input Form
    a. Submit 1 copy.
    b. Submit no later than no later than 28 days from Notice to Proceed date but prior to beginning the Work on site.
4. Refrigerant Management Owner's Standard Equipment Installation/Removal Input Form
    a. Submit 1 copy.
    b. Use the same form for equipment installation or for equipment removal and complete as appropriate.
    c. Submit no later than 7 days after equipment installation or equipment removal.
5. Refrigerant Management Owner's Standard Service Order Form
    a. Submit 1 copy.
    b. Submit no later than 7 days after removing, addiing, or accidental venting of refrigerant.

F. Section 016000 submittals:
1. Product Substitution Request
    a. Submit 1 copy.
    b. Submit when applicable.
2. Value Engineering Proposal
    a. Submit 1 copy.
    b. Submit when applicable.

G. Section 017419 submittals:

1. Waste Disposal Reports
    a. Submit 1 copy.
    b. Submit with final Application for Payment.

H. Section 017800 submittals:
1. Record Drawings
    a. Submit 2 copies.
    b. Submit with final Application for Payment.
2. Operations and Maintenance Manuals
    a. Submit 2 copies.
    b. Submit with final Application for Payment.
3. Fire Alarm System Record Of Completion Form
    a. Submit 2 copies.
    b. Submit with final Application for Payment

END OF SECTION

SECTION 013200
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Preliminary Schedule.

B. Construction progress schedule, with network analysis diagrams and reports.

C. Construction phasing plan.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Preliminary Construction Schedule.
   2. Construction Manager's Construction Schedule.

B. Related Sections include the following:
   1. Division 1 Section "Payment Procedures" for submitting the Schedule of Values.
   2. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
   3. Division 1 Section "Submittal Procedures" for submitting schedules and reports.
   4. Division 1 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.04 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
   1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
   2. Predecessor Activity: An activity that precedes another activity in the network.
   3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.
   1. Float time is not for the exclusive use or benefit of either Owner or Construction Manager, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
   2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
   3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building, or a similar significant construction element.

H. Milestone: A key or critical point in time for reference or measurement.

I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.05 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Construction Manager's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from parties involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.01 CONSTRUCTION MANAGER CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion.
   1. Activities: Treat each separate area as a separate numbered activity for each principal element of the Work.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
   1. Phasing: Arrange list of activities on schedule by phase.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

2.02 PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for commencement of the Work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.03 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

PART 3 – EXECUTION

3.01 CONSTRUCTION MANAGER’S CONSTRUCTION SCHEDULE

A. Construction Manager's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities.
   1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
   2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.

3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
   1. Post copies in Project meeting rooms and temporary field offices.
   2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

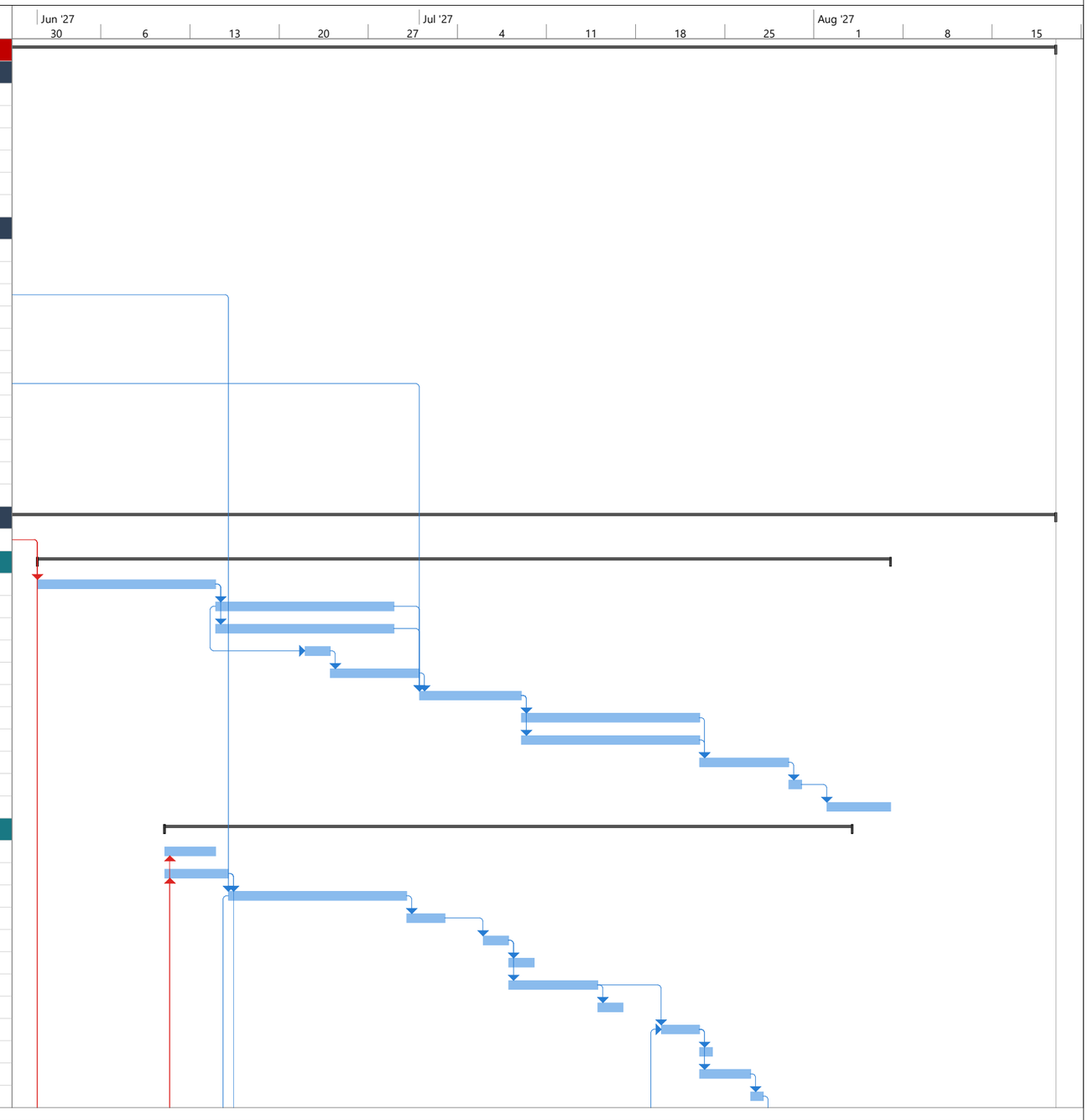
END OF SECTION

Poettker Construction

PARKWAY SCHOOL DISTRICT
ROS BLDG. RENO & SITE IMPROVEMENTS
BIDDING SCHEDULE

PARKWAY SCHOOLS

ID	Task Name	Duration	Start	Finish	Notes
1	**ROS BLDG. RENO & SITE IMPROVEMENTS**	**221 days?**	**Tue 10/13/26**	**Thu 8/19/27**	
2	**BIDDING**	**47 days**	**Tue 10/13/26**	**Wed 12/16/26**	
3	Issue for Bid	0 days	Tue 10/13/26	Tue 10/13/26	
4	Project Bidding	16 days	Tue 10/13/26	Tue 11/3/26	
5	Bid Open	0 days	Tue 11/3/26	Tue 11/3/26	
6	Bid Interviews & GMP	10 days	Wed 11/4/26	Tue 11/17/26	
7	Board Review	21 days	Wed 11/18/26	Wed 12/16/26	
8	Award	0 days	Wed 12/16/26	Wed 12/16/26	
9	**PROCUREMENT**	**115 days**	**Thu 12/17/26**	**Wed 5/26/27**	
10	Contracting & Adminstration	112 days	Thu 12/17/26	Fri 5/21/27	
11	Utilty Company Preconstruction Meeting	1 day	Mon 5/24/27	Mon 5/24/27	
12	District Notification of Water Service Shutdown	2 days	Tue 5/25/27	Wed 5/26/27	
13	**235216 - Condensing Boilers**	**60 days**	**Thu 1/14/27**	**Wed 4/7/27**	
14	235216-Submittal Development	10 days	Thu 1/14/27	Wed 1/27/27	
15	235216-Review & Approval	10 days	Thu 1/28/27	Wed 2/10/27	
16	235216-Fabricate & Delivery	40 days	Thu 2/11/27	Wed 4/7/27	
17	**OFCI - Playground Equipment**	**90 days**	**Thu 12/17/26**	**Wed 4/21/27**	
18	Purchase Order	10 days	Thu 12/17/26	Wed 12/30/26	
19	OFCI-Submittal	10 days	Thu 12/31/26	Wed 1/13/27	
20	Review & Approval	10 days	Thu 1/14/27	Wed 1/27/27	
21	OFC-Fabricate & Delivery	60 days	Thu 1/28/27	Wed 4/21/27	
22	**CONSTRUCTION**	**62 days?**	**Mon 5/24/27**	**Thu 8/19/27**	
23	Mobilization	5 days	Mon 5/24/27	Fri 5/28/27	
24	**BOILER REPLACEMENTS**	**48 days**	**Tue 6/1/27**	**Fri 8/6/27**	
25	Selective Demolition	10 days	Tue 6/1/27	Mon 6/14/27	
26	Mechanical Rough-in	10 days	Tue 6/15/27	Mon 6/28/27	
27	Electrical Rough-In	10 days	Tue 6/15/27	Mon 6/28/27	
28	Housekeeping Pads	2 days	Tue 6/22/27	Wed 6/23/27	
29	Housekeeping Pad Cure	5 days	Thu 6/24/27	Wed 6/30/27	
30	Install New Equipment	5 days	Thu 7/1/27	Thu 7/8/27	
31	Mechanical Trim-Out	10 days	Fri 7/9/27	Thu 7/22/27	
32	Electrical Trim-Out	10 days	Fri 7/9/27	Thu 7/22/27	
33	Start-Up / Test & Balance / Commissioning	5 days	Fri 7/23/27	Thu 7/29/27	
34	Punch List	1 day	Fri 7/30/27	Fri 7/30/27	
35	Corrective Actions	5 days	Mon 8/2/27	Fri 8/6/27	
36	**DOMESTIC WATER REPLACEMENT**	**37 days**	**Fri 6/11/27**	**Tue 8/3/27**	
37	Retaining Wall Demo	2 days	Fri 6/11/27	Mon 6/14/27	
38	Demo Pavement & Sidewalks	3 days	Fri 6/11/27	Tue 6/15/27	
39	Water Line Replacement	10 days	Wed 6/16/27	Tue 6/29/27	
40	Testing & Inspections	3 days	Wed 6/30/27	Fri 7/2/27	
41	Backfill	2 days	Tue 7/6/27	Wed 7/7/27	
42	Reinstall Retaining Wall	2 days	Thu 7/8/27	Fri 7/9/27	
43	Sidewalks & Curbs	5 days	Thu 7/8/27	Wed 7/14/27	
44	Brick Paver Replacement	2 days	Thu 7/15/27	Fri 7/16/27	
45	Asphalt Patching	3 days	Tue 7/20/27	Thu 7/22/27	
46	Pavement Markings & Signs	1 day	Fri 7/23/27	Fri 7/23/27	
47	Landscape Restoration	2 days	Fri 7/23/27	Mon 7/26/27	
48	Punch List	1 day	Tue 7/27/27	Tue 7/27/27	



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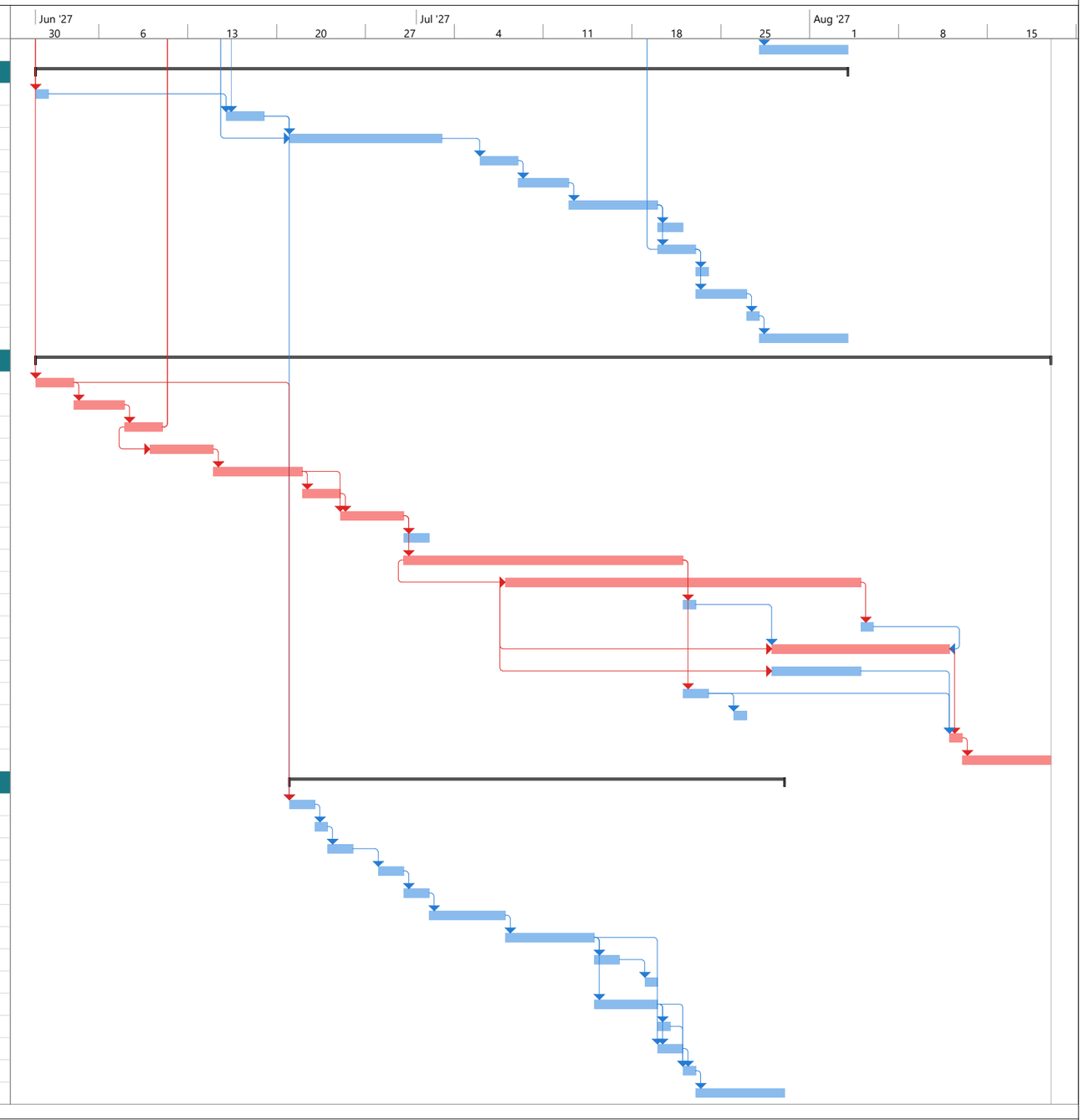
Task | Milestone | Summary | Critical | Critical Split | Progress

Poettker Construction

PARKWAY SCHOOL DISTRICT
ROS BLDG. RENO & SITE IMPROVEMENTS
BIDDING SCHEDULE

PARKWAY SCHOOLS

ID	Task Name	Duration	Start	Finish	Notes
49	Corrective Actions	5 days	Wed 7/28/27	Tue 8/3/27	
50	**SANITARY SEWER REPLACEMENT**	**45 days**	**Tue 6/1/27**	**Tue 8/3/27**	
51	CCTV Camera Existing Line	1 day	Tue 6/1/27	Tue 6/1/27	
52	Demo Trees, Pavement, Sidewalks	3 days	Wed 6/16/27	Fri 6/18/27	
53	Sanitary Sewer Replacement	10 days	Mon 6/21/27	Fri 7/2/27	
54	Testing & Inspections	3 days	Tue 7/6/27	Thu 7/8/27	
55	Backfill	2 days	Fri 7/9/27	Mon 7/12/27	
56	Sidewalks & Curbs	5 days	Tue 7/13/27	Mon 7/19/27	
57	Brick Paver Replacement	2 days	Tue 7/20/27	Wed 7/21/27	
58	Asphalt Patching	3 days	Tue 7/20/27	Thu 7/22/27	
59	Pavement Markings & Signs	1 day	Fri 7/23/27	Fri 7/23/27	
60	Landscape Restoration	2 days	Fri 7/23/27	Mon 7/26/27	
61	Punch List	1 day	Tue 7/27/27	Tue 7/27/27	
62	Corrective Actions	5 days	Wed 7/28/27	Tue 8/3/27	
63	**PLAYGROUNDS**	**57 days?**	**Tue 6/1/27**	**Thu 8/19/27**	
64	Demolish Playground Equipment & Fencing	3 days	Tue 6/1/27	Thu 6/3/27	
65	Remove Mulch, Concrete, Utilities	2 days	Fri 6/4/27	Mon 6/7/27	
66	Storm Structures & Pipe	3 days	Tue 6/8/27	Thu 6/10/27	
67	Retaining Wall Footing	3 days	Thu 6/10/27	Mon 6/14/27	
68	CIP Retaining Wall	5 days	Tue 6/15/27	Mon 6/21/27	
69	Underdrains & Backfill	3 days	Tue 6/22/27	Thu 6/24/27	
70	Perimeter Curbs	3 days	Fri 6/25/27	Tue 6/29/27	
71	Concrete Patching	2 days	Wed 6/30/27	Thu 7/1/27	
72	Small Playground Foundations & Equipment	15 days	Wed 6/30/27	Wed 7/21/27	
73	Large Playground Foundations & Equipment	20 days	Thu 7/8/27	Wed 8/4/27	
74	Small Playground Fine Grading	1 day?	Thu 7/22/27	Thu 7/22/27	
75	Large Playground Fine Trading	1 day	Thu 8/5/27	Thu 8/5/27	
76	PIP Play Surfacing	10 days	Thu 7/29/27	Wed 8/11/27	
77	Decorative Metal Fencing	5 days	Thu 7/29/27	Wed 8/4/27	
78	Landscape Restoration	2 days	Thu 7/22/27	Fri 7/23/27	
79	Chain-Link Fence	1 day	Mon 7/26/27	Mon 7/26/27	
80	Punch List	1 day	Thu 8/12/27	Thu 8/12/27	
81	Corrective Actions	5 days	Fri 8/13/27	Thu 8/19/27	
82	**PARKING LOT REPLACEMENT**	**28 days**	**Mon 6/21/27**	**Thu 7/29/27**	
83	Asphalt & Curb Removal	2 days	Mon 6/21/27	Tue 6/22/27	
84	CIP Stair & Handrail Removal	1 day	Wed 6/23/27	Wed 6/23/27	
85	Install Retaining Wall	2 days	Thu 6/24/27	Fri 6/25/27	
86	Replace Storm Structure	2 days	Mon 6/28/27	Tue 6/29/27	
87	Regrade Parking Lot	2 days	Wed 6/30/27	Thu 7/1/27	
88	Replace Curbs	3 days	Fri 7/2/27	Wed 7/7/27	
89	CIP Stairs & Sidewalk	5 days	Thu 7/8/27	Wed 7/14/27	
90	Install Handrails	2 days	Thu 7/15/27	Fri 7/16/27	
91	Paint Handrails	1 day	Mon 7/19/27	Mon 7/19/27	
92	Asphalt Paving	3 days	Thu 7/15/27	Mon 7/19/27	
93	Pavement Markings & Signs	1 day	Tue 7/20/27	Tue 7/20/27	
94	Landscape Restoration	2 days	Tue 7/20/27	Wed 7/21/27	
95	Punch List	1 day	Thu 7/22/27	Thu 7/22/27	
96	Corrective Actions	5 days	Fri 7/23/27	Thu 7/29/27	



Printed: Mon 10/12/26

Task | Milestone | Summary | Critical | Critical Split | Progress

SECTION 013553
SECURITY PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Security measures including formal security program, entry control, personnel identification, and miscellaneous restrictions.

1.02 RELATED REQUIREMENTS

A. Section 011010 - Project Summary - Bid Packages: use of premises and occupancy

B. Section 015000 - Temporary Facilities and Controls: Temporary lighting.

1.03 SECURITY PROGRAM

A. Protect Work , existing premises and Owner's operations from theft, vandalism, and unauthorized entry.

B. Initiate program in coordination with Owner's existing security system at project mobilization.

C. Maintain program throughout construction period until Owner occupancy.

1.04 ENTRY CONTROL

A. Restrict entrance of persons and vehicles into Project site and existing facilities.

B. Allow entrance only to authorized persons with proper identification.

C. Maintain log of workers and visitors, make available to Owner on request.

D. Owner will control entrance of persons and vehicles related to Owner's operations.

1.05 SECURITY IDENTIFICATION

A. Provide identification badge to each person authorized to enter premises.

B. All Contractor or Subcontractor employees working on the Project site will be required to obtain security identification badges before coming to the Project site.

C. **Failure of the Contractor or Subcontractor to enforce these security identification procedures may lead to a ban on future work with the Owner in addition to notices of non-performance.**

D. Badges may be obtained Monday through Friday after contacting the Parkway School District Security/Badging Office (Logan Gnade) at 314-415-8262, and making an appointment. The Parkway School District Security/Badging office is located at the Parkway School District Welcome Center at South Middle School, 760 Woods Mill Road, Manchester, Missouri 63011.

E. To obtain a security identification badge, the Contractor or Subcontractor employee shall be required to give their full name, present personal identification verifying their name (e.g., driver's license), give their employer's company name, and present documentation verifying their employment with the company (e.g., business card, identification letter on company letterhead, etc.).

1. During normal working hours, employment confirmation may be made by a confirming telephone call to the company.

F. Security identification badge must be kept with the Contractor or Subcontractor employee and prominently displayed while they are on the Project site.

1. The Contractor or Subcontractor employee shall prior to or immediately upon arriving at the project site to begin their work, report to the Contractor's Superintendent to present the their security identification badge and shall record the badge number on the Security Badges & OSHA 10 Hour Training Log form provided by the Contractor.
2. The security identification badge may be temporarily removed from prominent display if the security identification badge will pose a safety threat to the Contractor or Subcontractor employee as the employee carries out the Work.

3. If the Contractor or Subcontractor employee temporarily removes the security identification badge from prominent display for safety purposes, the Contractor or Subcontractor employee shall promptly present the security identification badge to any employee of the Owner that requests to see the security identification badge.

G. Failure to promptly present the security identification badge shall be grounds for instant removal of the Contractor or Subcontractor employee from the Project site until the security identification badge can be presented.

H. If the Contractor or Subcontractor employee fails to present the security identification badge a second time, the Owner will request the Contractor or Subcontractor employee to be removed from the Project site permanently.

I. Require return of badges at expiration of their employment on the Work.

1.06 SUBMITTALS

A. Owner's Standard Security Badges & OSHA 10 Hour Training Log Form is in Section 006000 - Project Forms.

B. Submit a copy of the Owner's Standard Security Badges & OSHA 10 Hour Training Log required under paragraph 1.05.F.1 of this Section prior to submitting Final Application for Payment or no later than 42 days from Substantial Completion, whichever comes first.

1.07 RESTRICTIONS

A. Do not allow cameras on site or photographs taken except by written approval of Owner.

B. Do not work prior to 6:00 a.m. or after 11:00 p.m. Monday through Friday within enclosed facility without prior approval of Owner.

C. Do not work on site or on exterior of facility outside of times allowed by local municipality or county ordinance.

D. Do not work on Saturdays, Sundays, or holidays without prior approval of Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 014100
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Owner regulatory requirements.

B. County, Municipality, and Fire District regulatory requirements.

C. State regulatory requirements.

D. Federal regulatory requirements.

1.02 OWNER

A. No Tobacco Use Policy:
   1. Owner has adopted a tobacco free site policy.
   2. No tobacco products may be used in the Owner's facilities or on the Owner's grounds.
   3. Any Contractor or Subcontractor employee discovered violating this policy may be required to leave the Project site and may not be allowed to return to the Project.

B. No Firearms Policy:
   1. Owner has adopted a firearms free site policy.
   2. No firearms may be brought in the Owner's facilities or on the Owner's grounds.
   3. Any Contractor or Subcontractor employee discovered violating this policy may be required to leave the Project site and may not be allowed to return to the Project.

C. Alcohol and Controlled Substances Policy:
   1. Owner has adopted a alcohol and controlled substance free site policy.
   2. No alcohol or controlled substances may be brought in the Owner's facilities or on the Owner's grounds.
      a. Exception: Controlled substances prescribed by a doctor specifically for the use of the Contractor or Subcontractor employee in the original prescription container will be allowed.
   3. Any Contractor or Subcontractor employee discovered violating this policy may be required to leave the Project site and may not be allowed to return to the Project.

1.03 COUNTY, MUNICIPALITY, AND FIRE DISTRICT

A. Regulatory requirements applicable to this project are the following:

B. 29 CFR 1910 - Occupational Safety and Health Standards.

C. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.

D. ADA Standards - 2010 ADA Standards for Accessible Design.

E. County of St. Louis amendments to some or all of the following.

F. Municipality where the Project is located amendments to some or all of the following.

G. Zoning Code: St. Louis County or Municipality where the project is located.

H. ICC (IBC) - International Building Code.

I. ICC A117.1 - Accessible and Usable Buildings and Facilities.

J. ICC (IBC) - ICC International Existing Building Code, 2009.

K. IAPMO (UPC) - Uniform Plumbing Code.

L. ICC (IFGC) - International Fuel Gas Code.

M. ICC (IMC) - International Mechanical Code.

N. NFPA 70 - National Electrical Code.

O. Elevator Code: State of Missouri and County of St. Louis.

P. ICC (IECC) - International Energy Conservation Code.

Q. Erosion and Sedimentation Control Regulations:Most recent edition adopted by Authority Having Jurisdiction, including all applicable amendments and supplements.

1.04 STATE

A. Prevailing Wage Law:
   1. Contractor and Subcontractors shall comply with the requirements of this paragraph 1.04 and Section 290.220 RSMo which provides that "a wage of no less than the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed, shall be paid to all workers employed by or on behalf of any public body engaged in public works exclusive of maintenance work."
   2. Contractor shall forfeit to the Owner the sum of One Hundred Dollars ($100.00) for each worker employed, for each calendar day, or portion thereof such worker is paid less than the said stipulated rates for any work done under this Contract, by the Contractor or by any Subcontractor to the Contractor.
   3. Contractor shall include provisions in all bonds to guarantee the faithful performance of the prevailing wage requirements specified herein.
   4. Contractor shall post in a prominent and easily accessible place at the Project Site during the full time that any worker shall be employed on the Project a clearly legible statement of all prevailing hourly wage rates to be paid to all workers employed in order to execute the Contract and perform the Work.
   5. Owner may request from time to time certified copies of Contractor's payroll to ascertain if Contractor is in compliance.
   6. Contractor shall execute an affidavit stating compliance with the prevailing wage law upon completion of the Project and before final payment request.
      a. The affidavit form is in Section 006000 - Project Forms.
   7. The Contractor and each Subcontractor shall maintain accurate records pertaining to wages paid all workers employed on the Project within the State of Missouri for a period of not less than 1 year following Final Acceptance by Owner.
   8. Wage Rate Determination for this Project is attached following this section.
   9. Submittals:
      a. Contractor will execute an affidavit stating compliance with the prevailing wage law upon completion of the project and before final payment request.
      b. The affidavit form is in Section 006000 - Project Forms.
      c. Submit affidavit form prior to submitting Final Application for Payment or no later than 42 days from Substantial Completion, whichever comes first.

B. Construction Safety Training Law:
   1. Contractor and Subcontractors shall comply with the requirements of 1.04 and Section 290.220 RSMo which provides that "any Contractor for any public body for purposes of construction of public works and any Subcontractor to such Contractor shall provide a ten-hour Occupational Safety and Health Administration (OSHA) construction safety program [the program] for their on-site employees which includes a course in construction safety and health approved by OSHA or a similar program approved by the department [of labor] which is at least as stringent as an approved OSHA program, unless such employees have previously completed the required program".
   2. Contractor and Subcontractors shall require all on-site workers to complete the ten-hour training program or such employees must hold documentation of prior completion of the program.
      a. Contractor shall require every on-site worker to report to the Contractor's Project Superintendent and produce documentation of successful completion of the program upon the on-site worker's first day working on the Project Site.

b. Contractor shall maintain a log of on-site workers that includes the worker's name, worker's signature, date worker began work on Project Site, company name employing worker, and training certification number on Owner's Standard OSHA 10 Hour Construction Safety & Health Training Log Form .
c. Contractor and Subcontractors shall require all on-site workers to carry documentation of successful completion of the program at all times while working on Project Site and present the documentation to the Owner's Representative when requested.

3. Contractor and Subcontractors shall require all on-site workers who have not previously completed the program to complete the program within sixty calendar days of beginning work on the Project.
   a. Any on-site worker who cannot produce documentation of successful completion of the program as required by paragraph 1.04.B.2 of this Section shall produce documentation of successful completion of the program within twenty calendar days of the initial request to present documentation.
   b. Any on-site worker who fails to present the documentation of successful completion of the program within twenty calendar days shall be removed from the Project until such time as the on-site worker can present the documentation of successful completion of the program.
4. Contractor shall forfeit as a penalty to the Owner two thousand five hundred dollars ($2,500.00) plus one hundred dollars ($100.00) for each employee employed by the Contractor or Subcontractor for each calendar day, or portion thereof, such employee is employed without the required training.
   a. The penalty will not begin to accrue until the time period in paragraphs 1.04.3 and 1.04.3.a of this Section have elapsed.
   b. Owner will withhold and retain therefrom all sums and amounts due and owing as a result of any violation of Section 292.675 RSMo when making payments to the Contractor under the Contract.
   c. Contractor may withhold from any Subcontractor sufficient sums to cover any penalties the Owner has withheld from the Contractor resulting from the Subcontractor's failure to comply with the terms of this Section.
      1) If the Contractor has made payment to the Subcontractor without withholding, the Contractor may recover from the Subcontractor the amount of the penalty resulting from the fault of the Subcontractor in an action maintained in the circuit court in the county in which the Project is located.
5. Submittals:
   a. Owner's Standard OSHA 10 Hour Construction Safety & Health Training Log Form is in Section 006000 - Project Forms.
   b. Submit a copy of the Owner's Standard OSHA 10 Hour Construction Safety & Health Training Log required under paragraph 1.04.B.2.b of this Section prior to submitting Final Application for Payment or no later than 42 days from Substantial Completion, whichever comes first.

1.05 FEDERAL

A. Immigration Documentation:
   1. The Immigration Reform and Control Act of 1986 (“IRCA”) requires all U.S. employers to verify the employment eligibility and identity of all employees as of November 6, 1986.
      a. This includes the verification of the individual's identity and work eligibility.
      b. The IRCA makes it unlawful for United States employers to knowingly hire or continue to employ unauthorized workers.
      c. Whether the illegal employment is intentional or merely due to an oversight or lack of knowledge, the employer may still be subject to fines as defined by the Department of Homeland Security.
   2. Employer Responsibility:

a. It is the employer's responsibility to ensure that the appropriate documentation is provided to every new employee hired after November 6th, 1986.
b. There are stiff penalties for not being able to provide Form I-9 for all employees upon request.
c. The employer has the right to refuse the employee their job if they are unable to furnish the required documents.
d. There are certain exceptions as to who Form I-9 is applicable for, such as independent contractors, employees hired from employment agencies, and employees hired before November 7, 1986.

3. Penalties for non compliance with Form I-9:
   a. Employers who fail to properly complete, retain, or make I-9 Forms available for inspection, face fines ranging from one hundred dollars ($100.00) to one thousand one hundred dollars ($1,100.00) per individual I-9.
   b. For employers who knowingly hire or knowingly continue to employ unauthorized workers, civil penalties range from two hundred fifty dollars ($250.00) to eleven thousand dollars ($11,000.00) per violation.
   c. For employers engaging in a pattern or practice of knowingly hiring or continuing to employ unauthorized workers, criminal penalties can be as much as three thousand dollars ($3,000.00) per unauthorized employee and/or 6 months of imprisonment.
4. Employee Responsibility:
   a. Even though the employer is responsible for providing a newly hired employee with Form I-9, the new employee must still complete Section 1 of Form I-9 by the end of the first day of work to be in compliance with the IRCA.
   b. In the event that the company is not aware of this legal requirement, it is strongly recommended that any new employee provide the employer with Form I-9 to ensure that his or her new workplace is in compliance with federal regulations.
5. Genuineness of work eligibility and identity documents:
   a. The employer must review the genuineness of the documents provided the employee. Employers may encounter the following two scenarios:
      1) A document accepted is not genuine
      2) The document accepted is genuine but does not belong to the person that provided it
   b. The employer can refuse to accept a document that does not appear to be genuine.
   c. If the prospective new employee cannot provide an acceptable document, he or she should not be allowed to continue to work.
6. Submittals:
   a. Contractor and Subcontractors shall submit a letter on their respective company letterhead, signed by authorized representative of the Contractor or Subcontractor is in compliance with the IRCA and that I-9 forms and supporting documentation are on file as required.
   b. Submit certification within 28 days from Notice to Proceed date but prior to beginning the Work on Project Site.

B. Refrigerant Management:
   1. Under Section 608 of the CAA, EPA has established regulations (40 CFR Part 82, Subpart F) that:
      a. Require service practices that maximize recovery and recycling of ozone-depleting substances (both chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) and their blends) during the servicing and disposal of air-conditioning and refrigeration equipment.
      b. Set certification requirements for refrigerant recycling and recovery equipment, technicians, and refrigerant reclaimers.
      c. Restrict the sale of refrigerant to certified technicians.

d. Require persons servicing or disposing of air-conditioning and refrigeration equipment to certify to EPA that they have acquired refrigerant recovery and/or recycling equipment and are complying with the requirements of the rule.
e. Require the repair of substantial leaks in air-conditioning and refrigeration equipment with a refrigerant charge greater than 50 pounds.
f. Establish safe disposal requirements to ensure removal of refrigerants from goods that enter the waste stream with the charge intact (e.g., motor vehicle air conditioners, home refrigerators, and room air conditioners).

2. Contractor shall complete an Owner's Standard Contractor Information and Licensing Input Form and identify all technicians that will work on equipment that uses a refrigerant.
   a. All technicians must carry a “Universal” class refrigerant technician license.
   b. Photocopies of each technician's license shall be attached to the Owner's Standard Contractor Information and Licensing Input Form.
3. Contractor shall complete an Owner's Standard Equipment Removal/Installation Input Form for each piece of equipment that uses a refrigerant removed as part of the Work.
4. Contractor shall complete an Owner's Standard Equipment Removal/Installation Input Form for each piece of equipment that uses a refrigerant installed as part of the Work.
5. Contractor shall complete an Owner's Standard Service Order Form for each removal or addition of refrigerant for each piece of equipment.
6. Disposition of Refrigerant:
   a. Contractor shall turn over all removed refrigerant to the Owner in containers conforming to DOT and EPA requirements and in good condition.
   b. Refrigerant containers shall be tagged with the name of the Contractor, the Owner's Project number, the Owner's equipment number, and the type of refrigerant in the container.
   c. Refrigerant will remain the property of the Owner.
   d. The Owner will contact the Contractor after refrigerant is transferred to Owner's storage containers to arrange time for Contractor to retrieve Contractor's refrigerant containers.
   e. Deliver refrigerant containers to the Owner at the District Operations Building, 363 North Woods Mill Road, Chesterfield, Missouri 63017, between the hours of 8:00 a.m. and 3:00 p.m. Monday through Friday.
   f. Notify Owner forty-eight hours in advance of delivery; obtain receipt from Owner at time of delivery.
7. Submittals:
   a. Contractor's transmittal form documenting delivery date, type of refrigerant, and quantity of refrigerant delivered to Owner.
   b. The following forms to be used are in Section 006000 - Project Forms:
      1) Owner's Standard Contractor Information and Licensing Input Form: submit within 28 days from Notice to Proceed date but prior to beginning the Work on Project Site.
      2) Owner's Standard Equipment Installation/Removal Input Form: submit all equipment forms as one submittal package prior to Substantial Completion date.
      3) Owner's Standard Service Order Form: submit all service order forms for removing, addiing, or accidental venting of refrigerant as one submittal package prior to Substantial Completion date.

1.06 RELATED REQUIREMENTS

A. Section 014000 - Quality Requirements.

1.07 QUALITY ASSURANCE

A. Contractor's Designer Qualifications: Refer to Section - 014000 - Quality Requirements.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 014100
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Owner regulatory requirements.

B. County, Municipality, and Fire District regulatory requirements.

C. State regulatory requirements.

D. Federal regulatory requirements.

1.02 OWNER

A. No Tobacco Use Policy:
   1. Owner has adopted a tobacco free site policy.
   2. No tobacco products may be used in the Owner's facilities or on the Owner's grounds.
   3. Any Contractor or Subcontractor employee discovered violating this policy may be required to leave the Project site and may not be allowed to return to the Project.

B. No Firearms Policy:
   1. Owner has adopted a firearms free site policy.
   2. No firearms may be brought in the Owner's facilities or on the Owner's grounds.
   3. Any Contractor or Subcontractor employee discovered violating this policy may be required to leave the Project site and may not be allowed to return to the Project.

C. Alcohol and Controlled Substances Policy:
   1. Owner has adopted a alcohol and controlled substance free site policy.
   2. No alcohol or controlled substances may be brought in the Owner's facilities or on the Owner's grounds.
      a. Exception: Controlled substances prescribed by a doctor specifically for the use of the Contractor or Subcontractor employee in the original prescription container will be allowed.
   3. Any Contractor or Subcontractor employee discovered violating this policy may be required to leave the Project site and may not be allowed to return to the Project.

1.03 COUNTY, MUNICIPALITY, AND FIRE DISTRICT

A. Regulatory requirements applicable to this project are the following:

B. 29 CFR 1910 - Occupational Safety and Health Standards.

C. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.

D. ADA Standards - 2010 ADA Standards for Accessible Design.

E. County of St. Louis amendments to some or all of the following.

F. Municipality where the Project is located amendments to some or all of the following.

G. Zoning Code: St. Louis County or Municipality where the project is located.

H. ICC (IBC) - International Building Code.

I. ICC A117.1 - Accessible and Usable Buildings and Facilities.

J. ICC (IBC) - ICC International Existing Building Code, 2009.

K. IAPMO (UPC) - Uniform Plumbing Code.

L. ICC (IFGC) - International Fuel Gas Code.

M. ICC (IMC) - International Mechanical Code.

N. NFPA 70 - National Electrical Code.

O. Elevator Code: State of Missouri and County of St. Louis.

P. ICC (IECC) - International Energy Conservation Code.

Q. Erosion and Sedimentation Control Regulations:Most recent edition adopted by Authority Having Jurisdiction, including all applicable amendments and supplements.

1.04 STATE

A. Prevailing Wage Law:
   1. Contractor and Subcontractors shall comply with the requirements of this paragraph 1.04 and Section 290.220 RSMo which provides that "a wage of no less than the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed, shall be paid to all workers employed by or on behalf of any public body engaged in public works exclusive of maintenance work."
   2. Contractor shall forfeit to the Owner the sum of One Hundred Dollars ($100.00) for each worker employed, for each calendar day, or portion thereof such worker is paid less than the said stipulated rates for any work done under this Contract, by the Contractor or by any Subcontractor to the Contractor.
   3. Contractor shall include provisions in all bonds to guarantee the faithful performance of the prevailing wage requirements specified herein.
   4. Contractor shall post in a prominent and easily accessible place at the Project Site during the full time that any worker shall be employed on the Project a clearly legible statement of all prevailing hourly wage rates to be paid to all workers employed in order to execute the Contract and perform the Work.
   5. Owner may request from time to time certified copies of Contractor's payroll to ascertain if Contractor is in compliance.
   6. Contractor shall execute an affidavit stating compliance with the prevailing wage law upon completion of the Project and before final payment request.
      a. The affidavit form is in Section 006000 - Project Forms.
   7. The Contractor and each Subcontractor shall maintain accurate records pertaining to wages paid all workers employed on the Project within the State of Missouri for a period of not less than 1 year following Final Acceptance by Owner.
   8. Wage Rate Determination for this Project is attached following this section.
   9. Submittals:
      a. Contractor will execute an affidavit stating compliance with the prevailing wage law upon completion of the project and before final payment request.
      b. The affidavit form is in Section 006000 - Project Forms.
      c. Submit affidavit form prior to submitting Final Application for Payment or no later than 42 days from Substantial Completion, whichever comes first.

B. Construction Safety Training Law:
   1. Contractor and Subcontractors shall comply with the requirements of 1.04 and Section 290.220 RSMo which provides that "any Contractor for any public body for purposes of construction of public works and any Subcontractor to such Contractor shall provide a ten-hour Occupational Safety and Health Administration (OSHA) construction safety program [the program] for their on-site employees which includes a course in construction safety and health approved by OSHA or a similar program approved by the department [of labor] which is at least as stringent as an approved OSHA program, unless such employees have previously completed the required program".
   2. Contractor and Subcontractors shall require all on-site workers to complete the ten-hour training program or such employees must hold documentation of prior completion of the program.
      a. Contractor shall require every on-site worker to report to the Contractor's Project Superintendent and produce documentation of successful completion of the program upon the on-site worker's first day working on the Project Site.

b. Contractor shall maintain a log of on-site workers that includes the worker's name, worker's signature, date worker began work on Project Site, company name employing worker, and training certification number on Owner's Standard OSHA 10 Hour Construction Safety & Health Training Log Form .
c. Contractor and Subcontractors shall require all on-site workers to carry documentation of successful completion of the program at all times while working on Project Site and present the documentation to the Owner's Representative when requested.

3. Contractor and Subcontractors shall require all on-site workers who have not previously completed the program to complete the program within sixty calendar days of beginning work on the Project.
   a. Any on-site worker who cannot produce documentation of successful completion of the program as required by paragraph 1.04.B.2 of this Section shall produce documentation of successful completion of the program within twenty calendar days of the initial request to present documentation.
   b. Any on-site worker who fails to present the documentation of successful completion of the program within twenty calendar days shall be removed from the Project until such time as the on-site worker can present the documentation of successful completion of the program.
4. Contractor shall forfeit as a penalty to the Owner two thousand five hundred dollars ($2,500.00) plus one hundred dollars ($100.00) for each employee employed by the Contractor or Subcontractor for each calendar day, or portion thereof, such employee is employed without the required training.
   a. The penalty will not begin to accrue until the time period in paragraphs 1.04.3 and 1.04.3.a of this Section have elapsed.
   b. Owner will withhold and retain therefrom all sums and amounts due and owing as a result of any violation of Section 292.675 RSMo when making payments to the Contractor under the Contract.
   c. Contractor may withhold from any Subcontractor sufficient sums to cover any penalties the Owner has withheld from the Contractor resulting from the Subcontractor's failure to comply with the terms of this Section.
      1) If the Contractor has made payment to the Subcontractor without withholding, the Contractor may recover from the Subcontractor the amount of the penalty resulting from the fault of the Subcontractor in an action maintained in the circuit court in the county in which the Project is located.
5. Submittals:
   a. Owner's Standard OSHA 10 Hour Construction Safety & Health Training Log Form is in Section 006000 - Project Forms.
   b. Submit a copy of the Owner's Standard OSHA 10 Hour Construction Safety & Health Training Log required under paragraph 1.04.B.2.b of this Section prior to submitting Final Application for Payment or no later than 42 days from Substantial Completion, whichever comes first.

1.05 FEDERAL

A. Immigration Documentation:
   1. The Immigration Reform and Control Act of 1986 (“IRCA”) requires all U.S. employers to verify the employment eligibility and identity of all employees as of November 6, 1986.
      a. This includes the verification of the individual's identity and work eligibility.
      b. The IRCA makes it unlawful for United States employers to knowingly hire or continue to employ unauthorized workers.
      c. Whether the illegal employment is intentional or merely due to an oversight or lack of knowledge, the employer may still be subject to fines as defined by the Department of Homeland Security.
   2. Employer Responsibility:

a. It is the employer's responsibility to ensure that the appropriate documentation is provided to every new employee hired after November 6th, 1986.
b. There are stiff penalties for not being able to provide Form I-9 for all employees upon request.
c. The employer has the right to refuse the employee their job if they are unable to furnish the required documents.
d. There are certain exceptions as to who Form I-9 is applicable for, such as independent contractors, employees hired from employment agencies, and employees hired before November 7, 1986.

3. Penalties for non compliance with Form I-9:
   a. Employers who fail to properly complete, retain, or make I-9 Forms available for inspection, face fines ranging from one hundred dollars ($100.00) to one thousand one hundred dollars ($1,100.00) per individual I-9.
   b. For employers who knowingly hire or knowingly continue to employ unauthorized workers, civil penalties range from two hundred fifty dollars ($250.00) to eleven thousand dollars ($11,000.00) per violation.
   c. For employers engaging in a pattern or practice of knowingly hiring or continuing to employ unauthorized workers, criminal penalties can be as much as three thousand dollars ($3,000.00) per unauthorized employee and/or 6 months of imprisonment.
4. Employee Responsibility:
   a. Even though the employer is responsible for providing a newly hired employee with Form I-9, the new employee must still complete Section 1 of Form I-9 by the end of the first day of work to be in compliance with the IRCA.
   b. In the event that the company is not aware of this legal requirement, it is strongly recommended that any new employee provide the employer with Form I-9 to ensure that his or her new workplace is in compliance with federal regulations.
5. Genuineness of work eligibility and identity documents:
   a. The employer must review the genuineness of the documents provided the employee. Employers may encounter the following two scenarios:
      1) A document accepted is not genuine
      2) The document accepted is genuine but does not belong to the person that provided it
   b. The employer can refuse to accept a document that does not appear to be genuine.
   c. If the prospective new employee cannot provide an acceptable document, he or she should not be allowed to continue to work.
6. Submittals:
   a. Contractor and Subcontractors shall submit a letter on their respective company letterhead, signed by authorized representative of the Contractor or Subcontractor is in compliance with the IRCA and that I-9 forms and supporting documentation are on file as required.
   b. Submit certification within 28 days from Notice to Proceed date but prior to beginning the Work on Project Site.

B. Refrigerant Management:
   1. Under Section 608 of the CAA, EPA has established regulations (40 CFR Part 82, Subpart F) that:
      a. Require service practices that maximize recovery and recycling of ozone-depleting substances (both chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) and their blends) during the servicing and disposal of air-conditioning and refrigeration equipment.
      b. Set certification requirements for refrigerant recycling and recovery equipment, technicians, and refrigerant reclaimers.
      c. Restrict the sale of refrigerant to certified technicians.

d. Require persons servicing or disposing of air-conditioning and refrigeration equipment to certify to EPA that they have acquired refrigerant recovery and/or recycling equipment and are complying with the requirements of the rule.
e. Require the repair of substantial leaks in air-conditioning and refrigeration equipment with a refrigerant charge greater than 50 pounds.
f. Establish safe disposal requirements to ensure removal of refrigerants from goods that enter the waste stream with the charge intact (e.g., motor vehicle air conditioners, home refrigerators, and room air conditioners).

2. Contractor shall complete an Owner's Standard Contractor Information and Licensing Input Form and identify all technicians that will work on equipment that uses a refrigerant.
   a. All technicians must carry a “Universal” class refrigerant technician license.
   b. Photocopies of each technician's license shall be attached to the Owner's Standard Contractor Information and Licensing Input Form.
3. Contractor shall complete an Owner's Standard Equipment Removal/Installation Input Form for each piece of equipment that uses a refrigerant removed as part of the Work.
4. Contractor shall complete an Owner's Standard Equipment Removal/Installation Input Form for each piece of equipment that uses a refrigerant installed as part of the Work.
5. Contractor shall complete an Owner's Standard Service Order Form for each removal or addition of refrigerant for each piece of equipment.
6. Disposition of Refrigerant:
   a. Contractor shall turn over all removed refrigerant to the Owner in containers conforming to DOT and EPA requirements and in good condition.
   b. Refrigerant containers shall be tagged with the name of the Contractor, the Owner's Project number, the Owner's equipment number, and the type of refrigerant in the container.
   c. Refrigerant will remain the property of the Owner.
   d. The Owner will contact the Contractor after refrigerant is transferred to Owner's storage containers to arrange time for Contractor to retrieve Contractor's refrigerant containers.
   e. Deliver refrigerant containers to the Owner at the District Operations Building, 363 North Woods Mill Road, Chesterfield, Missouri 63017, between the hours of 8:00 a.m. and 3:00 p.m. Monday through Friday.
   f. Notify Owner forty-eight hours in advance of delivery; obtain receipt from Owner at time of delivery.
7. Submittals:
   a. Contractor's transmittal form documenting delivery date, type of refrigerant, and quantity of refrigerant delivered to Owner.
   b. The following forms to be used are in Section 006000 - Project Forms:
      1) Owner's Standard Contractor Information and Licensing Input Form: submit within 28 days from Notice to Proceed date but prior to beginning the Work on Project Site.
      2) Owner's Standard Equipment Installation/Removal Input Form: submit all equipment forms as one submittal package prior to Substantial Completion date.
      3) Owner's Standard Service Order Form: submit all service order forms for removing, addiing, or accidental venting of refrigerant as one submittal package prior to Substantial Completion date.

1.06 RELATED REQUIREMENTS

A. Section 014000 - Quality Requirements.

1.07 QUALITY ASSURANCE

A. Contractor's Designer Qualifications: Refer to Section - 014000 - Quality Requirements.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

Missouri
Division of Labor Standards
WAGE AND HOUR SECTION

MIKE KEHOE, Governor

Annual Wage Order No. 33

Section 100
ST. LOUIS COUNTY

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by
Logan Hobbs, Director
Division of Labor Standards

Filed With Secretary of State: **March 10, 2026**

Last Date Objections May Be Filed: **April 9, 2026**

Prepared by Missouri Department of Labor and Industrial Relations

ST. LOUIS COUNTY

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$72.26
Boilermaker	$44.93*
Bricklayer - Stone Mason	$65.89
Carpenter	$69.38
Lather	
Linoleum Layers & Cutter	
Millwright	
Pile Driver	
Cement Mason	$61.40
Plasterer	
Communication Technician	$67.84
Electrician (Inside Wireman)	$79.41
Electrician (Outside Lineman)	$44.93*
Outside - Groundman	
Outside - Groundman Tree Trimmer	
Outside - Lineman Operator	
Outside - Lineman Tree Trimmer	
Elevator Constructor	$106.30
Glazier	$71.63
Iron Worker	$75.80
Laborer	$58.92
Laborer - First Semi-Skilled	
Laborer - General	
Laborer - Second Semi-Skilled	
Laborer - Skilled	
Mason	$57.31
Marble Finisher	
Marble Mason	
Terrazzo Finisher	
Terrazzo Worker	
Tile Finisher	
Tile Setter	
Operating Engineer	$76.62
Operating Engineer - Group I	
Operating Engineer - Group II	
Operating Engineer - Group III	
Operating Engineer - Group III - A	
Operating Engineer - Group IV	
Operating Engineer - Group V	
Painter	$57.67
Plumber	$83.99
Pipe Fitter	
Roofer/WaterProofer	$62.13
Sheet Metal Worker	$78.63
Sprinkler Fitter - Fire Protection	$88.12
Truck Driver	$44.93*
Truck Control Service Driver	
Truck Driver, Teamsters Group I	
Truck Driver, Teamsters Group II	
Truck Driver, Teamsters Group III	
Truck Driver, Teamsters Group IV	

*** The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.**

****The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in RSMo Section 290.210.**

ST. LOUIS COUNTY

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	$70.28
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$77.51
Outside - Groundman	
Outside - Groundman Tree Trimmer	
Outside - Lineman Operator	
Outside - Lineman Tree Trimmer	
Laborer	$59.45
Laborer - General	
Laborer - Skilled	
Operating Engineer	$76.52
Operating Engineer - Group I	
Operating Engineer - Group II	
Operating Engineer - Group III	
Operating Engineer - Group IV	
Truck Driver	$40.45
Truck Control Service Driver	
Truck Driver, Teamsters Group I	
Truck Driver, Teamsters Group II	
Truck Driver, Teamsters Group III	
Truck Driver, Teamsters Group IV	

Use Heavy Construction Rates on Highway and Heavy construction in accordance iwth the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title shown on the Building Construction Rate Sheet.

***The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.**

****The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title.**

OVERTIME
and
HOLIDAYS

OVERTIME

For all work performed on a Sunday or a holiday, not less than twice (2x) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work.

For all overtime work performed, not less than one and one-half (1½) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work or contractual obligation. For purposes of this subdivision, **"overtime work"** shall include work that exceeds ten hours in one day and work in excess of forty hours in one calendar week; and

A thirty-minute lunch period on each calendar day shall be allowed for each worker on a public works project, provided that such time shall not be considered as time worked.

HOLIDAYS

January first;
The last Monday in May;
July fourth;
The first Monday in September;
November eleventh;
The fourth Thursday in November; and
December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

SECTION 014216
DEFINITIONS

PART 1 GENERAL

1.01 SUMMARY

A. This section supplements the definitions contained in the General Conditions.

B. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

A. Contract: Same as Agreement.

B. Furnish: To supply, deliver, unload, and inspect for damage.

C. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.

D. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

E. Project Manual: The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the specifications.

F. Provide: To furnish and install.

G. Supply: Same as Furnish.

H. Other Secification Sections

1. Approve: The term "approved," where used in conjunction with the Owner's Representative's action on the Contractor's submittals, applications, and requests, is limited to the responsibilities and duties of the Architect stated in General and Supplementary Conditions. Such approval shall not release the Contractor from responsibility to fulfill Contract Document requirements, unless otherwise provided in the Contract Documents.
2. Directed: Terms such as "directed", "requested", "authorized", "selected", "approved", "required", and "permitted" mean "directed by the Owner's Representative", "requested by the "Owner's Representative", and similar phrases. However, no implied meaning shall be interpreted to extend the Owner's Representative's responsibility into the Contractor's area of construction supervision.
3. Furnish: The term "furnish" is used to mean, "supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations."
4. Foreman: This is the Contractor's Representative at the work site. This person will generally be the Competent Person required by OSHA in 29 CFR 1926.
5. General Superintendent: This is the Contractor's Representative supervising multiple project sites or on large scale project. This person may be the Competent Person required by OSHA in 29 CFR 1926.
6. Indicated: This term refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in Specifications, and similar requirements in Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help locate the reference; no limitation on location is intended except as specifically noted.
7. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations."
8. Installer: An "installer" is an entity engaged by the Contractor, either as an employee, subcontractor or sub subcontractor for performance of a particular construction activity, including installation, erection, application and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

9. Owner's Representative: This is the entity described as the "Architect" in AIA Document A201 "General Conditions of the Contract for Construction." All references to Architect or Engineer in the Contract Documents in all cases refer to the Owner's Representative. The Owner's Representative will represent the Owner during construction and until final payment is due. The Owner's Representative will advise and consult with the Owner. The Owner's instructions to the Contractor will be forwarded through the Owner's Representative.
10. Project Administrator: This is the entity described as the "Project Representative" in AIA Document A201 "General Conditions of the Contract for Construction," or is the entity described as "Engineer" in Engineers Joint Contract Document Committee (EJCDC) Document 1910-8 "Standard General Conditions of the Construction Contract." The Project Administrator is a full time representative of the Owner at the job site with authority to stop the work upon verbal order if requirements of the Contract Documents are not met, or if in the sole judgment of the Project Administrator, Owner's Representative, Owner, the interests of the Owner, safety of any person or the Owner's property are jeopardized by the work. The Project Administrator is different from the position of Owner's Representative as used in these documents, the latter having more limited authority in general and specifically not having authority to stop the work.
11. Project Site is the space available to the Contractor for performance of the work, either exclusively or in conjunction with others performing other construction as part of the project.
12. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."
13. Regulation: The term "Regulations" includes laws, statutes, ordinances, patents, royalties and lawful orders issued by authorities having jurisdiction, as well as rules, conventions and agreements within the construction industry that control performance of the Work, whether they are lawfully imposed by authorities having jurisdiction or not.
14. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the project site or elsewhere, and to report on, and, if required, to interpret, results of those inspections or tests.+

1.03 ASSIGNMENT OF SPECIALISTS

A. This Specification requires that certain specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and the assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.

B. This requirement should not be interpreted to conflict with enforcement of building codes or regulations governing the work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

C. Trades: Use of titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

1.04 INDUSTRY STANDARDS

A. Applicability of Standards: Except where Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into Contract Documents. Such standards are made a part of the Contract Documents by reference. Individual Sections indicate which codes and standards the Contractor must keep available at the Project Site for reference.

B. Referenced industry standards take precedence over standards that are not referenced but recognized in the construction industry as applicable.

C. Unreferenced industry standards are not directly applicable to the work, except as a general requirement of whether the work complies with recognized construction industry standards.

D. Publication Dates: Where compliance with an industry standard is required, comply with standard in effect as of date of execution of the work.

E. Updated Standards: At the request of the Owner, Contractor may submit a Change Order proposal where applicable code or standard has been revised and reissued after the date of the Contract Documents and before performance of Work affected. The Owner will decide whether to issue a Change Order to proceed with the updated standard.

F. Conflicting Requirements: Where compliance with two or more standards is specified, and they establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced, unless the Contract Documents indicate otherwise. Refer requirements that are different, but apparently equal, and uncertainties as to which quality level is more stringent to the Owner for a decision before proceeding.

G. Minimum Quantities or Quality Levels: In every instance the quantity or quality level shown or specified shall be the minimum to be provided or performed. The actual installation may comply exactly, within specified tolerances, with the minimum quantity or quality specified, or it may exceed that minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum values, as noted, as appropriate for the context of the requirements. Refer instances of uncertainty to the Owner for decision before proceeding.

H. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entities' construction activity. Copies of applicable standards are not bound with the Contract Documents.

I. Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.

J. Although copies of standards needed for enforcement of requirements may be part of required submittals, the Owner reserves the right to require the Contractor to submit additional copies as necessary for enforcement of requirements.

K. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where acronyms or abbreviations are used in the Specifications or other Contract Documents they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Dewatering
B. Temporary utilities.
C. Temporary telecommunications services.
D. Temporary sanitary facilities.
E. Temporary Controls: Barriers and enclosures.
F. Security requirements.
G. Vehicular access and parking.
H. Waste removal facilities and services.
I. Project identification sign.
J. Field offices.

1.02 RELATED REQUIREMENTS

A. Section 015100 - Temporary Utilities.
B. Section 015213 - Field Offices and Sheds.
C. Section 015500 - Vehicular Access and Parking.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

1.04 DEWATERING

A. Provide temporary means and methods for dewatering all temporary facilities and controls.
B. Maintain temporary facilities in operable condition.

1.05 TEMPORARY UTILITIES - SEE SECTION 015100

1.06 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
B. Telecommunications services shall include:
    1. Windows-based personal computer dedicated to project telecommunications, with necessary software and printer.
    2. Telephone Land Lines: One line, minimum; one handset per line.
        a. Land line requirement will be waived if Contractor's Superintendent has dedicated cellular telephone.
    3. Internet Connections: Minimum of one; DSL modem or faster.
        a. If Contractor is allowed to use Owner's existing facility for a field office, then Contractor may access Owner's internet connection at no cost to Contractor.

1.07 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
B. Maintain daily in clean and sanitary condition.

1.08 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.09 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings as indicated 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.

B. Construction: Framing and plywood or gypsum board sheet materials with closed joints and sealed edges at intersections with existing surfaces as indicated on drawings.
   1. Maximum flame spread rating of 75 in accordance with ASTM E84.

1.10 SECURITY - SEE SECTION 013553

1.11 VEHICULAR ACCESS AND PARKING - SEE SECTION 015500

1.12 WASTE REMOVAL

A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

C. Provide containers with lids. Remove trash from site periodically as containers are filled.

D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.13 PROJECT IDENTIFICATION

A. Provide project identification sign of design and construction indicated on drawings.

B. Erect on site at location indicated.

C. No signs are allowed without Owner permission except those required by law.

1.14 FIELD OFFICES - SEE SECTION 015213

1.15 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 015100
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heat, ventilation, and water.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction.

1.04 TEMPORARY ELECTRICITY

A. Cost: By Owner.

B. Connect to Owner's existing power service.
   1. Do not disrupt Owner's need for continuous service.
   2. Exercise measures to conserve energy.

C. Provide temporary electric feeder from existing building electrical service at location as directed.

D. Power Service Characteristics: TBD volt, TBD ampere, three phase, four wire.

E. Complement existing power service capacity and characteristics as required.

F. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. Provide flexible power cords as required.

G. Provide main service disconnect and over-current protection at convenient location .

H. Permanent convenience receptacles may be utilized during construction.

I. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.05 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain LED, compact fluorescent, or high-intensity discharge lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.

B. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.

C. Provide and maintain 0.25 watt/sq ft H.I.D. lighting to interior work areas after dark for security purposes.

D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

E. Maintain lighting and provide routine repairs.

F. Permanent building lighting may be utilized during construction.

1.06 TEMPORARY HEATING

A. Cost of Energy: By Owner.

B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.

C. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

D. Owner's existing heat plant may be used.
   1. Exercise measures to conserve energy.
   2. Enclose building prior to activating temporary heat.

E. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.07 TEMPORARY COOLING

A. Cost of Energy: By Owner.

B. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.

C. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

D. Owner's existing cooling plant may be used.
   1. Exercise measures to conserve energy.
   2. Enclose building prior to activating temporary cooling.

E. Prior to operation of permanent equipment for temporary cooling purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.08 TEMPORARY VENTILATION

A. Utilize existing ventilation equipment. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

1.09 TEMPORARY WATER SERVICE

A. Cost of Water Used: By Owner.

B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

C. Connect to existing water source.
   1. Exercise measures to conserve water.
   2. Provide separate metering and reimburse Owner for cost of water used.

D. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 015500
VEHICULAR ACCESS AND PARKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Access roads.

B. Parking.

C. Existing pavements and parking areas.

D. Permanent pavements and parking facilities.

E. Construction parking controls.

F. Flag persons.

G. Flares and lights.

H. Haul routes.

I. Traffic signs and signals.

J. Maintenance.

K. Removal, repair.

L. Mud from site vehicles.

1.02 RELATED REQUIREMENTS

A. Section 011010 - Project Summary - Bid Packages: For access to site, work sequence, and occupancy

B. Section 312200 - Grading: Specifications for earthwork and paving bases.

PART 2 PRODUCTS

2.01 MATERIALS

A. Temporary Construction: Contractor's option.

B. Materials for Permanent Construction: As specified in product specification sections, including earthwork, paving base, and topping.

2.02 SIGNS, SIGNALS, AND DEVICES

A. Stock Post Mounted and Wall Mounted Traffic Control and Informational Signs:

B. Traffic Control Signals: As approved by local jurisdictions.

C. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.

D. Flag Person Equipment: As required by local jurisdictions.

PART 3 EXECUTION

3.01 PREPARATION

A. Clear areas, provide surface and storm drainage of road, parking, area premises, and adjacent areas.

3.02 ACCESS ROADS

A. Use of existing on-site streets and driveways for construction traffic is permitted.

B. Tracked vehicles not allowed on paved areas.

C. Construct new temporary all-weather access roads from public thoroughfares to serve construction area, of a width and load bearing capacity to provide unimpeded traffic for construction purposes.

D. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.

E. Extend and relocate as work progress requires, provide detours as necessary for unimpeded traffic flow.

F. Location as approved by Architect.

G. Provide unimpeded access for emergency vehicles. Maintain 20 foot width driveways with turning space between and around combustible materials.

H. Provide and maintain access to fire hydrants and control valves free of obstructions.

3.03 PARKING

A. Use of designated areas of existing parking facilities by construction personnel is permitted.

B. Use of designated areas of new parking facilities by construction personnel is permitted.

C. Arrange for temporary parking areas to accommodate use of construction personnel.

D. When site space is not adequate, provide additional off-site parking.

E. Locate as approved by Architect.

3.04 PERMANENT PAVEMENTS AND PARKING FACILITIES

A. The base for permanent roads and parking areas may be used for construction traffic.

B. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

3.05 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.

B. Monitor parking of construction personnel's vehicles. Maintain vehicular access to and through parking areas.

C. Prevent parking on or adjacent to access roads or in non-designated areas.

3.06 FLAG PERSONS

A. Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

3.07 FLARES AND LIGHTS

A. Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.08 HAUL ROUTES

A. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.

B. Confine construction traffic to designated haul routes.

C. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

3.09 TRAFFIC SIGNS AND SIGNALS

A. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.

B. Relocate as work progresses, to maintain effective traffic control.

3.10 MAINTENANCE

A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.

B. Maintain existing and new permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

3.11 REMOVAL, REPAIR

A. Remove temporary roads when permanent paving is usable.

B. Remove underground work and compacted materials to a depth of 2 feet; fill and grade site as specified.

C. Repair existing facilities damaged by use, to original condition.

D. Remove equipment and devices when no longer required.

E. Repair damage caused by installation.

F. Remove post settings to a depth of 2 feet.

3.12 MUD FROM SITE VEHICLES

A. Provide means of removing mud from vehicle wheels before entering streets.

END OF SECTION

SECTION 015713
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.02 RELATED REQUIREMENTS

A. Section 311000 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.

B. Section 312200 - Grading: Temporary and permanent grade changes for erosion control.

C. Section 321500 - Aggregate Surfacing: Temporary and permanent roadways.

D. Section 329223 - Sodding: Permanent turf for erosion control.

E. Section 329300 - Plants: Permanent plantings for erosion control.

1.03 REFERENCE STANDARDS

A. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit.

1.04 PERFORMANCE REQUIREMENTS

A. Comply with all requirements of U.S. Environmental Protection Agency for erosion and sedimentation control, as specified for the National Pollutant Discharge Elimination System (NPDES), Phases I and II, under requirements for the 2003 Construction General Permit (CGP).

B. Comply with all requirements of the local municipality and St. Louis County for erosion and sedimentation control.

C. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports as required by the authority having jurisdiction.

D. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
   1. Obtain and pay for permits and provide security required by authority having jurisdiction.
   2. Owner will withhold payment to Contractor equivalent to all fines resulting from non-compliance with applicable regulations.

E. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

F. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
   1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.

G. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
   1. Control movement of sediment and soil from temporary stockpiles of soil.
   2. Prevent development of ruts due to equipment and vehicular traffic.
   3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

H. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
   1. Prevent windblown soil from leaving the project site.
   2. Prevent tracking of mud onto public roads outside site.
   3. Prevent mud and sediment from flowing onto sidewalks and pavements.
   4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

I. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
   2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

J. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.

K. Open Water: Prevent standing water that could become stagnant.

L. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

C. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures that must remain after Substantial Completion.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mulch: Use one of the following:
   1. Straw or hay.
   2. Erosion control matting or netting.

B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

C. Erosion Control Barriers
   1. Provide erosion control barriers such as straw bales, silt fences, and other measures as detailed in the drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Construction Entrances: Traffic-bearing aggregate surface.
   1. Width: As required; 20 feet, minimum.
   2. Length: 50 feet, minimum.
   3. Provide at each construction entrance from public right-of-way.
   4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.

C. Linear Sediment Barriers: Made of silt fences.
   1. Provide linear sediment barriers:
      a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
   2. Space sediment barriers with the following maximum slope length upslope from barrier:
      a. Slope of Less Than 2 Percent: 100 feet..
      b. Slope Between 2 and 5 Percent: 75 feet.
      c. Slope Between 5 and 10 Percent: 50 feet.
      d. Slope Between 10 and 20 Percent: 25 feet.
      e. Slope Over 20 Percent: 15 feet.

D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
   1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
   2. Straw bale row blocking entire inlet face area; anchor into pavement.

E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.

F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.

G. Soil Stockpiles: Protect using one of the following measures:
   1. Cover with polyethylene film, secured by placing soil on outer edges.
   2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.

H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.

I. Temporary Seeding: Use where temporary vegetated cover is required.

3.04 INSTALLATION

A. Silt Fences:
   1. Store and handle fabric in accordance with ASTM D4873/D4873M.
   2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
   3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
   4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
   5. Install with top of fabric at nominal height and embedment as specified.
   6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
   7. Fasten fabric to wood posts using one of the following:

a. Four nails per post with 3/4 inch diameter flat or button head, 1 inch long, and 14 gauge, 0.083 inch shank diameter.
b. Five staples per post with at least 17 gauge, 0.0453 inch wire, 3/4 inch crown width and 1/2 inch long legs.

8. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
9. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.

B. Straw Bale Rows:
1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
2. Install bales so that bindings are not in contact with the ground.
3. Embed bales at least 4 inches in the ground.
4. Anchor bales with at least two stakes per bale, driven at least 18 inches into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
5. Fill gaps between ends of bales with loose straw wedged tightly.
6. Place soil excavated for trench against bales on the upslope side of the row, compacted.

C. Temporary Seeding:
1. When hydraulic seeder is used, seedbed preparation is not required.
2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
3. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
4. Incorporate fertilizer into soil before seeding.
5. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
6. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
7. Repeat irrigation as required until grass is established.

3.05 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.

B. Repair deficiencies immediately.

C. Silt Fences:
1. Promptly replace fabric that deteriorates unless need for fence has passed.
2. Remove silt deposits that exceed one-third of the height of the fence.
3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Straw Bale Rows:
1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
2. Remove silt deposits that exceed one-half of the height of the bales.
3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

E. Clean out temporary sediment control structures weekly and relocate soil on site.

F. Place sediment in appropriate locations on site; do not remove from site.

3.06 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

F. Value engineering proposals

G. Procedures for Owner-supplied products.

H. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. 011010 - Project Summary - Bid Packages: Lists of products to be removed from existing building.

B. 011010 - Project Summary - Bid Packages: Identification of Owner-supplied products.

C. Section 014000 - Quality Requirements: Product quality monitoring.

D. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

E. Section 017419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is required.

1. See 011010 for list of items required to be salvaged for reuse and relocation.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. Use of products having any of the following characteristics is not permitted:
   1. Made of wood from newly cut old growth timber.
   2. Containing lead, cadmium, or asbestos.

C. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 016116.
   2. If wet-applied, have lower VOC content, as defined in Section 016116.
   3. Are extracted, harvested, and/or manufactured closer to the location of the project.
   4. Have longer documented life span under normal use.
   5. Result in less construction waste. See Section 017419
   6. Are made of vegetable materials that are rapidly renewable.
   7. Are made of recycled materials.
   8. If made of wood, are made of sustainably harvested wood, wood chips, or wood fiber.
   9. If bio-based, other than wood, are or are made of Sustainable Agriculture Network certified products.
   10. Are Cradle-to-Cradle Certified.
   11. Have a published Environmental Product Declaration (EPD).
   12. Have a published Health Product Declaration (HPD).
   13. Have a published Manufacturer's Inventory of Chemical Content.

D. Provide interchangeable components by the same manufacture for components being replaced.

E. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.

F. Cord and Plug: Provide minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

2.03 PRODUCT OPTIONS

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

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Owner; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. No substitutions will be considered after award of the Contract except as follows:
   1. The specified product becomes unavailable through no fault of the Contractor.
   2. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure of the Contractor to pursue the Work promptly or coordinate activities properly.

3. The specified product or method of construction cannot receive necessary approval by authorities having jurisdiction, and the requested substitution can be approved.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

C. A request for substitution constitutes a representation that the Contractor:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

E. Substitution Submittal Procedure (after contract award):
   1. Submit to Owner and Architect one electronic copy of request for substitution as a Request For Information in Owner's document management system for consideration.
   2. Limit each submittal to one value engineering proposal.
   3. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
   4. The Architect will notify Contractor in writing of decision to accept or reject request.
   5. If accepted, a Change Order will be issued to document the acceptance of the substitution request.

3.02 VALUE ENGINEERING PROPOSALS

A. Value engineering proposals shall be substitutions which, if accepted, provide a savings to the Project of at least two thousand five hundred dollars ($2,500.00) or more after deducting offsetting costs the Owner may be required to bear. Offsetting costs to the Owner may include increased administrative costs by the Owner, Architect's fees for incorporating proposal into Construction Documents, increased cost of other construction by the Owner, cost of Owner's other contractors, and similar considerations.

B. Value engineering proposals will be considered at any time after award of the Contract.

C. Owner is under no obligation to accept value engineering proposals from Contractor.

D. Owner is under no obligation to reimburse costs of value engineering proposal preparation to Contractor if proposal is rejected.

E. The amount of savings to the Project after deducting offsetting costs to the Owner will be distributed fifty percent to the Owner and fifty percent to the Contractor.

F. Value Engineering Proposal Submittal Procedure:
   1. Submit to Owner and Architect one electronic copy of value engineering proposal as a Request For Information into Owner's document management system for consideration.
   2. Limit each submittal to one value engineering proposal.
   3. Submit narrative describing value engineering proposal, product information, and cost savings analysis.
   4. The Owner will notify Contractor in writing of decision to accept or reject request.
   5. If accepted, a Change Order will be issued to document the acceptance of the value engineering proposal and modify the Contract Sum accordingly.

3.03 OWNER-SUPPLIED PRODUCTS

A. See Section 011010 011010 - Project Summary - Bid Packages for identification of Owner-supplied products.

B. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

C. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.

3.04 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.05 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 017419.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide off-site storage and protection when site does not permit on-site storage or protection.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Do not store products directly on the ground.

J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

L. Prevent contact with material that may cause corrosion, discoloration, or staining.

M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 016116
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

1.02 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Submittal procedures.

B. Section 014000 - Quality Requirements: Procedures for testing and certifications.

C. Section 016000 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.
   3. Flooring.
   4. Composite wood.
   5. Products making up wall and ceiling assemblies.
   6. Thermal and acoustical insulation.
   7. Other products when specifically stated in the specifications.

B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.
   3. Other products when specifically stated in the specifications.

C. Interior of Building: Anywhere inside the exterior weather barrier.

D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
   1. Concrete.
   2. Clay brick.
   3. Metals that are plated, anodized, or powder-coated.
   4. Glass.
   5. Ceramics.
   6. Solid wood flooring that is unfinished and untreated.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.

B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.

C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.3.

D. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products.

E. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.

F. CHPS (HPPD) - High Performance Products Database.

G. CRI (GLP) - Green Label Plus Testing Program - Certified Products.

H. GreenSeal GC-03 - Anti-Corrosive Paints; Green Seal, Inc.; 2007

I. GreenSeal GS-11 - Paints; Green Seal, Inc.; 1993.

J. GreenSeal GS-36 - Standard for Adhesives for Commercial Use.

K. SCAQMD 1113 - Architectural Coatings.

L. SCAQMD 1168 - Adhesive and Sealant Applications.

M. SCS (CPD) - SCS Certified Products.

N. UL (GGG) - GREENGUARD Gold Certified Products.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.06 QUALITY ASSURANCE

A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
   1. Wet-Applied Products: State amount applied in mass per surface area.
   2. Paints and Coatings: Test tinted products, not just tinting bases.
   3. Evidence of Compliance: Acceptable types of evidence are the following;
      a. Current UL (GGG) certification.
      b. Current SCS (CPD) Floorscore certification.
      c. Current SCS (CPD) Indoor Advantage Gold certification.
      d. Current listing in CHPS (HPPD) as a low-emitting product.
      e. Current CRI (GLP) certification.
      f. Test report showing compliance and stating exposure scenario used.
   4. Product data submittal showing VOC content is NOT acceptable evidence.
   5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.

B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Report of laboratory testing performed in accordance with requirements.
      b. Published product data showing compliance with requirements.
      c. Certification by manufacturer that product complies with requirements.

C. Composite Wood Emissions Standard: CARB (ATCM) for ultra-low emitting formaldehyde (ULEF) resins.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Current SCS "No Added Formaldehyde (NAF)" certification; www.scscertified.com.
      b. Report of laboratory testing performed in accordance with requirements.
      c. Published product data showing compliance with requirements.
      d. Certification by manufacturer that product complies with requirements.

D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.

B. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
   1. Composite Wood, Wood Fiber, and Wood Chip Products: Comply with Composite Wood Emissions Standard or contain no added formaldehyde resins.
   2. Inherently Non-Emitting Materials.

C. VOC-Content-Restricted Products: VOC content not greater than required by the following:
   1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
   2. Aerosol Adhesives: GreenSeal GS-36.
   3. Joint Sealants: SCAQMD 1168 Rule.
   4. Paints and Coatings: Each color; most stringent of the following:
      a. 40 CFR 59, Subpart D.
      b. SCAQMD 1113 Rule.
      c. CARB (SCM).

D. Other Product Categories: Comply with limitations specified elsewhere.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

SECTION 017000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Starting of systems and equipment.

H. Demonstration and instruction of Owner personnel.

I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

1.02 RELATED REQUIREMENTS

A. 011010 011010 - Project Summary - Bid Packages: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. 011010 011010 - Project Summary - Bid Packages : Project and Bid Package description.

C. Section 013000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

D. Section 014000 - Quality Requirements: Testing and inspection procedures.

E. Section 015000 - Temporary Facilities and Controls: Temporary exterior enclosures.

F. Section 015000 - Temporary Facilities and Controls: Temporary interior partitions.

G. Section 015100 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.

H. Section 017419 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.

I. Section 017800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

J. Section 017900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

K. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.
   2. Limitations on cutting structural members.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Cutting and Patching: Notify Owner in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate contractor.

C. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 QUALIFICATIONS

A. For demolition work, employ a firm specializing in the type of work required.

B. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

D. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.06 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

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

E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
   1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
   2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.

F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.
   2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
   3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
   4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. At All Times: Excessively noisy tools and operations will not be tolerated inside the building at any time of day; excessively noisy includes.
   2. Outdoors: Limit conduct of especially noisy exterior work to local municipality or County ordinances.
   3. Indoors: Limit conduct of especially noisy interior work to the hours of 6 pm to 7 am unless approved by Owner prior to performing noisy work.

H. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

I. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

J. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 COORDINATION

A. See 011010 011010 - Project Summary - Bid Packages for occupancy-related requirements.

B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

C. Notify affected utility companies and comply with their requirements.

D. Verify that utility requirements and characteristics of new 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.

E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and clean-up of work of separate sections.

H. 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.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with one copy to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Owner will locate and protect survey control and reference points.

D. Control datum for survey is that established by Owner provided survey.

E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

H. Utilize recognized engineering survey practices.

I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

J. Periodically verify layouts by same means.

K. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.

B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

F. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 015000 in locations indicated on drawings.
   2. Provide sound retardant partitions of construction indicated on drawings in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.
   3. Relocate items indicated on drawings.
   4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. See 011010 011010 - Project Summary - Bid Packages for other limitations on outages and required notifications.
      c. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.
   5. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

F. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.

2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.

G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. When existing 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.
2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
4. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.

H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

I. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

J. Clean existing systems and equipment.

K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

L. Do not begin new construction in alterations areas before demolition is complete.

M. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-complying work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material , to full thickness of the penetrated element.

J. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 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. Collect waste materials, debris, and trash/rubbish and place in appropriate trash receptacles or dumpsters daily.

E. Compliance failure:
   1. Owner shall give Contractor written notice of failure to comply with progress cleaning and waste removal requirements.
   2. Owner shall commence progress cleaning and waste removal requirements with Owner's own forces if Contractor has not complied within 24 hours after receiving notice.
   3. Owner shall back charge Contractor at the rate of $80 per man hour required to bring site to a clean and orderly condition.

3.09 PROTECTION OF EXISTING FACILITIES

A. Protect adjacent rooms and spaces that are not a part of the Work.

B. Contractor shall shut doors and keep closed.

C. Contractor shall seal off with plastic and tape inside the Work area any smoke detectors, communicating wall penetrations, return registers, and door undercuts during operations that will generate airborne dust and debris.

D. Contractor shall maintain plastic barriers until the Work generating airborne dust and debris is completed.

E. Contractor shall remove plastic barriers carefully to not damage existing facilities.

F. Contractor shall not use spray adhesives to attach plastic.

G. Contractor shall use tape that will not damage material adhered to upon tape removal.

H. Protect existing flooring:
   1. Prior to Contractor mobilization on site:
      a. Contractor shall provide contact adhesive plastic on carpeted flooring in any room or space, including stairs and ramps that are part of the Work or are used for storage and as indicated on the drawings.
      b. Contractor shall provide 1/4 inch tempered masonite, 3/8 inch masonite, or 1/4 inch plywood over contact adhesive plastic sheeting on carpeted flooring and 1/4 inch tempered masonite, 3/8 inch masonite, or 1/4 inch plywood over plastic sheeting on vinyl tile, sheet vinyl, wood, ceramic tile, quarry tile, porcelain tile, rubber, or poured resin flooring in corridors or any other heavy traffic area, including stairs and ramps used to move wheeled or skidded equipment or materials and as indicated on the drawings.

c. Contractor shall provide 1/4 inch tempered masonite, 3/8 inch masonite, or 1/4 inch plywood over plastic sheeting on vinyl tile, sheet vinyl, wood, ceramic tile, quarry tile, porcelain tile, rubber, or poured resin flooring in any rooms or spaces that are part of the Work or are used for storage.
d. Contractor shall provide 1/4 inch tempered masonite, 3/8 inch masonite, or 1/4 inch plywood in areas where soldering, metal cutting, pipe threading, welding, or torch work is performed.
e. Contractor shall tape all joints on installed 1/4 inch tempered masonite, 3/8 inch masonite, or 1/4 inch plywood and maintain taped joints throughout progress of the Work to insure joints remained sealed and do not pose a tripping hazard.
f. Contractor shall cooperate with Owner to identify spaces that meet the requirements for flooring protection identified in this Section prior to mobilization on site.

2. During construction:
a. Contractor will maintain flooring protection during progress of the Work and will not remove protection until all the Work in the room or space is substantially complete.
b. If Contractor moves into a new space to perform the Work or to use for storage and does not protect the existing floor, then the Contractor shall be back charged for cleaning flooring at a minimum or replacement of flooring at a maximum, dependent upon damage to flooring and at the sole discretion of the Owner.

I. Protect existing casework:
1. Contractor shall cover with plastic and tape as a minimum.
2. Contractor shall provide 1/4 inch tempered masonite, 3/8 inch masonite, or 1/4 inch plywood over plastic if casework is used as a ladder or scaffold for workers or if soldering, metal cutting, pipe threading, welding, or torch work is performed overhead.
3. Maintain during progress of the Work and do not remove until all the Work in the room or space is substantially complete.

J. Compliance failure:
1. Owner shall give Contractor written notice of failure to comply with protection of existing facilities.
2. Owner shall commence protecting existing facilities with Owner's own forces if Contractor has not complied within 24 hours after receiving notice.
3. Owner shall back charge Contractor at the rate of $80 per man hour plus cost of protection materials required to protect existing facilities.
4. Contractor shall repair to the satisfaction of the Owner or replace casework damaged as a consequence of using casework as a ladder or scaffold for workers or if damaged because soldering, metal cutting, pipe threading, welding, or torch work is performed overhead without specified protection.

3.10 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. 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.

G. Prohibit traffic from landscaped areas.

H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.11 SYSTEM STARTUP

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, and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative 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.

H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.12 DEMONSTRATION AND INSTRUCTION

A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.

3.13 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

B. Testing, adjusting, and balancing HVAC systems: See Section 230593 - Testing, Adjusting, and Balancing for HVAC.

3.14 FINAL CLEANING

A. Execute final cleaning prior to Substantial Completion.
   1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.

B. Use cleaning materials that are nonhazardous.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

F. Replace filters of operating equipment.

G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

H. Clean site; sweep paved areas, rake clean landscaped surfaces.

I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.15 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

1. Provide copies to Architect and Owner.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Owner when work is considered ready for Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, 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 Substantial Completion inspection.

E. Owner will occupy portions of the building as specified in Section 011000.

F. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

G. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

H. Accompany Owner's Construction Supervisor on Contractor's preliminary final inspection.

I. Notify Owner when work is considered finally complete.

J. Complete items of work determined by Architect's and Owner's final inspection.

END OF SECTION

SECTION 017419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Owner recovers commodity, universal, and hazardous waste materials.

C. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

D. Minimize trash/waste disposal in landfills; salvage or recycle as much waste as economically feasible.

E. Required Recycling: The following must be recycled by the Contractor:
   1. Wood pallets, not painted.
   2. Clean dimensional wood, not painted.
   3. Land clearing debris, including brush, branches, logs, and stumps; see 311000 - Site Clearing for use options.
   4. Concrete.
   5. Concrete masonry units.
   6. Bricks, unless specifically identified in the Contract Documents to be re-used on site.
   7. Pre-cast concrete panels.
   8. Asphalt.
   9. Asphalt roofing shingles.
   10. Plumbing fixtures, porcelain.
   11. Acoustical ceiling tile:
      a. Use acoustical ceiling tile recycling program administered by Armstrong World Industries, Inc.
         1) Additional information can be found at web address ***https://www.armstrongceilings.com/commercial/en-us/performance/sustainable-building-design/ceiling-recycling-program.html***
      b. Materials acceptable for recycling:
         1) All brands of dry, pulpable mineral fiber ceiling panels or tiles.
            (a) All metal splines must be removed from tiles (12”x12”).
         2) All brands of dry fiberglass panels (foil-back case by case).
            (a) Facing must be easily removable.
         3) Any vinyl or scrim-faced mineral fiber panels.
      c. Materials acceptable for recycling case-by-case: (Contact the Armstrong Recycling Center at telephone number 877-276-7876)
         1) Asbestos containing ceiling tiles, Ceiling tiles installed below friable asbestos or contaminated with any other hazardous material.
         2) Red or pink-backed ceiling tiles.
         3) Wet, moldy or weathered ceiling tiles.
         4) Ceiling tiles or pallets/boxes/bales which contain visible debris (garbage, construction waste).
         5) Ceiling tiles not packaged according to Armstrong Specifications.
         6) Any gypsum ceiling or board.
         7) Ceiling tiles with visible wood pulp.
         8) Armstrong Artran (cardboard like face).
         9) Armstrong Ceramaguard.
         10) Glue-up or adhesive ceiling tiles.
         11) Roll-offs which contain debris.
         12) Baled fiberglass, vinyl-faced, fabric, scram faced or foil-backed ceiling tiles.

d. Call the Armstrong Recycling Center at 877-276-7876 to review the building where the ceilings will be removed, verify the material meets our requirements and for assistance to facilitate recycle. We are continually updating the types of ceiling panels we can recycle and methods we can receive them in.
e. Ceiling material being reclaimed may not come into contact with asbestos containing material, hazardous waste materials or special waste.
    1) If the area where ceilings are being removed is or has gone through abatement procedures, verification that ceilings did not come in contact with asbestos containing material is required
f. Ceiling material being reclaimed must be kept dry and free from debris.
g. Contractor shall register the Project: Contact the Armstrong Ceiling Recycling Center at telephone number 877-276-7876.
h. Required Information to have project approved for recycling:
    1) Contact information for the recycle project.
    2) Building information (Year of Building Construction, Contractor or demo subontractor, Building use, copy of an asbestos survey, details on any prior or current abatement where ceiling is removed).
        (a) Owner will provide asbestos survey information upon request from the Contractor.
    3) Ceiling Information – Material type, quantity, timing.
i. Scheduling, packaging, and shipping procedures:
    1) Receive final project approval for recycling by the Armstrong Recycling Center.
    2) Contractor shall remove ceiling tiles to be recycled from grid.
    3) Contractor shall contact the Armstrong Recycling Center (877-276-7876) to schedule a pick up.
    4) Contractor shall use one of the following three options for return.
        (a) When Option B or C is chosed by the Contractor, coordinate with the local recyler/consolidator for the applicable option to be used.
    5) Option A For Return-Full Truckload Palletized Procedure:
        (a) Contractor shall supply pallets, metal bands, stretch wrap.
        (b) Approved ceiling materials will be palletized in a manner allowing both secure shipment by trailer and the ability of Armstrong employees to safely inspect and unload the trailers' contents, therefore all approved ceiling materials sent to Armstrong must be neatly stacked as follows:
            (1) 4’ x 4’ pallets stacked with ceiling materials to 4 feet tall each and then stacked on top of each other in the trailer. This method is preferred but proper loading equipment must be available at the job site.
            (2) 4’ x 4’ pallets stacked with ceiling materials to 6 feet tall each.
            (3) Some combination of 2’x4’ and 4’x4’ pallets that are agreed upon in advance, in writing to accommodate special building circumstances if building elevators do not accommodate larger size pallets.
            (4) When 2’ x 4’ pallets are used place onto 4’ x 4’ pallets to stabilize two 2’ x 4’ pallets and use stretch wrap to secure pallets together..
        (c) Contractor shall neatly stack ceiling panels on 4’ x 4’ wooden pallets and secure them with metal bands or stretch wrap for stable shipment.
            (1) Any variation from pallet size must be pre-approved by Armstrong.
        (d) Pallets must be kept dry.
            (1) Wet material is not acceptable and will be returned.
        (e) Pallets must be labeled per Armstrong requirements.
        (f) Pallets must be secured within trailers to prevent shifting in transit.
            (1) Carriers will provide load stabilizers.
        (g) Armstrong will pay for the return freight of full trailers of approved material, all of which are defined as a minimum of 30,000 square feet as follows:

(1) Forty-four 4’ x 4’ pallets stacked with ceiling material to 4 feet tall each and then stacked on top of each other in the trailer (preferred method, but proper loading equipment must be available at the job site).
(2) Twenty-two 4’ x 4’ pallets with ceiling material stacked to 6 feet tall each.

(h) It is Contractor's responsibility to ensure that only full trailer loads of approved ceiling materials are shipped.

6) Option B For Return-Less Than Full Truckload Palletized Procedure:
(a) Where the amount of approved ceiling materials from a site is insufficient for a full trailer load, the Contractor may elect to utilize the services of a local recycler/conconsolidator to consolidate approved ceiling materials in a secure and dry location, until a full trailer load is ready for shipment.
(1) The local recycler/consolidator will ensure that all such aggregated shipments are and remain clearly labeled as to their origin and date of approval by an Armstrong employee.
(2) Go to following web address to find a local recyler/consolidator: ***www.armstrongceilings.com/commercial/enus/performance/sustainable-building-design/ceiling-recyclingprogram.html***.
(3) Upon aggregating a full truck load of ceiling tiles, follow the Option A procedures.

(b) The local recycler/consolidator may assist in supplying pallets, metal bands, and stretch wrap.
(c) When local consolidation is not available a LTL pick up may be arranged in some areas for five (5) pallets (7,000 sq. ft.) or more of approved ceiling materials.
(1) Armstrong will pay the return freight of these LTL pickups. LTL pickup must be pre-approved by Armstrong when other options are not available.
(2) LTL pickup must be pre-approved by Armstrong when other options are not available.

(d) The recycler/consolidator shall retain ownership of approved ceiling materials until it is received and accepted at the destination, the Armstrong Plant, as defined by the terms of shipment, F.O.B. (Free on board) destination, despite Armstrong’s payment of the freight costs for full trailer loads.
(e) While the Armstrong approved common carrier is not a party to this agreement, the following describes their responsibilities.
(1) The common carrier that Armstrong has selected is responsible for the transport of the approved ceiling materials from the pick up location to Armstrong’s plant.
(2) This common carrier is an independent contractor utilized by Armstrong and required to demonstrate general liability insurance coverage that meets or exceeds industry standards.

7) Option C For Return-On-Site Roll-Off Procedure (Bulk return to local recycler/consolidator):
(a) Where the amount of approved ceiling materials from a site is insufficient for a full trailer load, the Contractor may elect to utilize the services of a local recycler/conconsolidator to consolidate approved ceiling materials in a secure and dry location, until a full trailer load is ready for shipment.
(1) The local recycler/consolidator will ensure that all such aggregated shipments are and remain clearly labeled as to their origin and date of approval by an Armstrong employee.

(2) Go to following web address to find a local recyler/consolidator: ***www.armstrongceilings.com/commercial/enus/performance/sustainable-building-design/ceiling-recyclingprogram.html.***
(3) Upon aggregating a full truck load of ceiling tiles, follow the Option A procedures.
(b) Material must be clean and dry.
(c) No wood, metal, construction debris, trash or hazardous materials of any kind can be included.
(d) Material shall be placed in a roll-off container with a water impermeable cover such that material inside does not get wet.
(e) Material shall not be loaded above the top of the container.
(f) Container should have visible Armstrong RA label attached.

12. Contractor can find contact information for various material recyclers at the following web addresses, but may use the material recycler of their choosing, whether or not they are listed at the web addresses provided:

a.	***http://www.stlouisco.com/HealthandWellness/RecyclingandWasteManagement/RegulationsAndLicensing/ConstructionAndDemolitionRecycling***

F. Required Recycling: The following must be disposed of in Owner provided containers or stockpiled in areas identified by Owner on project site for Owner pick-up for recycling or disposal:
1. Single Stream Recycling Container:
   a. Aluminum and plastic beverage containers.
   b. All nonhazardous aluminum containers.
   c. All nonhazardous glass containers.
   d. All nonhazardous plastic containers marked with the number 1, 2, 3, 4, 5, or 7.
      1) Plastic containers marked with the number 6, plastic bags, plastic straps, and plastic container lids shall not be recycled but shall be disposed of off site.
   e. All nonhazardous cardboard free of contaminants with the exception of metal staples or tape.
2. Ferrous Scrap Metal Recycling Container:
   a. All nonhazardous ferrous metals, including packaging banding, metal studs, acoustic ceiling tile frames, sheet metal, structural steel, conduit not containing copper or aluminum wire, piping, reinforcing bars, doors without glazing, door frames, door hardware, and other items made of steel, iron, galvanized steel, stainless steel.
3. Non-Ferrous Scrap Metal Recycling Container:
   a. All nonhazardous non-ferrous metals, including acoustic ceiling tile frames, sheet metal, conduit which can contain copper or aluminum wire, piping, plumbing fixture trim components, doors without glazing, door frames, door hardware, and other items made of aluminum, copper, zinc, lead, brass, and bronze.
   b. All electrical cabling and wiring.
4. Stockpile For Owner Recycling Or Hazmat Disposal:
   a. Mechanical and electrical equipment, unless otherwise indicated on the drawings.
      1) Refrigerant shall be removed from mechanical equipment before recycling mechanical equipment.
   b. Fluorescent lamps (light bulbs).
      1) Protect lamps from breakage during demolition, collection, and stockpiling
   c. All lead acid NiCad and lithium batteries.
   d. All lighting ballasts or other electrical equipment suspected of containing PCBs.

G. The Owner's waste minimization and material recovery operation is limited to those commodity, universal, and hazardous waste materials identified above as Owner's responsibility and responsibility for disposal or recycling of all other construction and demolition waste shall be the responsibility of the Contractor.

H. Owner will recycle recyclable materials and legally dispose of hazardous materials collected from the commodity, universal, and hazardous waste materials identified above as Owner's responsibility.

I. Revenue from recycling of materials collected from the commodity, universal, and hazardous waste materials identified above as Owner's responsibility shall accrue to the Owner.

J. Revenue from recycling of materials collected from the commodity, universal, and hazardous waste materials identified above as Contractor's responsibility shall accrue to the Contractor.

K. Develop and follow a Waste Management Plan designed to implement these requirements.

L. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.
   5. Incineration, either on- or off-site.

M. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: List of items to be salvaged from the existing building for relocation in project or for Owner.

B. Section 013000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

C. Section 015000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

D. Section 016000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

E. Section 017000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

F. Section 311000 - Site Clearing: Handling and disposal of land clearing debris.

1.03 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Waste Management Plan:
   1. Submit Report prior to starting the Work on Project Site but no later than 42 days after Notice To Proceed date.
   2. Submit to Owner one electronic copy of waste disposal report as an e-mail attachment containing the following information:
      a. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed.
      b. Landfill Alternatives: List all waste materials that will be diverted from landfills by salvage or recycling.
         1) List each material proposed to be salvaged or recycled.

C. Waste Disposal Reports:
   1. Submit Report prior to submitting Final Application for Payment but no later than 28 days after Substantial Completion date.
   2. Submit to Owner one electronic copy of waste disposal report as an e-mail attachment containing the following information:
      a. Landfill Disposal: Include the following information:
         1) Identification of material.
         2) Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
         3) Provide the name, address, telephone number, and contact person's name of the landfills used and provide certification to the Owner that the landfills have been used.
         4) Include manifests, weight tickets, receipts, or invoices as evidence of quantity.
      b. Recycled and Salvaged Materials: Include the following information for each:
         1) Does not apply to Owner recycled materials.
         2) Identification of material, including those retrieved by installer for use on other projects.
         3) Amount, in tons or cubic yards, date removed from the project site, and receiving party.
         4) Include manifests, weight tickets, receipts, and invoices as evidence of quantity.
         5) Certification by receiving party that materials will not be disposed of in landfills or by incineration.
      c. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

A. See Section 011000 for list of items to be salvaged from the existing building for relocation in project or for Owner.

B. See Section 013000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

C. See Section 015000 for additional requirements related to trash/waste collection and removal facilities and services.

D. See Section 016000 for waste prevention requirements related to delivery, storage, and handling.

E. See Section 017000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman and each Subcontractor.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings, particularly at:
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to Subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 017800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Extended Warranties.

1.02 RELATED REQUIREMENTS

A. Section 007200 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

C. Section 017000 - Execution and Closeout Requirements: Contract closeout procedures.

D. Individual Product Sections: Specific requirements for operation and maintenance data.

E. Individual Product Sections: Extended warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents Affidavits:
   1. Owner's Standard Affidavits of Record Document Completion is in Section 006000 - Project Forms.
   2. Submit to Owner and Architect one electronic copy of Owner's Standard Affidavits of Record Document Completion as a Submittal into Owner's document management system prior to submittal of Final Application for Payment but no later than 28 days after Substantial Completion date.

B. Operation and Maintenance Data:
   1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within 10 ten days after acceptance.
   2. Compile all operation and maintenance data for each Section and submit as one submittal for each Section.
   3. Submit to Owner and Architect one electronic copy of operation and maintenance data for each Section as a Submittal into Owner's document management system as required in paragraph 1.03.B.1 but no later than 42 days after Notice to Proceed.
   4. The submittal will be reviewed and returned with Owner's and Architect's comments or it will be accepted.
   5. Revise content of all returned documents as required by the comments.
   6. Submit one set of revised final documents for each Section in final form within 10 days after receipt of returned submittal.

C. Extended Warranties:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents no later than 14 days after Substantial Completion date.
   2. Compile all extended warranties, which are warranties only exceeding one year in length, and submit as one submittal.
   3. Submit to Owner and Architect one electronic copy of extended warranties as a Submittal into Owner's document management system as required in paragraph 1.03.C.1.
   4. This submittal will be reviewed and returned with Owner's and Architect's comments or it will be accepted.
   5. Revise content of all returned documents as required by the comments.
   6. Submit one set of revised final documents in final form within 10 days after receipt of returned submittal.

a. For items of Work for which acceptance is delayed beyond Substantial Completion date, submit within 14 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Record actual revisions to the Work on Construction Documents in the Record Documents Table in the Owner's document management system including:
   1. Drawings.
   2. Specifications.
   3. Addenda.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications:
   1. Identify the product manufacturer selected for the Project in the acceptable manufacturer's paragraph in each Section.
   2. Identify product substitutions or alternates utilized including manufacturer, manufacturer's website address, and model number.

F. Record Drawingsand Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.

E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

G. Provide servicing and lubrication schedule, and list of lubricants required.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Provide control diagrams by controls manufacturer as installed.

L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

O. Include test and balancing reports.

P. Additional Requirements: As specified in individual product specification sections.

3.05 EXTENDED WARRANTIES

A. Obtain extended warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain extended warranties and bonds until time specified for submittal.

END OF SECTION

SECTION 017900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. HVAC systems and equipment.
   3. Plumbing equipment.
   4. Electrical systems and equipment.
   5. Conveying systems.
   6. Landscape irrigation.
   7. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

A. Section 017800 - Closeout Submittals: Operation and maintenance manuals.

B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Coordinate training sessions dates and times with Owner's Construction Supervisor.
   2. Notify Owner's Construction Supervisor not less than two weeks prior to start of training.
   3. Provide the following information for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided and determination as to whether equipment will be provided by Owner or Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

1.04 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.

2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstration may be combined with Owner personnel training if applicable.

C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than one week prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than one week after Substantial Completion.

3.02 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Owner will provide classroom and seating at no cost to Contractor.

C. Provide training in minimum two hour segments.

D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

F. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.
   5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   6. Discuss common troubleshooting problems and solutions.
   7. Discuss any peculiarities of equipment installation or operation.
   8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   9. Review recommended tools and spare parts inventory suggestions of manufacturers.
   10. Review spare parts and tools required to be furnished by Contractor.
   11. Review spare parts suppliers and sources and procurement procedures.

G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 024100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of built site elements.

B. Selective demolition of building elements for alteration purposes excluding removal of hazardous materials and toxic substances.

1.02 RELATED REQUIREMENTS

A. Section 003100 - Available Project Information: Existing building survey conducted by Owner; information about known hazardous materials.

B. Section 011000 - Summary: Limitations on Contractor's use of site and premises.

C. Section 011000 - Summary: Sequencing and staging requirements.

D. Section 011000 - Summary: Description of items to be removed by Owner.

E. Section 011000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

F. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

G. Section 016000 - Product Requirements: Handling and storage of items removed for salvage and relocation.

H. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

I. Section 017419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

J. Section 311000 - Site Clearing: Vegetation and existing debris removal; earth stripping and stockpiling.

K. Section 312323 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

L. Section 329300 - Plants: Relocation of existing trees, shrubs, and other plants.

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with requirements in Section 017000.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Use of explosives is not permitted.
   3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   4. Provide, erect, and maintain temporary barriers and security devices.

5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
7. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
8. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

C. Do not begin removal until receipt of notification to proceed from Owner.

D. Do not begin removal until built elements to be salvaged or relocated have been removed.

E. Do not begin removal until vegetation to be relocated has been removed and vegetation to remain has been protected from damage.

F. Protect existing structures and other elements to remain in place and not removed.
1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

G. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

H. Provide and maintain daily the effectiveness of dust control walls and required asset protection.

I. Perform demolition in a manner that maximizes salvage and recycling of materials.
1. Comply with requirements of Section 017419 - Construction Waste Management and Disposal.
2. Dismantle existing construction and separate materials.
3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

J. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.02 EXISTING UTILITIES

A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Unused underground piping may be abandoned in place provided it is completely drained and capped unless otherwise indicated; remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.03 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
1. Verify construction and utility arrangements are as indicated.

2. Report discrepancies to Architect before disturbing existing installation.
3. Record discrepancies encountered daily on record drawings.
4. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from areas that remain occupied.
1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 015000 in locations indicated on drawings.

C. Remove existing work as indicated and required to accomplish new work.
1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction indicated.
2. Remove items indicated on drawings.

D. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.
1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
3. See Section 011000 - Summary for limitations on outages and required notifications.
4. Verify that abandoned services serve only abandoned facilities before removal.
5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.

E. Protect existing work to remain.
1. Prevent movement of structure. Provide shoring and bracing as required.
2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch to match new work.

F. Protect items to be salvaged by the Owner or reused in the Work by the Contractor.

3.04 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site daily as it accumulates. Do not use the Owner's dumpsters.

B. Remove materials not to be reused on site; comply with requirements of Section 017419 - Waste Management.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 031000
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formwork for cast-in-place concrete, with shoring, bracing and anchorage.

B. Openings for other work.

C. Form accessories.

D. Form stripping.

1.02 RELATED REQUIREMENTS

A. Section 032000 - Concrete Reinforcing.

B. Section 033000 - Cast-in-Place Concrete.

C. Section 051200 - Structural Steel Framing: Placement of embedded steel anchors and plates in cast-in-place concrete.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.

C. Design Data: As required by authorities having jurisdiction.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design formwork under direct supervision of a Professional Structural Engineer experienced in design of concrete formwork and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.

C. Chamfer outside corners of beams, joists, columns, and walls.

D. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.

E. Comply with relevant portions of ACI CODE-318, ACI PRC-347, and ACI SPEC-301.

2.02 WOOD FORM MATERIALS

A. Application: Use for edge forms and unexposed finish concrete only.

B. Form Materials: At the discretion of the Contractor.

2.03 REMOVABLE PREFABRICATED FORMS

2.04 FORMWORK ACCESSORIES

A. Form Ties: Removable type, galvanized metal, fixed length, cone type, with waterproofing washer, free of defects that could leave holes larger than 1 inch in concrete surface.

B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.

1. Do not use materials containing diesel oil or petroleum-based compounds.
2. Products:
    a. SpecChem, LLC; Bio Strip WB (water-based): www.specchemllc.com/#sle.
    b. Substitutions: See Section 016000 - Product Requirements.

C. Flashing Reglets: Galvanized steel, at least 22 gage, 0.0299 inch thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for securing to concrete formwork.

D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

E. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 051200.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

A. Earth forms are not permitted unless specifically indicated on drawings.

B. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.03 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI SPEC-301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Align joints and make watertight. Keep form joints to a minimum.

E. Obtain approval before framing openings in structural members that are not indicated on drawings.

F. Coordinate this section with other sections of work that require attachment of components to formwork.

G. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect before proceeding.

3.04 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.

B. Locate and set in place items that will be cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

G. Form Anchors and Hangers:
   1. Do not use anchors and hangers in exposed concrete leaving exposed metal at concrete surface.
   2. Symmetrically arrange hangers supporting forms from structural steel members to minimize twisting or rotation of member.
   3. Penetration of structural steel members is not permitted.

3.06 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.
   1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
   2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.07 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI SPEC-117, unless otherwise indicated.

B. Camber slabs and beams in accordance with ACI SPEC-301.

3.08 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure. Formwork shall be inspected for shape, location, and dimensions of concrete member being formed.

3.09 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

SECTION 032000
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ACI MNL-66 - ACI Detailing Manual.

B. ACI SPEC-301 - Specifications for Concrete Construction.

C. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.

D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Comply with requirements of ACI MNL-66 Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
   1. Prepare shop drawings under seal of a Professional Structural Engineer experienced in design of work of this type and licensed in the State in which the Project is located.

C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

D. Reports: Submit certified copies of mill test report of reinforcement materials analysis.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI SPEC-301.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: Deformed bars, ASTM A996/A996M Grade 60 (420), Type A.

B. Steel Welded Wire Reinforcement (WWR): Galvanized, deformed type; ASTM A1064/A1064M.
   1. Form: Flat Sheets.
   2. WWR Style: As indicated on drawings.

C. Reinforcement Accessories:
   1. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   2. Provide stainless steel components for placement within 1-1/2 inches of weathering surfaces.

2.02 FABRICATION

A. Locate reinforcing splices not indicated on drawings at point of minimum stress.

PART 3 EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Accommodate placement of formed openings.

C. Maintain concrete cover around reinforcing as follows:
   1. Walls (exposed to weather or backfill): 2 inch.
   2. Footings and Concrete Formed Against Earth: 3 inch.
   3. Slabs on Fill: 3 inch.

D. Comply with applicable code for concrete cover over reinforcement.

3.02 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 014000 - Quality Requirements, will inspect installed reinforcement for compliance with contract documents before concrete placement.

END OF SECTION

SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Floors and slabs on grade.

B. Miscellaneous concrete elements, including equipment pads and Fence and Gate Post Foundations.

C. Concrete curing.

1.02 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code for Structural Concrete—Code Requirements and Commentary.

B. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide.

C. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

D. ACI PRC-305 - Guide to Hot Weather Concreting.

E. ACI PRC-306 - Guide to Cold Weather Concreting.

F. ACI PRC-308 - Curing of Concrete—Guide.

G. ACI SPEC-301 - Specifications for Concrete Construction.

H. ASTM C33/C33M - Standard Specification for Concrete Aggregates.

I. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

J. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.

K. ASTM C143/C143M - Standard Test Method for Slump of Concrete.

L. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

M. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing.

N. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.

O. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

P. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

C. Mix Design: Submit proposed concrete mix design.
   1. Indicate proposed mix design complies with requirements of ACI SPEC-301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI CODE-318, Chapter 5 - Concrete Quality, Mixing and Placing.

D. Test Reports: Submit report for each test or series of tests specified.

E. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.

B. Follow recommendations of ACI PRC-305 when concreting during hot weather.

C. Follow recommendations of ACI PRC-306 when concreting during cold weather.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 FORMWORK

A. Comply with requirements of Section 031000.

2.02 REINFORCEMENT MATERIALS

A. Comply with requirements of Section 032000.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type IL - Limestone Portland type.
   1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C33/C33M.
   1. Acquire aggregates for entire project from same source.

C. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ACCESSORY MATERIALS

A. Underslab Vapor Retarder: Multi-layer, fabric-, cord-, grid-, or aluminum-reinforced polyethylene or equivalent, complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
   1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
   2. Products:
      a. Henry Company; Moistop Ultra 15: www.henry.com/#sle.
      b. ISI Building Products; Viper VaporCheck II 15-mil (Class A): www.isibp.com/#sle.
      c. Stego Industries, LLC: www.stegoindustries.com.
      d. W. R. Meadows, Inc; PERMINATOR Class A - 10 mils (0.25 mm): www.wrmeadows.com/#sle.

2.05 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.

B. Concrete Strength: Establish required average strength for concrete on the basis of field experience or trial mixtures, as specified in ACI 301.

C. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 5,000 pounds per square inch.
   2. Water-Cement Ratio: Maximum 40 percent by weight.
   3. Total Air Content: 4.5 - 7.5 percent, determined in accordance with ASTM C173/C173M.
   4. Maximum Slump: 8" for concrete with high range water reducing admixture, 6" for concrete containing mid-range water reducing admixture. Water slump of 2"-3" pre-additive (3"-4" for concrete receiving a "dry-shake" hardener). Max 4" water slump for all other concrete not containing a water reducer.
   5. Maximum Aggregate Size: 5/8 inch.

2.06 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C94/C94M.

C. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with Work of this section.

B. Verify requirements for concrete cover over reinforcement

C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

D. Commencement of Work shall indicate acceptance of existing conditions.

3.02 PREPARATION

A. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
   2. Use latex bonding agent only for non-load-bearing applications.

B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

C. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
   1. Granular Fill Over Vapor Retarder: Cover vapor retarder with compactible granular fill as indicated on drawings. Do not use sand.

3.03 PLACING CONCRETE

A. Place concrete in accordance with ACI PRC-304.

B. Notify Architect not less than 24 hours prior to commencement of placement operations.

C. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

D. Ensure reinforcement will not be disturbed during concrete placement.

E. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

3.04 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. An independent testing agency, as specified in Section 014000, will inspect finished slabs for compliance with specified tolerances.

B. Maximum Variation of Surface Flatness:
   1. Exposed Concrete Floors: 1/8 inch in 10 feet.
   2. Under Seamless Resilient Flooring: 1/8 inch in 10 feet.
   3. Under Carpeting: 1/8 inch in 10 feet.
   4. Tennis Courts: 1/8 inch in 10 feet

C. Correct the slab surface if tolerances are less than specified.

D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.05 CONCRETE FINISHING

3.06 CURING AND PROTECTION

A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than seven days.
   2. High early strength concrete: Not less than four days.

3.07 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.

E. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 50 cubic yards or less of each class of concrete placed.

F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.08 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.09 SCHEDULE - CONCRETE TYPES AND FINISHES

A. Exposed Portico Structure: 5,000 pounds per square inch 28 day concrete, air entrained, smooth rubbed finish.

END OF SECTION

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, exterior penetrations, and other items indicated in Schedule.

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

C. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement.

D. CDA A4050 - Copper in Architecture - Handbook.

E. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Maintain one copy of each document on site.

C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal.

2.02 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of same material as sheet, minimum 2 inches wide, interlocking with sheet.

C. Form pieces in longest possible lengths.

D. Hem exposed edges on underside 1/2 inch; miter and seam corners.

E. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

F. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

G. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

H. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.03 ACCESSORIES

A. Primer Type: Zinc chromate.

B. Protective Backing Paint: Zinc molybdate alkyd.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

E. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

A. Insert flashings into reglets to form tight fit; secure in place with plastic wedges; pack remaining spaces with lead wool; seal flashings into reglets with sealant.

B. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

C. Apply plastic cement compound between metal flashings and felt flashings.

D. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

E. Seal metal joints watertight.

F. Counterflash with reglets at masonry. Surface mounted termination bars are not acceptable.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 077100
ROOF SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured roof specialties, including copings, copings, fascias, fascias, gravel stops, gravel stops, and vents.

B. Roof control and expansion joint covers.

1.02 RELATED REQUIREMENTS

A. Section 075200 - Modified Bituminous Membrane Roofing

B. Section 077200 - Roof Accessories: Manufactured curbs, roof hatches, and snow guards.

1.03 REFERENCE STANDARDS

A. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement.

B. NRCA (RM) - The NRCA Roofing Manual.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

PART 2 PRODUCTS

2.01 COMPONENTS

A. Pipe and Penetration Flashing: Base of stainless steel, compatible with sheet metal roof systems, and capable of accomodating pipes sized between 0.375 inches and 12 inches.

2.02 ACCESSORIES

A. Sealant for Joints in Linear Components: As recommended by component manufacturer.

B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

C. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

D. Fasteners for anchoring aluminum elements to preservative pressure treated wood blocking or framing are to be stainless steel fasteners. Provide separation and no direct contact of aluminum flashings and preservative pressure treated roof blocking to avoid potential corrosion using roofing membrane or roofing felts.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Seal joints within components when required by component manufacturer.

C. Anchor components securely.

D. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

E. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

F. Coordinate installation of flashing flanges into reglets.

END OF SECTION

SECTION 077200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof penetrations mounting curbs.

B. Roof hatches, manual and automatic operation, including smoke vents.

C. Roof walkways and platforms.

D. Non-penetrating pedestals.

E. Snow guards.

F. Piping and conduit supports are specified in their respective sections, not in this section.

1.02 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide.

B. UL (DIR) - Online Certifications Directory.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.
   5. For smoke hatches, submit evidence of approval by evaluation agency specified.

C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.
   1. Submit shop drawings sealed and signed by a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

D. Certificate: For smoke hatches, provide certificate of approval from authority having jurisdiction.

E. Warranty Documentation:
   1. Submit manufacturer warranty.
   2. Ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 ROOF HATCHES AND VENTS, MANUAL AND AUTOMATIC OPERATION

A. Smoke and Heat Vents: Where "smoke" or "smoke/heat" operation is indicated, provide following additional features and omit manual operation for access.
   1. Smoke Release Mechanism: Automatic opening on melting of replaceable UL (DIR) listed fusible link at 165 degree F.
   2. UL (DIR) or FM (AG) listed as automatically operated smoke and heat vent.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

B. Remove burrs, and smooth out any sharp edges

C. Provide caps on all piping railings and ends and holes in pipe to eliminate bee hives.

3.04 CLEANING

A. Clean installed work to like-new condition.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Self-leveling pourable joint sealants.

B. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.

1.03 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.

B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

D. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.

E. ASTM C1193 - Standard Guide for Use of Joint Sealants.

F. SWRI (VAL) - SWR Institute Validated Products Directory.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.
   5. Substrates for which use of primer is required.
   6. Substrates for which laboratory adhesion and/or compatibility testing is required.
   7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
   8. Sample product warranty.
   9. Certification by manufacturer indicating that product complies with specification requirements.
   10. SWRI Validation: Provide currently available sealant product validations as listed by SWRI (VAL) for specified sealants.

C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

D. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

E. Test Reports: For joint sealants and backing, provide independent laboratory reports and test results showing negative asbestos containing materials content using Polarized Light Microscopy (PLM) test method.

F. Executed warranty.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each referenced document covering installation requirements on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

E. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
   1. Adhesion Testing: In accordance with ASTM C794.
   2. Compatibility Testing: In accordance with ASTM C1087.
   3. Allow sufficient time for testing to avoid delaying the work.
   4. Deliver sufficient samples to manufacturer for testing.
   5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.

F. Field Quality Control Plan:
   1. Visual inspection of entire length of sealant joints.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Self-Leveling Sealants:
   1. Bostik Inc: www.bostik-us.com.
   2. Dow Chemical Company: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
   3. Pecora Corporation: www.pecora.com.
   4. Sherwin-Williams Company: www.sherwin-williams.com.
   5. Sika Corporation: www.usa-sika.com.
   6. W.R. Meadows, Inc: www.wrmeadows.com/sle.
   7. Substitutions: See Section 016000 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to:
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
      e. Other joints indicated below.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.

b. Other joints indicated below.

3. Do not seal the following types of joints:
   a. Intentional weep holes in masonry.
   b. Joints indicated to be treated with manufactured expansion joint cover, or some other type of sealing device.
   c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
   d. Joints where installation of sealant is specified in another section.
   e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
   1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, noncuring.
   2. Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.

C. Interior Wet Areas: Mechanical room; fixtures in wet areas include plumbing fixtures and other similar items.

2.03 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with acceptable levels of volatile organic compound (VOC) content; see Section 016116.

2.04 SELF-LEVELING JOINT SEALANTS

A. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's standard range.
   4. Service Temperature Range: Minus 40 to 180 degrees F.

2.05 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
   1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
   2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
   3. Record each test on Preinstallation Adhesion Test Log as indicated.
   4. If any sample fails, review products and installation procedures, consult manufacturer, or take other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Architect.
   5. After completion of tests, remove remaining sample material and prepare joints for new sealant installation.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

3.05 POST-OCCUPANCY

A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width, i.e., at low temperature in thermal cycle. Report failures immediately and repair them.

END OF SECTION

SECTION 099123
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. All miscellaneous steel and unfinished metal elements.
   3. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, electrical equipment, and eletrical raceways, unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Marble, granite, slate, and other natural stones.
   6. Floors, unless specifically indicated.
   7. Ceramic and other tiles.
   8. Glass.
   9. Acoustical materials, unless specifically indicated.
   10. Concealed pipes, ducts, and conduits.
   11. Bathroom and Accessories
   12. FRP Doors

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.

B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.

D. SSPC-SP 1 - Solvent Cleaning.

E. SSPC-SP 2 - Hand Tool Cleaning.

F. SSPC-SP 6 - Commercial Blast Cleaning.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
2. MPI product number (e.g., MPI #47).
3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for submittals.
2. Substitution of MPI-approved products by a different manufacturer is preferred over substitution of unapproved products by the same manufacturer.
3. Substitution of a different paint system using MPI-approved products by the same manufacturer will be considered.

B. Paints:
1. Behr Process Corporation: www.behr.com/#sle.
2. Glidden Paint: www.glidden.com
3. PPG Paints: www.ppgpaints.com/#sle.
4. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: Not permitted.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.

1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
3. Supply each paint material in quantity required to complete entire project's work from a single production run.
4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 016116.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated on drawings.
1. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
2. Extend colors to surface edges; colors may change at any edge as directed by Architect.
3. In utility areas, finish equipment, piping, conduit, and exposed duct work in colors according to the color coding scheme indicated.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint MI-OP-3L - Ferrous Metals, Unprimed, Latex, 3 Coat:
1. One coat of latex primer.
2. Semi-gloss: Two coats of latex enamel.

B. Paint MI-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat:
1. Touch-up with latex primer.
2. Semi-gloss: Two coats of latex enamel; use this sheen for all locations unless otherwise indicated.

C. Paint MgI-OP-3L - Galvanized Metals, Latex, 3 Coat:
1. One coat galvanize primer.
2. Semi-gloss: Two coats of latex enamel.

D. Paint GI-P-1A - Gypsum Board/Plaster, Primer, 1 Coat:
1. One coat of latex primer sealer.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. Interior Rust-Inhibitive Water Based Primer; MPI #107.
2. Interior/Exterior Quick Dry Alkyd Primer for Metal; MPI #76.
3. Interior Water Based Primer for Galvanized Metal; MPI #134 or #134 X-Green.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

H. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to SSPC-SP 2.

I. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.06 SCHEDULE - PAINT SYSTEMS

A. Galvanized Steel: Finish surfaces exposed to view.
   1. Interior: Mgl-OP-3L.

B. Shop-Primed Metal Items: Finish surfaces exposed to view.
   1. Finish the following items:
      a. Mechanical equipment.
      b. Electrical equipment.
   2. Interior: MI-OP-2L.

END OF SECTION

SECTION 116813
PLAYGROUND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Playground layout and staking.

B. Concrete footings for playground equipment.

C. Installation of playground equipment, equipment provided by owner.

D. Location of each item of playground equipment is indicated on drawings.

1.02 RELATED REQUIREMENTS

A. Section 005200 - Agreement Form : Liability Insurance and Bonding requirements.

B. Section 033000 - Cast-in-Place Concrete: Footings for playground equipment.

C. Section 312200 - Grading: Shaping subgrade to specified grade levels.

D. Section 321313 - Concrete Paving: Concrete Sidewalks and Ramps.

E. Section 321816.13 - Playground Protective Surfacing: Protective surfacing in playground area.

1.03 DEFINITIONS

A. Play Event: A piece of playground equipment that supports one or more play activities.

B. Use Zone: Area under and around a play event within which the ground surfacing must meet fall impact attenuation requirements of ASTM F1292 when tested at the fall height specified for the play event. Use Zones must not overlap and must stay within play surface boundary.

C. Fall Height: Vertical distance between the finished elevation of the designated play surface and the finished elevation of the protective surfacing beneath it, as defined in ASTM F1487.

D. Protective Surfacing: Resilient ground surfacing, specified in Section 32 1816.13. The characteristics of the protective surfacing are based on the fall height of the playground equipment. Changes in either the surfacing or the fall height, particularly reducing the resilience of the protective surfacing or increasing the fall height, will reduce safety-related performance. Protective Surface slopes must not exceed 2% in any direction.

E. Subbase: Compacted aggregate material on which the protective surfacing is installed; the subbase for the protective surfacing is installed over the subgrade hat has been fully compacted and over the underdrain system. Subbase surfaces must be compacted to 95% maximum dry density, Standard Proctor Test (ASTM D698) as tested and confirmed by a Geotechnical Engineer with a report submitted to the Architect.

F. Subgrade: Compacted surface of the ground that supports the subbase below the protective surfacing. Subgrade surfaces must be compacted to 95% maximum dry density, Standard Proctor Test (ASTM D698) as tested and confirmed by a Geotechnical Engineer with a report submitted to the Architect.

1.04 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

B. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.

C. ASTM D648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.

D. ASTM F1292 - Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment.

E. ASTM F1487 - Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.

F. AWPA U1 - Use Category System: User Specification for Treated Wood.

G. CPSC Pub. No. 325 - Public Playground Safety Handbook.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meetings: Convene a meeting one week before starting earthwork for playground to discuss coordination between various installers.
   1. Require attendance by personnel responsible for grading and installers of playground equipment, protective surfacing, footings, and adjacent work.
   2. Include representatives of Contractor.
   3. Notify Architect at least 2 weeks prior to meeting.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Proposals for Substitutions: Substitutions that will increase fall height, platform height, or maximum equipment height will not be considered; submit shop drawings with proposed modifications clearly identified and sufficient information to determine compliance with specified criteria.

C. Product Data: For manufactured equipment, provide manufacturer's product data showing materials of construction, compliance with specified standards, installation procedures, safety limitations, and the number of users permitted.

D. Installation Instructions: For manufactured equipment, provide manufacturer's product installation manual for each piece of equipment that shows required installation preparation, process, fasteners and equipment with details of proper assembly, testing and tightening procedures, and indicates required regular inspection and maintenance tasks. Provide to Owner prior to start of construction.

E. Shop Drawings: Detailed scale drawings showing play event layout, use zone perimeters, and fall height for each play event.
   1. Show locations and dimensions of footings and anchorage points.
   2. Clearly identify mounting elevations in relation to a fixed survey point on site and to subgrade elevation and depth of protective surfacing.
   3. Show locations of underground utilities and storm drainage underdrain system.
   4. Show locations of related construction such as walkways and roadways, fences, site furnishings, plantings and existing vegetation.
   5. Provide a color rendered playground plan and two or more 3-dimensional perspective color renderings. Plans and renderings must show accurate scale playground limits, layout of exact equipment pieces and equipment colors. Provide two or more views to show full layout of all equipment.

F. Samples: For each item that a color must be selected, provide color chart showing full range of colors and finishes.

G. Installer's qualification statement.

H. Maintenance Data: Provide manufacturer's recommended maintenance instructions and list of replaceable parts for each equipment item, with address and phone number of source of supply.

I. Geotechnical compaction test reports for subgrade and subbase material compaction.

J. Executed warranty.

1.07 QUALITY ASSURANCE

A. Bidder Qualifications: Entities submitting bids must have no less than 5-years experience supplying commercial playground equipment, have represented commercial playground equipment with same manufacturer for no less than the last 5-years, are licensed and bonded, are licensed contractors in the state of Missouri, and are bondable for up to the amount of the proposed cost for the work. An August 2020 copy of the manufacturers acknowledgement that the bidder has represented them for no less than the last 5-years and stating the bidders ability to provide commercial playground equipment specifically for the Parkway School District, a copy of bidders 2020 business license, an August 2020 copy of the bidders bonding company stating bondability level, a copy of the bidders certificate of insurance (naming Parkway School District as an additional insured), and a 2020 copy of the bidders Missouri contractor's license valid through the balance of 2020 to be included with the bid submittals.
   1. Maintain one copy of the latest edition of ASTM F1487 and CPSC Pub. No. 325 at project site.

B. Qualified manufacturers are to have at least 20-years of experience in commercial playground equipment manufacturing, including steel and aluminum tubing, rotomolding, thermoplastic, HDPE, and powder coating; as well as carry ISO 9001/2000 certification. Powder coating operation to have a PCI (Powder Coating Institute) certification rating of no less than Gold level. Manufacturer to carry no less than product liability insurance as described Section 005200 AIA Document A101-2017 Exhibit A Insurance and Bonding.

C. Installer Qualifications: Installer must have no less than 5-years' experience installing commercial playground equipment, be certified by the playground equipment manufacturer by having attended the playground equipment manufacturer training school within the last two years, be licensed, and carry liability insurance and bonding as described in Section 005200 AIA Document A101-2017 Exhibit A Insurance and Bonding. A copy of the installer's manufacturer certification, business license and certificate of insurance (naming Parkway School District as an additional insured) to be included with the bid submittals.

D. Sourcing: To ensure that product aesthetics match corresponding project design and quality intent, procure all products from a single manufacturer.

E. Installer Qualifications: Company certified by manufacturer for training and experience installing play events and equipment.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store equipment to project site in accordance with manufacturer's recommendations.

B. Store materials in a dry, covered area, elevated above grade.

C. Keep manufacturer-provided protective wrapping on individual posts and equipment during installation for as long as possible where it does not interfere with installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum 1 year warranty against structural failure caused by defective materials or defective workmanship for all playground equipment not identified in this section.

C. Provide minimum 15 year limited warranty on all rigid steel equipment components, PVC coated platforms, steps, weldments rotationally molded and sheet plastic components, plastic lumber, roof panels. Warranty limited to structural failure caused by corrosion, defective materials or defective workmanship.

D. Provide minimum 10 year limited warranty on fabric and fabric shade steel frames. Warranty limited to structural failure caused by defective materials or workmanship.

E. Provide minimum 8 year warranty on accessible swing seats and shade fabric and components against rot, UV deterioration and defects in materials and workmanship.

F. Provide minimum 5 year warranty on climbing rocks, PVC coating against cracking or peeling, steel core cable nets and rope fittings and connections against structural failure due to defects in materials and workmanship.

G. Provide minimum 3 year warranty on electronic panel speakers, sound chips and circuit boards.

PART 2 PRODUCTS

2.01 PLAYGROUND EQUIPMENT - GENERAL

A. Design Assumptions: The safety of the playground depends on strict compliance with design criteria. In addition, this project must be completed to meet the following assumptions and expectations.
   1. Playgrounds A have been designed for children ages 5 through 12. Play equipment proposed will be appropriate and safe for that age group.
   2. Playgrounds B have been designed for children ages 2 through 5. Play equipment
   3. Separate areas for different age groups are indicated on drawings.
   4. If deviations from specified dimensions, especially fall heights, is required, obtain approval prior to proceeding; follow approval request procedure as specified for substitutions.
   5. Installation heights of all play equipment will be measured, checked, confirmed and adjusted with play surface elevations and slopes to comply with ADA guidelines for cross-slopes and CPSC Public Playground Safety Guidelines for equipment heights prior to installation and pouring of concrete footings.
   6. Installed playground equipment will be clean, will appear as new free from cuts, chips, scratches and dents, and safe to touch with no sharp metal, plastic or rubber coating edges.
   7. All equipment must be designed to be installed in a rubberized pour-in-place surface.

B. Mount equipment posts centered and embedded in concrete footings, per manufacturer recommendations and details, unless otherwise indicated.
   1. Playground protective surfacing constitutes a poured-in-place resilient surface color layer installed over a resilient base layer; installed over a free-draining washed stone subbase (non-resilient); that is installed over geotextile filter fabric; installed over a sloped compacted soil subgrade; drainage to collect in a grated inlet and perforated underdrain pipe system and piped away from the playground; top of footings, turnbuckles and anchorage devices are to be covered and wrapped per manufacturer recommendations for user safety and CPSC compliance. Turnbuckles, ropes and anchoring rods must not be installed below and through resilient protective surfacing in a manner that could cause tearing or resilient surfacing by equipment use.
   2. Protective Surfacing Depth: per manufacturer system designed, tested and certified for playground equipment maximum fall height .
   3. Provide supports as required to mount equipment at proper height above finish and sub-grades to allow installation of sufficient depth of protective surfacing; portion of support below top of surfacing must comply with specified requirements for equipment.
   4. Compact subgrade and subbase inside and outside playground areas to specified requirements. Provide compaction and re-compaction testing by a Geotechnical Engineer and submit successful test reports to Architect for each surface preparation.
   5. Survey and check required slopes and finish grades prior to setting equipment heights. Temporarily mark required finish surface elevations throughout playground prior to installing protective surface.
   6. Fully compact and re-compact drainage stone around playground perimeters, adjacent to pavement edges and around all play structure posts to eliminate depressions, soft spots and formation of void space.
   7. Check all equipment for damage and sharp edges. Check platform edge rubber coating drips, rubber coating at pre-drilled platform holes, metal post tops, slide joints and guardrail post bottoms especially. Remove sharp edges, rough material, areas and repair and paint touchup equipment repairs prior to installation. Check all again and repair as needed after installation.

8. Paint portion of support that is intended to be installed below top surface of protective surfacing a different color, or mark in other permanent way, so that installers and maintainers of protective surfacing can easily determine whether sufficient depth has been installed.

C. Provide permanent label for each equipment item stating age group that equipment was designed for, manufacturer identification, and warning labels in accordance with ASTM F1487.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that that excess soil, rocks, and debris have been removed in and around the playground area, that the subgrade has been graded smooth, sloped to drains and fully compacted, underdrain system installed, and subgrade elevations are as required.

B. Verify playground slide heights above proposed finish grade lines are compliant with CPSC Playground Safety Guidelines.

C. Verify that playground equipment footings have been installed in proper locations and at proper elevations.

D. Verify location of underground utilities and facilities in playground area; damage to underdrain and underground utilities and facilities will be repaired at Contractor's expense.

3.02 PREPARATION

A. Stake location of playground elements, including Use Zone perimeters, perimeter of protective surfacing, access and egress points, hard surfaces, walls, fences, and structures, and planting locations.

B. Stake layout of entire Use Zone perimeter before starting any work and before subbase under resilient surfacing is laid.
   1. Verify that Use Zone perimeters do not overlap hard surfaces, whether currently installed or not.
   2. Verify that Use Zones are free of obstructions that would extend into resilient portion of protective surfacing.
   3. If conflicts or obstructions exist, notify Architect.
   4. Do not proceed until revised drawings have been provided, showing corrected layout, and obstructions have been removed.

3.03 INSTALLATION

A. Coordinate work with preparation for and installation of protective surfacing specified in Section 321816.13; install resilient portion of protective surfacing after playground equipment installation.

B. Install in accordance with CPSC Pub. No. 325, ASTM F1487, manufacturer's instructions, and requirements of authorities having jurisdiction (AHJ).

C. Anchor equipment securely below bottom elevation of resilient surfacing layer.

D. Install without sharp points, edges or protrusions, entanglement hazards, pinch, crush, or shear points.

E. Do not modify play events on site without written approval of manufacturer.

F. Install required signage if not factory-installed.

3.04 FIELD QUALITY CONTROL

A. Prior to requesting Owner and Owner's Representative playground inspection, obtain the services of the equipment manufacturer's field representative to review the finished installation for compliance with specified requirements and with design criteria to the extent known to the Contractor; submit report of field review. Correct all deficiencies and have the equipment manufacturer's field representative conduct an additional review prior to requesting Owner inspection. Submit final equipment manufacturer's field representative approval report prior to requesting Owner and Owner's Representative playground inspection.

B. Prior to requesting Owner and Owner's Representative playground inspection, obtain the services of a CPSC Certified Safety Inspector (CPSI) to review all equipment and playground conditions for compliance with CPSC guidelines. Correct all deficiencies and have CPSI conduct an additional review prior to requesting Owner inspection. Submit final CPSI approval report prior to requesting Owner and Owner's Representative playground inspection.

C. Owner or Owner's representative will inspect playground equipment after installation and after receipt of HIC Testing report, final equipment manufacturer's field representative approval report and final CPSI approval report, to review and verify that playground meets specified design safety and accessibility requirements.

D. Check play equipment for sharp edges, cuts, scrapes, soil, dents, loose and missing pieces or fasteners. Clean, repair and paint touchup to restore equipment to like-new appearance prior to calling for Owner or Owner's representative review and approval.

E. Repair or replace rejected work until compliance is achieved.

3.05 CLEANING

A. Restore adjacent existing areas that have been damaged from the construction.

B. Playground equipment must be clean and in like-new condition before it can be accepted. Clean all playground equipment of construction materials, dirt, stains, scratches, sharps, burrs, filings, and blemishes due to shipment or installation; clean, repair and paint touch-up in accordance with manufacturer's instructions, using cleaning agents and repair methods as recommended by manufacturer.

C. Clean playground area of excess construction materials, debris, and waste.

D. Remove excess and waste material and dispose of off-site in accordance with requirements of authorities having jurisdiction (AHJ).

3.06 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Replace damaged products before Date of Substantial Completion.

C. Surround playgrounds with erosion control filter sock and/or silt fence to keep storm drainage and sediment from flowing onto playground subbase.

END OF SECTION

SECTION 230519
METERS AND GAUGES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flow meters.

B. Pressure gauges and pressure gauge taps.

C. Industrial type of thermometers and thermometer wells.

D. Static pressure gauges.

1.02 RELATED REQUIREMENTS

A. Section 232113 - Hydronic Piping.

1.03 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments.

B. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle, and Venturi.

C. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers.

D. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.

E. AWWA M6 - Water Meters -- Selection, Installation, Testing, and Maintenance.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

C. Operation and Maintenance Data: Meters.

1.05 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.01 LIQUID FLOW METERS

A. Manufacturers:
   1. Dwyer Instruments, Inc: www.dwyer-inst.com.
   2. McCrometer: www.mccrometer.com.
   3. Venture Measurement, a Danaher Company: www.venturemeasurement.com.
   4. Veris Industries
   5. Substitutions: See Section 016000 - Product Requirements.

B. CalibratedASME MFC-3M Venturi orifice plate and flanges with valved taps, chart for conversion of differential pressure readings to flow rate, with pressure gauge in case.

C. Annular element flow stations with meter set.
   1. Measuring Station: Type 316 stainless steel pitot type flow element inserted through welded threaded couplet, with safety shut-off valves and quick coupling connections, and permanent metal tag indicating design flow rate, reading for design flow rate, metered fluid, line size, station or location number.
      a. Pressure rating: 275 psi.
      b. Maximum temperature: 400 degrees F.
      c. Accuracy: Plus 0.55 percent to minus 2.30 percent.

2.02 MANUFACTURERS - GAGES AND THERMOMETERS

A. Dwyer Instruments, Inc: www.dwyer-inst.com.

B. Moeller Instrument Co., Inc: www.moellerinstrument.com.

C. Omega Engineering, Inc: www.omega.com.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.03 PRESSURE GAUGES

A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
   1. Case: Steel with brass bourdon tube.
   2. Size: 4-1/2 inch diameter.
   3. Mid-Scale Accuracy: One percent.
   4. Scale: Psi and KPa.

2.04 PRESSURE GAUGE TAPPINGS

A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi.

B. Needle Valve: Brass, 1/4 inch NPT for minimum 150 psi.

C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections.

D. Syphon: Steel, Schedule 40, 1/4 inch angle or straight pattern.

2.05 STEM TYPE THERMOMETERS

A. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
   1. Size: 9 inch scale.
   2. Window: Clear Lexan.
   3. Stem: 3/4 inch NPT brass.
   4. Accuracy: 2 percentper ASTM E77.
   5. Calibration: Degrees F.

2.06 DIAL THERMOMETERS

A. Thermometers - Fixed Mounting: Dial type bimetallic actuated; ASTM E1; stainless steel case, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
   1. Size: 3-1/2 inch diameter dial.
   2. Temperature Range: 0 to 250F.
   3. Lens: Clear glass.
   4. Accuracy: 1 percent.
   5. Calibration: Degrees F.

B. Thermometer: ASTM E1, stainless steel case, adjustable angle with front recalibration, bimetallic helix actuated with silicone fluid damping, white with black markings and black pointer hermetically sealed lens, stainless steel stem.
   1. Size: 3 inch diameter dial.
   2. Lens: Clear glass.
   3. Accuracy: 1 percent.
   4. Calibration: Degrees F.

C. Thermometers: Dial type vapor or liquid actuated; ASTM E1; stainless steel case, with brass or copper bulb, copper or bronze braided capillary, white with black markings and black pointer, glass lens.
   1. Size: 3-1/2 inch diameter dial.
   2. Lens: Clear glass.
   3. Length of Capillary: Minimum 5 feet.
   4. Accuracy: 2 percent.

5. Calibration: Degrees F.

2.07 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.08 TEST PLUGS

A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Nordel core for temperatures up to 350 degrees F.

2.09 STATIC PRESSURE GAUGES

A. 3-1/2 inch diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.

B. Inclined manometer, red liquid on white background with black figures, front recalibration adjustment, 3 percent of full scale accuracy.

C. Accessories: Static pressure tips with compression fittings for bulkhead mounting, 1/4 inch diameter tubing.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install positive displacement meters with isolating valves on inlet and outletto AWWA M6. Provide full line size valved bypass with globe valve for liquid service meters.

C. Provide one pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.

D. Install pressure gauges with pulsation dampers. Provide gauge cock to isolate each gauge. Provide siphon on gauges in steam systems. Extend nipples and siphons to allow clearance from insulation.

E. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

F. Install thermometers in air duct systems on flanges.

G. Install thermometer sockets adjacent to controls system thermostat, transmitter, or sensor sockets. Refer to Section 230943. Where thermometers are provided on local panels, duct or pipe mounted thermometers are not required.

H. Locate duct mounted thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence.

I. Coil and conceal excess capillary on remote element instruments.

J. Provide instruments with scale ranges selected according to service with largest appropriate scale.

K. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

L. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

END OF SECTION

SECTION 230523
GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Angle valves.

B. Globe valves.

C. Ball valves.

D. Butterfly valves.

E. Check valves.

F. Chainwheels.

1.02 RELATED REQUIREMENTS

A. Section 230548 - Vibration and Seismic Controls for HVAC.

B. Section 230553 - Identification for HVAC Piping and Equipment.

C. Section 230719 - HVAC Piping Insulation.

D. Section 232113 - Hydronic Piping.

1.03 ABBREVIATIONS AND ACRONYMS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. PFA: Perfluoroalkoxy alkane.

G. PTFE: Polytetrafluoroethylene.

H. RS: Rising stem.

I. TFE: Tetrafluoroethylene.

J. WOG: Water, oil, and gas.

1.04 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch.

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

C. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard.

D. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves.

E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

F. ASME B16.34 - Valves — Flanged, Threaded, and Welding End.

G. ASME B31.9 - Building Services Piping.

H. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators.

I. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

J. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.

K. ASTM A536 - Standard Specification for Ductile Iron Castings.

L. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.

M. AWWA C606 - Grooved and Shouldered Joints.

N. MSS SP-45 - Drain and Bypass Connections.

O. MSS SP-67 - Butterfly Valves.

P. MSS SP-68 - High Pressure Butterfly Valves with Offset Design.

Q. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends.

R. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service.

S. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves.

T. MSS SP-85 - Gray Iron Globe and Angle Valves, Flanged and Threaded Ends.

U. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

1.06 QUALITY ASSURANCE

A. Manufacturer:
   1. Obtain valves for each valve type from single manufacturer.
   2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
   2. Protect valve parts exposed to piped medium against rust and corrosion.
   3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
   4. Secure check valves in either the closed position or open position.
   5. Adjust butterfly valves to closed or partially closed position.

B. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.
      a. Provide temporary inlet and outlet caps.
      b. Maintain caps in place until installation.
   2. Store valves in shipping containers and maintain in place until installation.
      a. Store valves indoors in dry environment.
      b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

C. Exercise the following precautions for handling:
   1. Handle large valves with sling, modified to avoid damage to exposed parts.
   2. Avoid the use of operating handles or stems as rigging or lifting points.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

B. Provide the following valves for the applications if not indicated on drawings:
   1. Throttling (Hydronic): Butterfly, Ball, Globe, and Angle.
   2. Isolation (Shutoff): Butterfly, Ball, and Plug.
   3. Swing Check (Pump Outlet):
      a. Size 2 inch and Smaller: Bronze with bronze disc.
      b. Size 2-1/2 inch and Larger: Iron with lever and weight, lever and spring, center-guided metal, or center-guided with resilient seat.

C. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.

D. Required Valve End Connections for Non-Wafer Types:
   1. Steel Pipe:
      a. Size 2 inch and Smaller: Threaded ends.
      b. Size 2-1/2 inch and Larger: Grooved ends.
   2. Copper Tube:
      a. Size 2 inch and Smaller: Threaded ends, except solder-joint valve-ends.
      b. Size 2-1/2 inch and Larger: Grooved ends.

E. Heating Hot Water Valves:
   1. Size 2 inch and Smaller, Brass and Bronze Valves:
      a. Threaded ends.
      b. Angle: Bronze disc, Class 125.
      c. Ball: Full port, one piece, brass trim.
      d. Swing Check: Bronze disc, Class 125.
      e. Globe: Bronze disc, Class 125.
   2. Size 2-1/2 inch and Larger, Iron Valves:
      a. 2-1/2 inch to 4 inch: Threaded ends.
      b. Ball: 2-1/2 inch to 10 inch, Class 150.
      c. Single-Flange Butterfly: 2-1/2 inch to 12 inch, aluminum-bronze disc, EPDM seat, 200 CWP.
      d. Single-Flange Butterfly: 14 inch to 24 inch, aluminum-bronze disc, EPDM seat, 150 CWP.
      e. Grooved-End Butterfly: 2-1/2 inch to 12 inch, 175 CWP.
      f. Butterfly: High performance, single flange, Class 150.
      g. Swing Check: Metal seats, Class 125.
      h. Swing Check: 2-1/2 inch to 12 inch, lever and spring closure control, Class 125.
      i. Grooved-End Swing Check: 3 inch to 12 inch, 300 CWP.
      j. Center-Guided Check: Compact-wafer, metal seat, Class 125.
      k. Plate-Type Check: Single plate, metal seat, Class 125 .
      l. Globe: 2-1/2 inch to 12 inch, Class 125.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:
   1. Gear Actuator: Quarter-turn valves 8 inch and larger.
   2. Handwheel: Valves other than quarter-turn types.
   3. Hand Lever: Quarter-turn valves 6 inch and smaller.

4. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator, of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

D. Valves in Insulated Piping: Provide 2 inch stem extensions and the following features:
   1. Gate Valves: Rising stem.
   2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
   3. Butterfly Valves: Extended neck.

E. Valve-End Connections:
   1. Threaded End Valves: ASME B1.20.1.
   2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
   3. Pipe Flanges and Flanged Fittings 1/2 inch through 24 inch: ASME B16.5.
   4. Solder Joint Connections: ASME B16.18.

F. General ASME Compliance:
   1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
   2. Building Services Piping Valves: ASME B31.9.

G. Bronze Valves:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.

H. Valve Bypass and Drain Connections: MSS SP-45.

I. Source Limitations: Obtain each valve type from a single manufacturer.

2.03 BRONZE, ANGLE VALVES

A. CWP Rating: Class 125: 200 psi and Class 150: 300 psi:
   1. Comply with MSS SP-80, Type 1.
   2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
   3. Ends: Threaded.
   4. Stem: Bronze.
   5. Disc: Bronze, PTFE, or TFE.
   6. Packing: Asbestos free.
   7. Handwheel: Bronze or aluminum.

2.04 BRONZE, GLOBE VALVES

A. CWP Rating: Class 125: 200 psi:
   1. Comply with MSS SP-80, Type 1.
   2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
   3. Ends: Threaded or solder joint.
   4. Stem and Disc: Bronze or PTFE.
   5. Packing: Asbestos free.
   6. Handwheel: Malleable iron.

2.05 IRON, GLOBE VALVES

A. CWP Ratings: Class 125: 200 psi and Class 250: 500 psi:
   1. Comply with MSS SP-85, Type I.
   2. Body: Gray iron; ASTM A126, with bolted bonnet.
   3. Ends: Flanged.
   4. Trim: Bronze.
   5. Packing and Gasket: Asbestos free.
   6. Operator: Handwheel or chainwheel.

2.06 BRONZE, BALL VALVES

A. General:

1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Two Piece, Full Port with Bronze or Brass Trim:
1. Comply with MSS SP-110.
2. WSP Rating: 150 psi.
3. WOG Rating: 400 psi.
4. Body: Forged bronze.
5. End Connections: Pipe thread or solder.
6. Seats: PTFE.
7. Stem: Stainless steel.
8. Ball: Stainless steel, vented.

2.07 IRON, BALL VALVES

A. Split Body, Full Port, Flanged:
1. Comply with MSS SP-72.
2. CWP Rating: Minimum 200 psi.
3. Body: Cast iron or ductile iron.
   a. Cast Iron: ASTM A126 gray iron; Class 125 flanges.
   b. Ductile Iron: ASTM A395/A395M or ASTM A536 ductile iron; Class 150 flanges.
4. Seats: PTFE.
5. Stem: Stainless steel or carbon steel.
6. Ball: Manufactured from plated carbon steel, stainless steel, PFA-fused stainless steel, and PFA-fused cast iron.
7. Operator: Lockable lever handle or gear operator.

2.08 IRON, SINGLE FLANGE BUTTERFLY VALVES

A. Wafer and Lug Style:
1. Class 125 or 150.
2. Comply with MSS SP-67, Type I.
3. Wafer Style, CWP Ratings:
   a. Sizes 2 to 12 inches: 200 psi.
   b. Sizes 14 to 24 inches: 150 psi.
4. Lug Style, CWP Ratings:
   a. Sizes 2 to 12 inches: 250 psi.
   b. Sizes 14 to 24 inches: 150 psi.
5. Body Material: ASTM A126 cast iron or ASTM A536 ductile iron.
6. Stem: One or two-piece stainless steel.
7. Seat: NBR.
8. Disc: Aluminum-bronze.

2.09 IRON, GROOVED-END BUTTERFLY VALVES

A. CWP Rating: 175 psi.
1. Comply with MSS SP-67, Type I.
2. Body: Coated ductile iron.
3. Stem: Two-piece stainless steel.
4. Disc: Coated ductile iron.
5. Disc Seal: EPDM.

2.10 HIGH-PERFORMANCE, SINGLE FLANGE BUTTERFLY VALVES

A. Lug type; Bidirectional dead end service without downstream flange:
1. Comply with MSS SP-68.
2. Class 150: CWP Rating: 285 psi at 100 degrees F.
3. Body: Provide stainless steel.
4. Seat: Reinforced PTFE.

5. Offset stem: Stainless steel.
6. Disc: Stainless steel.

2.11 BRONZE, SWING CHECK VALVES

A. Class 125:
1. Pressure and Temperature Rating: MSS SP-80, Type 3.
2. Design: Y-pattern, horizontal or vertical flow.
3. WSP Rating: 200 psi.
4. Body: Bronze, ASTM B62.
5. End Connections: Threaded or soldered.
6. Disc: Bronze.
7. Manufacturers:
   a. Apollo Valves: www.apollovalves.com/#sle.
   b. Kitz Corporation of America; #22: www.kitzus-kca.com/#sle.
   c. NIBCO INC: www.nibco.com/#sle.
   d. Substitutions: See Section 016000 - Product Requirements.

2.12 IRON, FLANGED END SWING CHECK VALVES

A. Class 125:
1. 150 psi with metal seats.
2. 200 psi with metal seats and nonmetallic-to-metal seats.

B. Manufacturers:
1. Apollo Valves: www.apollovalves.com/#sle.
2. NIBCO INC: www.nibco.com/#sle.
3. Substitutions: See Section 016000 - Product Requirements.

2.13 IRON, SWING CHECK VALVES WITH CLOSURE CONTROL

A. Class 125:
1. Comply with MSS SP-71, Type I.
2. Sizes 2-1/2 to 12 inch: CWP Rating; 200 psi.
3. Sizes 14 to 24 inch: CWP Rating; 150 psi.
4. Body Design: Clear or full waterway.
5. Body Material: ASTM A126, gray iron with bolted bonnet.
6. Ends: Flanged.
7. Trim: Bronze.
8. Gasket: Asbestos free.
9. Closer Control: Factory installed, exterior lever, and spring or weight.

2.14 IRON, GROOVED-END SWING CHECK VALVES

A. Class 300:
1. CWP Rating: 300 psi.
2. Body Material: ASTM A536, Grade 65-45-12 ductile iron.
3. Seal: EPDM or Nitrile.
4. Disc: Ductile iron.
5. Coating: Black, non-lead paint.

2.15 IRON, CENTER-GUIDED CHECK VALVES

2.16 IRON, PLATE-TYPE CHECK VALVES

2.17 CHAINWHEELS

A. Description: Valve actuation assembly with sprocket rim, brackets, and chain.
1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
2. Attachment: For connection to butterfly valve stems.
3. Sprocket Rim with Chain Guides: Ductile iron include zinc coating.

4. Chain: Hot-dip galvanized steel. Sized to fit sprocket rim.

PART 3 EXECUTION

3.01 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges, are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Install check valves where necessary to maintain direction of flow as follows:
   1. Lift Check: Install with stem plumb and vertical.
   2. Swing Check: Install horizontal maintaining hinge pin level.
   3. Orient plate-type and center-guided into horizontal or vertical position, between flanges.

D. Provide chainwheels on operators for valves 4 NPS and larger where located 96 inches or more above finished floor, terminating 60 inches above finished floor.

END OF SECTION

SECTION 230548
VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vibration isolation requirements.

B. Seismic control requirements.

C. Equipment support bases.

D. Vibration isolators.

E. External seismic snubber assemblies.

F. Seismic restraint systems.

1.02 RELATED REQUIREMENTS

A. Section 231113 - Facility Natural-Gas Piping.

B. Section 23200s - HVAC Piping and Pumps.

C. Section 23500s - Central Heating Equipment.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

B. ASCE 19 - Structural Applications of Steel Cables for Buildings.

C. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications.

D. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment.

E. FEMA 413 - Installing Seismic Restraints for Electrical Equipment.

F. FEMA 414 - Installing Seismic Restraints for Duct and Pipe.

G. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage.

H. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172.

I. ICC (IBC) - International Building Code.

J. MFMA-4 - Metal Framing Standards Publication.

K. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

C. Product Data:
   1. Provide manufacturer's product literature documenting compliance with PART 2 PRODUCTS.
   2. Include seismic rating documentation for each isolator and restraint component accounting for horizontal, vertical, and combined loads.

D. Shop Drawings:

E. Manufacturer's Instructions: Indicate installation instructions with special procedures and setting dimensions.

1.05 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Perform design and installation in accordance with applicable codes.

C. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and registered and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The VMC Group; thevmcgroup.com

B. B-line: www.cooperindustries.com

C. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. General:
   1. All vibration isolators, base frames and inertia bases to conform to all uniform deflection and stability requirements under all operating loads.
   2. Steel springs to function without undue stress or overloading.
   3. Steel springs to operate in the linear portion of the load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
   4. Lateral to vertical stiffness ratio to not exceed 0.08 with spring deflection at minimum 75 percent of specified deflection.
   5. All equipment mounted on vibration isolated bases to have minimum operating clearance of 2 inches between the base and floor or support beneath unless noted otherwise.

2.03 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

A. Manufacturers:
   1. Vibration-Isolated Equipment Support Bases:
      a. Kinetics Noise Control, Inc: www.kineticsnoise.com/#sle.
      b. Mason Industries: www.mason-ind.com/#sle.
      c. Vibration Eliminator Company, Inc: www.veco-nyc.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.

B. Vibration-Isolated Concrete Inertia Bases:
   1. Description: Concrete-filled engineered steel forms with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.
   2. Minimum Base Depth: 6 inches.
   3. Minimum Base Mass (Including Concrete): 1.5 times weight of supported equipment.
   4. Concrete Reinforcement: Welded or tied reinforcing bars running both ways in a single layer.
   5. Concrete: Filled on site with minimum 3000 psi concrete in accordance with Section 033000.

2.04 VIBRATION ISOLATORS

A. Manufacturers:
   1. Vibration Isolators:
      a. Kinetics Noise Control, Inc: www.kineticsnoise.com/#sle.
      b. Mason Industries: www.mason-ind.com/#sle.
      c. Vibration Eliminator Company, Inc: www.veco-nyc.com/#sle.
   2. Source Limitations: Furnish vibration-isolators and associated accessories produced by a single manufacturer and obtained from a single supplier.

B. General Requirements:
   1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
   2. Spring Elements for Spring Isolators:
      a. Color code or otherwise identify springs to indicate load capacity.
      b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.

c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
f. Selected to function without undue stress or overloading.

3. Seismic Snubbing Elements for Seismic Isolators:
   a. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
   b. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

2.05 EXTERNAL SEISMIC SNUBBER ASSEMBLIES

A. Description: Steel snubbing assemblies designed for external attachment to both equipment and supporting structure that, as part of a complete system, restrain equipment motion in all directions during a seismic event while maintaining vibration isolation during normal operation.

B. Seismic Snubbing Elements:
   1. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
   2. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

C. Comply with:

D. All Directional External:

2.06 SEISMIC RESTRAINT SYSTEMS

A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

B. Cable Restraints:
   1. Comply with ASCE 19.
   2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
   3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
   4. Use protective thimbles for cable loops where potential for cable damage exists.

C. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

D. Comply with:
   1. ASHRAE (HVACA) Handbook - HVAC Applications.
   2. FEMA 412.
   3. SMACNA (SRM).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

3.02 INSTALLATION - GENERAL

A. Install in accordance with manufacturer's instructions.

3.03 INSTALLATION - SEISMIC

A. Comply with:
   1. ASHRAE Handbook - HVAC Applications
   2. SMACNA (SRM)

B. Seismic Snubbers:
   1. Provide on all isolated equipment, piping and ductwork.
   2. Provide minimum of four seismic snubbers located close to isolators.
   3. Snub equipment designated for post-disaster use to 0.05 inch maximum clearance.
   4. Snub all other equipment between 0.15 inch and 0.25 inch clearance.

C. Floor and Base-Mounted Equipment, Vibration Isolated Equipment and associated Vibration and Seismic Controls for Connections:
   1. Install equipment anchorage items designed to resist seismic design force in any direction.
   2. Install vibration and seismic controls designed to include based and isolator requirements.
   3. Provide flexible connection between equipment and interconnected piping.
   4. Provide isolators and restraints designed for amplified code forces per ASCE 7 and with demostrated ability to resist required forces including forces in cluding gravity, operational and seismic forces.
   5. Where equipment is not desgned to be point loaded, provide base capable of transferring gravity and seismic demands from equipment to isolator bas plate anchorage.

D. Suspended Mechanical Equipment:
   1. Provide supports and bracing to resist seismic design force in any direction.
   2. Provide flexible connectcions between equipment and interconnected piping.
   3. Brace equipment hung from spring mounts using cable or other bracing that will not transmit vibration to the structure.

E. Piping:
   1. Provide seismic bracing in accordance ASCE 7.
   2. Provide flexible connections between floor mounted equipment and suspended piping; between unbraced piping and restrained suspended items; as required from thermal movement; at building separations and seismic joints; and wherever related differential movement could damage pipe in an earthquake.
   3. Pipes and Connections Constructed of Ductile Materials (copper, ductile iron, steel or aluminum and brazed, welded or screwed connections):
      a. Provide transverse bracing at spacing not more than 40 feet on center.
      b. Provide logitudinal bracing at spacing not more than 80 feet on center.
   4. Pipes and Connections Constructed of Non Ductile Materials (cast iron, no-hub, plastic or non-UL listed grooved coupling pipe):
      a. Provide transverse bracing at spacing not more than 20 feet on center.
      b. Provide longitudinal bracing at spaceing not more than 40 feet on center.
   5. Re-use of Existing Hangers:
      a. Unless otherwise shown on the drawings, it is assumed all hangers supporting new piping, located at a seismic brace, will be new.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect vibration isolation and/or seismic control components for damage and defects.

C. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

D. Inspect isolated equipment after installation and submit report. Include static deflections.

3.05 SCHEDULE

A. Pipe Isolation Schedule.

1. 1 Inch pipe size: Isolate 120 diameter from equipment.
2. 2 Inch Pipe size: Isolate 90 diameters from equipment.
3. 3 Inch Pipe Size: Isolate 80 diameters from equipment.
4. 4 Inch Pipe Size: Isolate 75 diameters from equipment.
5. 6 Inch Pipe Size: Isolate 65 diameters from equipment

END OF SECTION

SECTION 230553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe markers.

E. Ceiling tacks.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, and function.

D. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. All HVAC Equipment (air and water): Nameplates, and Ceiling tacks, where located above lay-in ceiling

B. Control Panels and Control Modules: Nameplates.

C. Fire Dampers and Combination Fire & Smoke Dampers: Nameplates, and Ceiling tacks, where located above lay-in ceiling.

D. Instrumentation: Tags, and Ceiling tacks, where located above lay-in ceiling.

E. Piping: Pipe markers.

F. Pumps: Nameplates.

G. Relays: Tags, and Ceiling tacks, where located above lay-in ceiling

H. Small-sized Equipment: Tags, and Ceiling tacks, where located above lay-in ceiling.

I. Tanks: Nameplates.

J. Valves: Tags, and ceiling tacks where located above lay-in ceiling.

K. Water Treatment Devices: Nameplates.

2.02 IDENTIFICATION MANUFACTURERS

A. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.

B. Seton Identification Products: www.seton.com.

C. Brady Corp. .

D. Craftmark Identification Systems.

E. Labelmaster

F. VisionMark, Inc.

G. Almetek Industries, Inc.

H. Advanced Graphic Engraving: www.advancedgraphicengraving.com.

I. MIFAB, Inc.: www.mifab.com.

J. Substitutions: See Section 016000 - Product Requirements.

2.03 NAMEPLATES

A. Manufacturers:
   1. Advanced Graphic Engraving, LLC: www.advancedgraphicengraving.com/#sle.
   2. Brimar Industries, Inc: www.pipemarker.com/#sle.
   3. Craftmark Pipe Markers: www.craftmarkid.com/#sle.
   4. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
   5. Seton Identification Products, a Tricor Direct Company; _____: www.seton.com/#sle.
   6. Substitutions: See Section 016000 - Product Requirements.

B. Letter Color: White.

C. Letter Height: 1/4 inch.

D. Background Color: Black.

E. Plastic: Comply with ASTM D709.

2.04 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

B. Metal Tags: Aluminum with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.05 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
   1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
   2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
   3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
   4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
   5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.
   6. Ductwork and Equipment: 2-1/2 inch high letters.

B. Stencil Paint: As specified in Section 099123, semi-gloss enamel, colors complying with ASME A13.1.

2.06 PIPE MARKERS

A. Manufacturers:
   1. Brady Corporation: www.bradycorp.com/#sle.
   2. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
   3. Seton Identification Products, a Tricor Company: www.seton.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Color: Comply with ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

E. Color code as follows:
   1. Heating, Cooling, and Boiler Feedwater: Green with white letters.
   2. Toxic and Corrosive Fluids: Orange with black letters.
   3. Compressed Air: Blue with white letters.

2.07 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:
   1. HVAC Equipment: Yellow.
   2. Fire Dampers and Smoke Dampers: Red.
   3. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 099123 for stencil painting.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Apply stencil painting in accordance with Section 099123.

D. Install plastic pipe markers in accordance with manufacturer's instructions.

E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

F. Use tags on piping 3/4 inch diameter and smaller.
   1. Identify service, flow direction, and pressure.

G. Install in clear view and align with axis of piping.

H. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

I. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 230593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic systems.

1.02 RELATED REQUIREMENTS

A. Section 014000 - Quality Requirements: Employment of testing agency and payment for services.

1.03 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems.

C. NEBB (TAB) - Procedural Standard for Testing, Adjusting and Balancing of Environmental Systems.

D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

C. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

D. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Submit under provisions of Section 014000.
   2. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   3. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   4. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
   5. Include the following on the title page of each report:
      a. Name of Testing, Adjusting, and Balancing Agency.
      b. Address of Testing, Adjusting, and Balancing Agency.
      c. Telephone number of Testing, Adjusting, and Balancing Agency.
      d. Project name and owner project number.
      e. Project location.
      f. Project Architect.
      g. Project Engineer.
      h. Project Contractor.
      i. Project altitude.
      j. Report date.

E. Project Record Documents: Record actual locations of balancing valves and rough setting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC (NSTSB), AABC National Standards for Total System Balance.
   2. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
   3. SMACNA (TAB).
   4. Maintain at least one copy of the standard to be used at project site at all times.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.
   3. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
      b. NEAABC BB, National Environmental Balancing Bureau: www.nebb.org/#sle.
      c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire and volume dampers are in place and open.
   8. Air coil fins are cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.
   11. Duct system leakage is minimized.
   12. Hydronic systems are flushed, filled, and vented.
   13. Pumps are rotating correctly.
   14. Proper strainer baskets are clean and in place.
   15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

3.04 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
   1. Running log of events and issues.
   2. Discrepancies, deficient or uncompleted work by others.
   3. Contract interpretation requests.
   4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.06 AIR SYSTEM PROCEDURE (AS APPLICABLE TO THE PROJECT)

3.07 WATER SYSTEM PROCEDURE (AS APPLICABLE TO THE PROJECT)

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.08 SCOPE

A. Test of existing prior to commencement of demolition.
   1. As specified on drawings.

B. Test, adjust, and balance the following:
   1. HVAC Pumps.
   2. Gas-Fired Condensing Boilers

C. See drawing for additional information and requirement.

3.09 MINIMUM DATA TO BE REPORTED

A. Pumps:
   1. Identification/number.
   2. Manufacturer.

3. Size/model.
4. Impeller.
5. Service.
6. Design flow rate, pressure drop, BHP.
7. Actual flow rate, pressure drop, BHP.
8. Discharge pressure.
9. Suction pressure.
10. Total operating head pressure.
11. Shut off, discharge and suction pressures.
12. Shut off, total head pressure.

B. Combustion Equipment:
1. Boiler manufacturer.
2. Model number.
3. Serial number.
4. Firing rate.
5. Overfire draft.
6. Gas meter timing dial size.
7. Gas meter time per revolution.
8. Gas pressure at meter outlet.
9. Gas flow rate.
10. Heat input.
11. Burner manifold gas pressure.
12. Percent carbon monoxide (CO).
13. Percent carbon dioxide (CO2).
14. Percent oxygen (O2).
15. Percent excess air.
16. Flue gas temperature at outlet.
17. Ambient temperature.
18. Net stack temperature.
19. Percent stack loss.
20. Percent combustion efficiency.
21. Heat output.

C. Air Distribution Tests:
1. Air terminal number.
2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Area factor.
6. Design velocity.
7. Design air flow.
8. Test (final) velocity.
9. Test (final) air flow.
10. Percent of design air flow.

END OF SECTION

SECTION 230716
HVAC EQUIPMENT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Equipment insulation.

B. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

A. Section 230553 - Identification for HVAC Piping and Equipment.

B. Section 232113 - Hydronic Piping: Placement of hangers and hanger inserts.

C. Section 232114 - Hydronic Specialties.

1.03 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

B. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

E. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type).

F. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for equipment scheduled.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.07 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, UL 723, ASTM E84, or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Insulation: ASTM C553; flexible, noncombustible.
   1. K Value: 0.36 at 75 degrees F, when tested in accordance with ASTM C177 or ASTM C518.
   2. Maximum Service Temperature: 1,000 degrees F.
   3. Maximum Water Vapor Absorption: 5.0 percent by weight.

2.03 GLASS FIBER, RIGID

A. Insulation: ASTM C612or ASTM C592; rigid, noncombustible.
   1. K Value: 0.25 at 75 degrees F, when tested in accordance with ASTM C177 or ASTM C518.
   2. Maximum Service Temperature: 850 degrees F.
   3. Maximum Water Vapor Absorption: 5.0 percent by weight.
   4. Maximum Density: 8.0 pcf.

2.04 JACKETING AND ACCESSORIES

A. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire-retardant lagging adhesive.
   1. Lagging Adhesive: Compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Factory Insulated Equipment: Do not insulate.

C. Exposed Equipment: Locate insulation and cover seams in least visible locations.

D. Fiber glass insulated equipment containing fluids below ambient temperature; provide vapor barrier jackets, factory-applied or field-applied. Finish with glass cloth and vapor barrier adhesive.

E. For hot equipment containing fluids over 140 degrees F, insulate flanges and unions with removable sections and jackets.

F. Fiber glass insulated equipment containing fluids above ambient temperature; provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Finish with glass cloth and adhesive.

G. Inserts and Shields:
   1. Application: Equipment 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between hangers and inserts.
   3. Insert Location: Between support shield and equipment and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

H. Finish insulation at supports, protrusions, and interruptions.

I. Cover glass fiber insulation with metal mesh and finish with heavy coat of insulating cement.

J. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

K. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

3.03 SCHEDULE

A. Heating Systems:
   1. Pump Bodies:
   2. Air Separators:
   3. Expansion Tanks:

END OF SECTION

SECTION 230719
HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Flexible removable and reusable blanket insulation.

C. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 232113 - Hydronic Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.

C. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

E. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.

F. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.

G. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Test Reports: For HVAC pipe and fitting insulaton, provide independent laboratory reports and test results showing negative asbestos containing materials content using Polarized Light Microscopy (PLM) test method.

D. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.06 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, UL 723, ASTM E84, or UL 723.

2.02 GLASS FIBER, RIGID

A. Manufacturers:
   1. CertainTeed Corporation: www.certainteed.com.
   2. Johns Manville Corporation: www.jm.com.
   3. Knauf Insulation: www.knaufinsulation.com.
   4. Owens Corning Corp: www.owenscorning.com.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: ASTM C547and ASTM C795; rigid molded, noncombustible.
   1. K Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 850 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Insulation: ASTM C547and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
   1. K Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 650 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.

D. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

F. Vapor Barrier Lap Adhesive: Compatible with insulation.

G. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

H. Fibrous Glass Fabric:
   1. Cloth: Untreated; 9 oz/sq yd weight.
   2. Blanket: 1.0 pcf density.
   3. Weave: 5 by 5.

I. Indoor Vapor Barrier Finish:
   1. Cloth: Untreated; 9 oz/sq yd weight.
   2. Vinyl emulsion type acrylic, compatible with insulation, black color.

J. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

K. Outdoor Breather Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

L. Insulating Cement: ASTM C449.

2.03 CELLULAR GLASS

A. Manufacturers:
   1. Pittsburgh Corning Corporation: www.foamglasinsulation.com.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Block Insulation: ASTM C552, Type I, Grade 6.
   1. K Value: 0.35 at 100 degrees F.
   2. Service Temperature: 800 degrees F, maximum.
   3. Water Absorption: 0.5 percent by volume, maximum.

2.04 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
   1. Minimum Service Temperature: Minus 40 degrees F.
   2. Maximum Service Temperature: 180 degrees F.
   3. Connection: Waterproof vapor barrier adhesive.

B. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.05 JACKETING AND ACCESSORIES

A. PVC Plastic.
   1. Manufacturers:
      a. Johns Manville Corporation: www.jm.com.
      b. Substitutions: See Section 016000 - Product Requirements.
   2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.
      c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil, 0.010 inch.
      e. Connections: Brush on welding adhesive.
   3. Covering Adhesive Mastic: Compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Glass Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.

E. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

F. Glass Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:
   1. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

G. Inserts and Shields:
   1. Application: Piping 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.

I. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

J. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV resistant finish for flexible elastomeric cellular insulation without jacketing.

K. Buried Piping: Provide factory-fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with 1 mil, 0.001 inch thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.

L. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULE

END OF SECTION

SECTION 230913
INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Control panels.

B. Control Valves:
   1. Electronic operators.

C. HVAC&R Sensors:
   1. Temperature sensors.
   2. Humidity sensors.

D. Time clocks.

E. Sensors with transmitters:
   1. Building static pressure transmitters.

F. Control valves.

G. Automatic dampers.

H. Damper operators.

I. Time clocks.

J. Input/Output sensors.

K. Miscellaneous accessories.

1.02 RELATED REQUIREMENTS

A. Section 232113 - Hydronic Piping: Installation of control valves, flow switches, temperature sensor sockets, and gauge taps.

B. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

C. Section 262726 - Wiring Devices: Elevation of exposed components.

1.03 REFERENCE STANDARDS

A. NEMA BS 31032 - Residential Controls–Electrical Wall-Mounted Room Thermostats.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

D. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Submit all submital documents listed in this Section under Section 230923 - Direct-Digital Control System for HVAC.

C. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

D. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences.
   1. Submit schedule of valves indicating size, flow, and pressure drop for each valve.
      a. Valve submittals shall be coordinated for type, quantity, size, and piping configuration to ensure compatibility with pipe design.

E. Manufacturer's Instructions: Provide for all manufactured components.

F. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

1.05 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriter's Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer's warranty for contro valves.

PART 2 PRODUCTS

2.01 SYSTEM PERFORMANCE

A. Reporting Accuracy. System shall report values with minimum end-to-end accuracy listed in Table below.

Measured Variable	Reported Accuracy
Space Temperature	±0.5ºC (±1ºF)
Ducted Air	±0.5ºC (±1ºF)
Outside Air	±1.0ºC (±2ºF)
Dew Point	±1.5ºC (±3ºF)
Water Temperature	±0.5ºC (±1ºF)
Delta-T	±0.15º (±0.25ºF)
Relative Humidity	±5% RH
Water Flow	±2% of full scale
Airflow (terminal)	±10% of full scale (Accuracy applies to 10%–100% of scale)
Airflow (measuring stations)	±5% of full scale
Airflow (pressurized spaces)	±3% of full scale
Air Pressure (ducts)	±25 Pa (±0.1 in. w.g.)
Air Pressure (space)	±3 Pa (±0.01 in. w.g.)
Water Pressure	±2% of full scale (For both absolute and differential pressure)
Electrical	±1% of reading (Not including utility-supplied meters)
Carbon Monoxide (CO)	±5% of reading
Carbon Dioxide (CO2)	±50 ppm

B. Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed in Table below.

Controlled Variable	Control Accuracy	Range of Medium
Air Pressure	±50 Pa (±0.2 in. w.g.) ±3 Pa (±0.01 in. w.g.)	0–1.5 kPa (0–6 in. w.g.) -25 to 25 Pa (-0.1 to 0.1 in. w.g.)
Airflow	±10% of full scale	
Space Temperature	±1.0ºC (±2.0ºF)	
Duct Temperature	±1.5ºC (±3ºF)	
Humidity	±5% RH	
Fluid Pressure	±10 kPa (±1.5 psi) ±250 Pa (±1.0 in. w.g.)	MPa (1–150 psi) 0–12.5 kPa (0–50 in. w.g.) differential

2.02 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.03 CONTROL PANELS

A. NEMA EN 10250, general purpose utility enclosures with enameled finished face panel.

B. Provide common keying for all panels.

2.04 CONTROL VALVES

A. Manufacturer:
   1. BELIMO.

B. Control Valves:
   1. Factory fabricated of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.
   2. Sizing:
      a. Two-Position: Line size or size using a pressure differential of 1 psi.
      b. Two-Way Modulating: 5 psid or twice the load pressure drop, whichever is more.
      c. Three-Way Modulating: Twice the load pressure drop, but not more than 5 psid

C. The manufacturer shall warrant all components for a period of 5 years from the date of production, with the first two years unconditional (except as noted).

D. Characterized Control Valves:
   1. 3” and Smaller: Nickel-plated forged brass body rated at no less than 400 psi, stainless steel ball and blowout proof stem, female NPT end fittings, with a dual EPDM O-ring packing design, fiberglass reinforced Teflon seats, and a TEFZEL or stainless steel flow characterizing disc.
   2. 2-1/2” through 6”: GG25 cast iron body, ANSI 125, class B, stainless steel ball and blowout proof stem, flange to match ANSI 125 with a dual EPDM O-ring package design, PTFE seats, and a stainless steel flow characterizing disc.
   3. Valve assemblies shall be maintenance free.
   4. NPS 2” and smaller characterized control valves shall be provided as part of a pipe package supplied by the valve manufacturer. The supply side of the coil shall contain a strainer/shut-off ball valve/drain with hose connection/[an integrated isolation ball valve/manual air vent with a P/T port. The return side of the coil shall contain a union fitting with a P/T port, characterized control valve, an integrated manual balancing valve/union/isolation ball valve/manual air vent with P/T port. Shut-off valves as an integrated part of the characterized control valve are prohibited. For 3-way installations, supply an integrated 100% port isolation valve/manual air vent with a P/T port for field installation in the bypass of the circuit . A 12” or 24” flexible hose set shall be provided for each coil supply and return connection for all pipe packages.

E. Globe valves shall have the following characteristics:
   1. Hydraulic system globe valves shall have the following characteristics:
      a. NPS 2 and Smaller: ANSI Class 250 bronze body, stainless steel stem, brass plug, bronze seat, and a TFE packing.
      b. NPS 2-1/2 and Larger: ANSI Class 125 [250] cast iron body, stainless steel stem, bronze plug, bronze seat, and a TFE V-ring packing.
      c. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.
      d. Two- and three-way globe valves shall be used only if characterized control valves do not fit the sizing criteria or application.

F. Butterfly Valves - Resilient Seat:

1. NPS 2 to 12: Valve body shall be full lugged ductile iron 200 psig body with a 304 stainless steel disc, EPDM seat, extended neck and shall meet ANSI Class 125/150 flange standards. Disc-to-stem connection shall utilize an internal spline. The shaft shall be supported at four locations by RPTFE bushings. A coated disc shell is not acceptable.
2. NPS 14 and Larger: Valve body shall be full lugged ductile iron 150 psig body with a 304 stainless steel disc, EPDM seat, extended neck and shall meet ANSI Class 125/150 flange standards. Disc-to-stem connection shall utilize a dual-pin method to prevent the disc from settling onto the liner. The shaft shall be supported at four locations by RPTFE bushings. A coated disc shell is not acceptable.
3. Sizing: Two-Position (on/off) butterfly valves shall be sized using the 900 Cv rating. Modulating butterfly valves shall be sized using the 600 Cv rating.
4. Flow Characteristics: Modified equal percentage, unidirectional dead end service.
5. Close-Off Pressure Rating: Bubble-tight shutoff (no leakage).
6. The combination of two 2-way butterfly valves in a tee configuration cross-linked to ensure proper flow orientation shall be permitted. The tee shall be constructed of cast iron/stainless steel.

G. Water valves shall fail normally open or closed, as scheduled on plans, or as follows:
1. Water zone valves-normally open preferred.
2. Heating coils in air handlers-normally open.
3. Chilled water control valves-normally closed.
4. Other applications-as scheduled or as required by sequences of operation.

H. Electronic Operators:
1. Control valves shall be two-way or three-way type for two-position or modulating service as indicated.
2. Valves shall spring return to normal position as indicated on freeze, fire, or temperature protection.
3. Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:
    a. Water Valves:
        1) Two-way: 150% of total system (pump) head.
        2) Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.
4. Select operator for full shut off at maximum pump differential pressure.
5. Signal and Range. Proportional actuators shall accept a 0-10 Vdc or a 0-20 mA control signal and shall have a 2-10 Vdc or 4-20 mA operating range. (Floating motor actuators may be substituted for proportional actuators in terminal unit applications)
6. Wiring. 24 Vac and 24 Vdc actuators shall operate on Class 2 wiring.
7. Manual Positioning. Operators shall be able to manually position each actuator when the actuator is not powered. Non-spring-return actuators shall have an external manual gear release. Spring-return actuators with more than 60 in.-lb torque capacity shall have a manual crank.
8. Product:
    a. Belimo
    b. Industrial Actuators (Butterfly Valves)

2.05 DAMPER OPERATORS

A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.
1. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
2. Provide one operator for maximum 24 sq ft damper section.

2.06 HVAC&R SENSORS

A. Temperature Sensors:
   1. Use RTD (Resistance Temperature Device) type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
   2. Construct RTD of nickel or platinum with base resistance of 1000 ohms at 70 degrees F.
   3. 100 ohm platinum RTD is acceptable if used with project DDC controllers.
   4. Temperature Sensing Device: Compatible with project DDC controllers.
   5. Performance Characteristics:
      a. RTD:
         1) Room Sensor Accuracy: Plus/minus 0.50 degrees F minimum.
         2) Duct Averaging Accuracy: Plus/minus 0.50 degrees F minimum.
         3) Chilled Water Accuracy: Plus/minus 0.50 degrees F minimum.
         4) All Other Accuracy: Plus/minus 0.75 degrees F minimum.
         5) Range: Minus 40 degrees F through 220 degrees F minimum.
      b. Thermistor:
         1) Accuracy (All): Plus/minus 0.36 degrees F minimum.
         2) Range: Minus 25 degrees F through 122 degrees F minimum.
         3) Heat Dissipation Constant: 2.7 mW per degree C.
      c. Temperature Transmitter:
         1) Accuracy: 0.10 degree F minimum or plus/minus 0.20 percent of span.
         2) Output: 4 to 20 mA.
      d. Sensing Range:
         1) Provide limited range sensors if required to sense the range expected for a respective point.
         2) Use RTD type sensors for extended ranges beyond minus 30 to 230 degrees F.
         3) Use temperature transmitters in conjunction with RTD's when RTD's are incompatible with DDC controller direct temperature input.
      e. Wire Resistance:
         1) Use appropriate wire size to limit temperature offset due to wire resistance to 1.0 degree F or use temperature transmitter when offset is greater than 1.0 degree F due to wire resistance.
         2) Compensate for wire resistance in software input definition when feature is available in the DDC controller.
      f. Room Sensors: Locking cover as indicated on drawing.
      g. Outside Air Sensors: Watertight inlet fitting shielded from direct rays of the sun.
      h. Room Temperature Sensors:
         1) Construct for surface or wall box mounting.
         2) Provide the following:
            (a) Setpoint reset slide switch with an adjustable temperature range.
            (b) Momentary override request push button for activation of after-hours operation as indicated on drawing.
            (c) Analog thermometer.
         3) Product: BAPI; www.bapihvac.com
            (a) Substitutions: See Section 01 6000 - Product Requirements.
      i. Temperature Averaging Elements:
         1) Use on duct sensors for ductwork 10 sq ft or larger.
         2) Use averaging elements where prone to stratification with sensor length 8 ft or 16 ft.
         3) Provide for all mixed air and heating coil discharge sensors regardless of duct size.

B. Humidity Sensors:

1. Drift: No more than 1% of full scale annually.
2. Room Sensors: Span of 20 - 80 percent relative humidity.
    a. Provide locking cove as indicated on drawing.
3. Duct and Outside Air Sensors: With element guard and mounting plate, range of 0 - 100 percent relative humidity.
    a. Duct Sensors: have a sampling chamber.
    b. Outside Air Sensors: suitable for ambient conditions of -40°F–170°F.

C. Static Pressure Sensors:
1. Unidirectional with ranges not exceeding 150 percent of maximum expected input.
2. Temperature compensate with typical thermal error or 0.06 percent of full scale in temperature range of 40 to 100 degrees F.
3. Accuracy: One percent of full scale with repeatability 0.3 percent.
4. Output: 0 - 5 vdc with power at 12 to 28 vdc.

D. Equipment Operation Sensors:
1. Status Inputs for Fans: Differential pressure switch with adjustable range of 0 to 5 inches wg.
2. Status Inputs for Pumps: Differential pressure switch piped across pump with adjustable pressure differential range of 8 to 60 psi.
3. Status Inputs for Electric Motors: Current sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.

2.07 TIME CLOCKS

A. Seven day programming switch timer with synchronous timing motor and seven day dial, continuously charged Ni-cad battery driven power failure 8 hour carry over and multiple switch trippers to control systems for minimum of two and maximum of eight signals per day with two normally open and two normally closed output switches.

2.08 OVERRIDE TIMERS.

A. Unless implemented in control software, override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration required by application. Provide 0-6 hour calibrated dial unless otherwise specified. Flush mount timer on local control panel face or where shown.

2.09 FLOW SWITCHES.

A. Flow-proving switches shall be paddle (water service only) or differential pressure type (air or water service) as shown. Switches shall be UL listed, SPDT snap-acting, and pilot duty rated (125 VA minimum).

B. Paddle switches shall have adjustable sensitivity and NEMA 1 enclosure unless otherwise specified.

C. Differential pressure switches shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

2.10 RELAYS.

A. Control Relays. Control relays shall be plug-in type, UL listed, and shall have dust cover and LED “energized” indicator. Contact rating, configuration, and coil voltage shall be suitable for application.

B. Time Delay Relays. Time delay relays shall be solid-state plug-in type, UL listed, and shall have adjustable time delay. Delay shall be adjustable ±100% from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.

2.11 SENSORS WITH TRANSMITTERS

A. Building Static Pressure Transmitters:

1. One pipe, direct acting, double bell, scale range 0.01 to 6.0 in-wc positive or negative, and sensitivity of 0.0005 in-wc. Transmit electronic signal to receiver with matching scale range.

B. Pressure Transmitters:
   1. One pipe direct acting for gas, liquid, or steam service, range suitable for system, proportional electronic output.

C. Temperature Transmitters:
   1. One pipe, directly proportional output signal to measured variable, linearity within plus or minus 1/2 percent of range for 200 degrees F span and plus or minus 1 percent for 50 degrees F span, with 50 degrees F. temperature range, compensated bulb, averaging capillary, or rod and tube operation on 20 psig input pressure and 3 to 15 psig output.

D. Humidity Transmitters:
   1. One pipe, directly proportioned output signal to measured variable, linearity within plus or minus 1 percent for 70 percent relative humidity span, capable of withstanding 95 percent relative humidity without loss of calibration.

E. Current Transmitters.
   1. AC current transmitters shall be self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4-20 mA two-wire output. Full-scale unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy shall be ±1% full-scale at 500 ohm maximum burden.
   2. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.
   3. Unit shall be split-core type for clamp-on installation on existing wiring.

F. Voltage Transmitters.
   1. AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4-20 mA output with zero and span adjustment.
   2. Adjustable full-scale unit ranges shall be 100-130 Vac, 200-250 Vac, 250-330 Vac, and 400-600 Vac. Unit accuracy shall be ±1% full-scale at 500 ohm maximum burden.
   3. Transmitters shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized at 600 Vac rating.

2.12 TRANSFORMERS

A. Current Transformers.
   1. AC current transformers shall be UL/CSA recognized and shall be completely encased (except for terminals) in approved plastic material.
   2. Transformers shall be available in various current ratios and shall be selected for ±1% accuracy at 5 A full-scale output.
   3. Use fixed-core transformers for new wiring installation and split-core transformers for existing wiring installation.

B. Voltage Transformers.
   1. AC voltage transformers shall be UL/CSA recognized, 600 Vac rated, and shall have built-in fuse protection.
   2. Transformers shall be suitable for ambient temperatures of 4°C-55°C (40°F-130°F) and shall provide ±0.5% accuracy at 24 Vac and 5 VA load.
   3. Windings (except for terminals) shall be completely enclosed with metal or plastic.

2.13 HYDRONIC FLOWMETERS

A. Insertion-Type Turbine Meter
   1. Dual counter-rotating axial turbine elements, each with its own rotational sensing system, and an averaging circuit to reduce measurement errors due to swirl and flow profile distortion. Single turbine for piping 2 inches and smaller. Flow sensing turbine rotors shall be non-metallic and not impaired by magnetic drag.

2. Insertion type complete with ‘hot-tap’ isolation valves to enable sensor removal without water supply system shutdown.
3. Sensing method shall be impedance sensing (non magnetic and non photoelectric)
4. Volumetric accuracy
   a. ± 0.5% of reading at calibrated velocity
   b. ± 1% of reading from 3 to 30 ft/s (10:1 range)
   c. ± 2% of reading from 0.4 to 20 ft/s (50:1 range)
5. Each sensor shall be individually calibrated and tagged accordingly against the manufacturer’s primary standards which must be accurate to within 0.1% of flow rate and traceable to the National Institute of Standards and Technology (NIST).
6. Maximum operating pressure of 400 psi and maximum operating temperature of 200°F continuous (220°F peak).
7. All wetted metal parts shall be constructed of 316 stainless steel.
8. Analog outputs shall consist of non interactive zero and span adjustments, a DC linearly of 0.1% of span, voltage output of 0-10 Vdc, and current output of 4-20 mA.

2.14 CURRENT SWITCHES.

A. Current-operated switches shall be self-powered, solid-state with adjustable trip current. Select switches to match application current and DDC system output requirements.

2.15 PRESSURE TRANSDUCERS.

A. Transducers shall have linear output signal and field-adjustable zero and span.

B. Transducer sensing elements shall withstand continuous operating conditions of positive or negative pressure 50% greater than calibrated span without damage.

C. Water pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Transducer shall have 4-20 mA output, suitable mounting provisions, and block and bleed valves.

D. Water differential pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Over-range limit (differential pressure) and maximum static pressure shall be 2000 kPa (300 psi.)Transducer shall have 4-20 mA output, suitable mounting provisions, and 5-valve manifold.

2.16 DIFFERENTIAL PRESSURE SWITCHES.

A. Differential pressure switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum) and shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that systems are ready to receive work.

C. Beginning of installation means installer accepts existing conditions.

D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

F. Ensure installation of components is complementary to installation of similar components.

G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check and verify location of thermostats with plans and room details before installation. Locate 60 inches above floor. Align with lighting switches and humidistats; see Section 262726.

C. Mount freeze protection thermostats using flanges and element holders.

D. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

E. Provide thermostats in aspirating boxes in front entrances.

F. Provide guards on thermostats in where indicated.

G. Provide valves with position indicators and with pilot positioners where sequenced with other controls.

H. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.

I. Mount control panels adjacent to associated equipment on vibration free walls or free standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

J. Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.

K. Provide conduit and electrical wiring in accordance with Section 260583. Electrical material and installation shall be in accordance with appropriate requirements of .

L. Control Valve Installation
   1. Slip-stem control valves shall be installed so that the stem position is not more than 60 degrees from the vertical up position. Ball type control valves shall be installed with the stem in the horizontal position.
   2. Valves shall be installed in accordance with the manufacturer's recommendations.
   3. Control valves shall be installed so that they are accessible and serviceable and so that actuators may be serviced and removed without interference from structure or other pipes and/or equipment.
   4. Isolation valves shall be installed so that the control valve body may be serviced without draining the supply/return side piping system. Unions shall be installed at all connections to screw-type control valves.
   5. Provide tags for all control valves indicating service and number. Tags shall be brass, 1.5 inch in diameter, with ¼ inch high letters. Securely fasten with chain and hook. Match identification numbers as shown on approved controls shop drawings.

M. Control Damper Installation
   1. Duct openings shall be free of any obstruction or irregularities that might interfere with blade or linkage rotation or actuator mounting. Duct openings shall measure ¼ in. larger than damper dimensions and shall be square, straight, and level.
   2. Individual damper sections, as well as entire multiple section assemblies, must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each damper section. Both dimensions must be within 0.3 cm (1/8 in.) of each other.
   3. Follow the manufacturer's instructions for field installation of control dampers. Unless specifically designed for vertical blade application, dampers must be mounted with blade axis horizontal.
   4. Install extended shaft or jackshaft according to manufacturer’s instructions. (Typically, a sticker on the damper face shows recommended extended shaft location. Attach shaft on labeled side of damper to that blade.)
   5. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle damper after installation to ensure proper operation. On multiple section assemblies, all sections must open and close simultaneously.
   6. Provide a visible and accessible indication of damper position on the drive shaft end.

7. Support ductwork in area of damper when required to prevent sagging due to damper weight.
8. After installation of low-leakage dampers with seals, caulk between frame and duct or opening to prevent leakage around perimeter of damper.

N. Installation of Sensors
1. Install sensors in accordance with the manufacturer's recommendations.
2. Mount sensors rigidly and adequately for environment within which the sensor operates.
3. Room temperature sensors shall be installed on concealed junction boxes properly supported by wall framing.
4. All wires attached to sensors shall be sealed in their raceways or in the wall to stop air transmitted from other areas from affecting sensor readings.
5. Sensors used in mixing plenums and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner vertically across the duct. Each bend shall be supported with a capillary clip.
6. Low-limit sensors used in mixing plenums shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip. Provide 3 m (1 ft) of sensing element for each 1 m2(1 ft2) of coil area.
7. Do not install temperature sensors within the vapor plume of a humidifier. If installing a sensor downstream of a humidifier, install it at least 3 m (10 ft) downstream.
8. All pipe-mounted temperature sensors shall be installed in wells. Install liquid temperature sensors with heat-conducting fluid in thermal wells.
9. Install outdoor air temperature sensors on north wall, complete with sun shield at designated location.
10. Differential Air Static Pressure.
    a. Supply Duct Static Pressure. Pipe the high-pressure tap to the duct using a pitot tube. Pipe the low-pressure port to a tee in the height-pressure tap tubing of the corresponding building static pressure sensor (if applicable) or to the location of the duct high-pressure tap and leave open to the plenum.
    b. Return Duct Static Pressure. Pipe high-pressure tap to duct using a pitot tube. Pipe the low-pressure port to a tee in the low-pressure tap tubing of the corresponding building static pressure sensor.
    c. Building Static Pressure. Pipe the low-pressure port of the pressure sensor to the static pressure port located on the outside of the building through a high-volume accumulator. Pipe the high-pressure port to a location behind a thermostat cover.
    d. The piping to the pressure ports on all pressure transducers shall contain a capped test port located adjacent to the transducer.
    e. All pressure transducers, other than those controlling VAV boxes, shall be located in field device panels, not on the equipment monitored or on ductwork. Mount transducers in a location accessible for service without use of ladders or special equipment.
    f. All air and water differential pressure sensors shall have gauge tees mounted adjacent to the taps. Water gauges shall also have shut-off valves installed before the tee.
11. Smoke detectors, freezestats, high-pressure cut-offs, and other safety switches shall be hard-wired to de-energize equipment as described in the sequence of operation. Switches shall require manual reset. Provide contacts that allow DDC software to monitor safety switch status.
12. Install humidity sensors for duct mounted humidifiers at least 3 m (10 ft) downstream of the humidifier. Do not install filters between the humidifier and the sensor.

O. Flow Switch Installation
1. Use correct paddle for pipe diameter.
2. Adjust flow switch according to manufacturer's instructions.

P. Actuators

1. General. Mount and link control damper actuators according to manufacturer's instructions.
    a. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten the linkage.
    b. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
    c. Provide all mounting hardware and linkages for actuator installation.
2. Electric/Electronic
    a. Dampers: Actuators shall be direct mounted on damper shaft or jackshaft unless shown as a linkage installation. For low-leakage dampers with seals, the actuator shall be mounted with a minimum 5° travel available for tightening the damper seal. Actuators shall be mounted following manufacturer’s recommendations.
    b. Valves: Actuators shall be connected to valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following the actuator manufacturer's recommendations.

Q. Control Damper Installation
1. Damper submittals shall be coordinated for type, quantity, and size to ensure compatibility with sheet metal design.
2. Duct openings shall be free of any obstruction or irregularities that might interfere with blade or linkage rotation or actuator mounting. Duct openings shall measure ¼ in. larger than damper dimensions and shall be square, straight, and level.
3. Individual damper sections, as well as entire multiple section assemblies, must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each damper section. Both dimensions must be within 0.3 cm (1/8 in.) of each other.
4. Follow the manufacturer's instructions for field installation of control dampers. Unless specifically designed for vertical blade application, dampers must be mounted with blade axis horizontal.
5. Install extended shaft or jackshaft according to manufacturer’s instructions. (Typically, a sticker on the damper face shows recommended extended shaft location. Attach shaft on labeled side of damper to that blade.)
6. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle damper after installation to ensure proper operation. On multiple section assemblies, all sections must open and close simultaneously.
7. Provide a visible and accessible indication of damper position on the drive shaft end.
8. Support ductwork in area of damper when required to prevent sagging due to damper weight.
9. After installation of low-leakage dampers with seals, caulk between frame and duct or opening to prevent leakage around perimeter of damper.

END OF SECTION

SECTION 230923
DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 230913 - Instrumentation and Control Devices for HVAC.

B. Section 230993 - Sequence of Operations for HVAC Controls.

C. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.02 REFERENCE STANDARDS

A. ANSI/CEA 709.1.D - Control Network Protocol Specification.

B. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks.

C. NFPA 70 - National Electrical Code.

D. UL (DIR) - Online Certifications Directory.

1.03 COODINATION REQUIREMENTS

A. Coordinate with HVAC equipment supplier and system field installer to clarly identify the following components to ensure the entire system meets the design intent:
   1. Interface requirment for HVAC equipment factory provided controllers.
   2. HVAC equipment factory supplied and installed control components.
   3. HVAC equipment factory installed control components.
   4. Field installed components.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data and Shop Drawing: Provide data and shop drawingfor each system hardware, software module and equipment to be installed or provided.
   1. DDC System Hardware
      a. A complete bill of materials to be used indicating quantity, manufacturer, model number, and relevant technical data of equipment to be used.
      b. Manufacturer’s description and technical data such as performance curves, product specifications, and installation and maintenance instructions for items listed below and for relevant items not listed below:
         1) Direct digital controllers (controller panels)
         2) Control panels
         3) Power supplies
         4) Batteries
         5) Operator interface equipment
         6) Wiring
      c. Wiring diagrams and layouts for each control panel. Show termination numbers.
      d. Schematic diagrams for all field sensors and controllers. Provide floor plans of all sensor locations and control hardware. Riser diagrams
   2. Central System Hardware and Software
      a. A complete bill of material of equipment used indicating quantity, manufacturer, model number, and relevant technical.
      b. Manufacturer’s description and technical data such as product specifications and installation and maintenance instructions for items listed below and for relevant items furnished under this contract not listed below:
         1) Central Processing Unit (CPU) or web server
         2) Monitors
         3) Keyboards

4) Power supplies
5) Battery backups
6) Interface equipment between CPU or server and control panels
7) Operating System software
8) Operator interface software
9) Color graphic software
10) Third-party software

c. Schematic diagrams for all control, communication, and power wiring. Provide a schematic drawing of the central system installation. Label all cables and ports with computer manufacturers' model numbers and functions. Show interface wiring to control system.

d. Network riser diagrams of wiring between central control unit and control panels.

e. Controlled Systems
1) Riser diagrams showing control network layout, communication protocol, and wire types.
2) A schematic diagram of each controlled system. The schematics shall have all control points labeled with point names shown or listed. The schematics shall graphically show the location of all control elements in the system.
3) A schematic wiring diagram of each controlled system. Label control elements and terminals. Where a control element is also shown on control system schematic, use the same name.
4) An instrumentation list (Bill of Materials) for each controlled system. List each control system element in a table. Show element name, type of device, manufacturer, model number, and product data sheet number.
5) A mounting, wiring, and routing plan-view drawing. The design shall take into account HVAC, electrical, and other systems' design and elevation requirements. The drawing shall show the specific location of all concrete pads and bases and any special wall bracing for panels to accommodate this work.
6) A complete description of the operation of the control system, including sequences of operation. The description shall include and reference a schematic diagram of the controlled system.
7) A point list for each control system. List I/O points and software points specified in Section 23 09 93. Indicate alarmed and trended points.

3. Quantities of items submitted shall be reviewed but are the responsibility of the Contractor.
4. BACnet Protocol Implementation Conformance Statement (PICS) for each submitted type of controller and operator interface.

C. Manufacturer's Instructions: Indicate manufacturer's installation instructions for all manufactured components.

D. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
1. Revise shop drawings to reflect actual installation and operating sequences.
2. Include submittals data in final "Record Documents" form.

E. Operation and Maintenance Data:
1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with NFPA 70.

B. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for purpose specified and indicated.

1.06 OWNERSHIP OF PROPRIETARY MATERIAL

A. Project-specific software and documentation shall become Owner's property. This includes, but is not limited to:
   1. Graphics
   2. Record drawings
   3. Database
   4. Application programming code; software.
   5. Documentation

1.07 DEFINITION

A. BACnet Interoperability Building Blocks (BIBB): A BIBB defines a small portion of BACnet functionality that is needed to perform a particular task. BIBBS are combined to build the BACnet functional requirements for a device in a specification.

B. BACnet/BACnet Standard: BACnet communication requirements as defined by the latest version of ASHRAE/ANSI 135 and approved addenda.

C. Control Systems Server: A computer(s) that maintain(s) the systems configuration and programming database.

D. Controller: Intelligent stand-alone control device. Controller is a generic reference to building controllers, custom application controllers, and application specific controllers.

E. Direct Digital Control: Microprocessor-based control including Analog/Digital conversion and program logic.

F. Gateway: Bi-directional protocol translator connecting control systems that use different communication protocols.

G. Local Area Network: Computer or control system communications network limited to local building or campus.

H. Master-Slave/Token Passing: Data link protocol as defined by the BACnet standard.

I. Point-to-Point Serial communication as defined in the BACnet standard.

J. Primary Controlling LAN: High speed, peer-to-peer controller LAN connecting BCs and optionally AACs and ASCs. Refer to System Architecture below.

K. Protocol Implementation Conformance Statement: A written document that identifies the particular options specified by BACnet that are implemented in a device.

L. Router: A device that connects two or more networks at the network layer.

M. Wiring: Raceway, fittings, wire, boxes and related items.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Automatic Controls Equipment Systems (ACES).
   1. Local Representative: ACES, Michael Kunstel, O: (314) 722-2987; mkunstel@automaticcontrols.net.

B. Substitutions: See Section 016000 - Product Requirements.

2.02 SYSTEM PERFORMANCE

A. Performance Standards. System shall conform to the following minimum standards over network connections. Systems shall be tested using manufacturer’s recommended hardware and software for operator workstation (server and browser for web-based systems).
   1. Graphic Display. A graphic with 20 dynamic points shall display with current data within 10 sec.

2. Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 sec.and shall automatically refresh every 15 sec.
3. Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh within 6 sec.
4. Object Command. Devices shall react to command of a binary object within 2 sec. Devices shall begin reacting to command of an analog object within 2 sec.
5. Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 45 sec.
6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 sec. Select execution times consistent with the mechanical process under control.
7. Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per sec. Select execution times consistent with the mechanical process under control.
8. Multiple Alarm Annunciation. Each workstation on the network shall receive alarms within 5 sec of other workstations.

2.03 MATERIALS

A. Use new products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by Owner. Spare parts shall be available for at least five years after completion of this contract.

2.04 COMMUNICATION

A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135, BACnet.

B. Install new wiring and network devices as required to provide a complete and workable control network.

C. Use existing Ethernet backbone for network segments marked "existing" on project drawings.

D. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.

E. Internetwork operator interface and value passing shall be transparent to internetwork architecture.
   1. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.
   2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute control strategies specified in Section 23 09 93. An authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.

F. Workstations, Building Control Panels, and Controllers with real-time clocks shall use the BACnet Time Synchronization service. System shall automatically synchronize system clocks daily from an operator-designated device via the internetwork. The system shall automatically adjust for daylight saving and standard time as applicable.

G. System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and wiring.

H. System shall support Web services data exchange with any other system that complies with XML (extensible markup language) and SOAP (simple object access protocol) standards specified by the Web Services Interoperability Organization(WS-I) Basic Profile 1.0 or higher. Web services support shall as a minimum be provided at the workstation or web server level and shall enable data to be read from or written to the system.
   1. System shall support Web services read data requests by retrieving requested trend data or point values (I/O hardware points, analog value software points, or binary value software points) from any system controller or from the trend history database.
   2. System shall support Web services write data request to each analog and binary object that can be edited through the system operator interface by downloading a numeric value to the specified object.
   3. For read or write requests, the system shall require user name and password authentication and shall support SSL (Secure Socket Layer) or equivalent data encryption.
   4. System shall support discovery through a Web services connection or shall provide a tool available through the Operator Interface that will reveal the path/identifier needed to allow a third party Web services device to read data from or write data to any object in the system which supports this service.

2.05 CONTROLLERS

A. General:
   1. Provide an adequate number of the following as required to achieve performance specified in Section 23 09 23 Article 2.03 (System Performance):
      a. Building Controllers (BC)
      b. Advanced Application Controllers (AAC)
      c. Application Specific Controllers (ASC)
      d. Smart Actuators (SA)
      e. Smart Sensors (SS)
   2. Every device in the system which executes control logic and directly controls HVAC equipment must conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135, BACnet Annex L.

B. BACnet.
   1. BCs: Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L, and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.
   2. AACs: Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-AAC in the BTL Product Listing.
   3. ASCs: Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-ASC in the BTL Product Listing.
   4. SSs: Each SS shall conform to BACnet Smart Sensor (B-SS) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-SS in the BTL Product Listing.
   5. BACnet Communication.
      a. Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.
      b. BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.
      c. Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
      d. Each ASC shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.

e. Each SA shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
f. Each SS shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using ARCNET or MS/TP Data Link/Physical layer protocol.

C. Communication:
1. Service Port:
a. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal.
1) Connection shall be extended to space temperature sensor ports where shown on drawings.
2. Signal Management:
a. BC and ASC operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms.
3. Data Sharing:
a. Each BC and AAC shall share data as required with each networked BC and AAC.
4. Stand-Alone Operation:
a. Each piece of equipment specified in Section 23 09 93 shall be controlled by a single controller to provide stand-alone control in the event of communication failure.
b. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network such as outdoor air conditions, supply air or water temperature coming from source equipment, etc.

D. Environment:
1. Controller hardware shall be suitable for anticipated ambient conditions:
a. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -20°F to 140°F.
b. Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 32°F to 120°F.

E. Keypad and Display:
1. Provide a local keypad and display for each BC and AAC
2. Use for interrogating and editing data.
3. System security password prevents unauthorized use.

F. Real-Time Clock:
1. Controllers that perform scheduling shall have a real-time clock.

G. Serviceability:
1. Diagnostic LEDs for power, communication, and processor.
2. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
3. Each BC and AAC shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation.
4. System shall continuously check controller network and generate alarm for each controller that fails to respond.

H. Memory:
1. Controller memory shall support operating system, database, and programming requirements.
2. Each BC and AAC shall retain BIOS and application programming for at least 72 hours in the event of power loss.
3. Each ASC and SA shall use nonvolatile memory and shall retain BIOS and application programming in the event of power loss. System shall automatically download dynamic control parameters following power loss.

I. Immunity to Power and Noise:
   1. Maintain operation at 90 to 110 percent of nominal voltage rating.
   2. Perform orderly shutdown below 80 percent of nominal voltage.
   3. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.

J. Transformer:
   1. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.

2.06 INPUT AND OUTPUT INTERFACE

A. General:
   1. Hard-wire input and output points to BCs, AACs, ASCs, or SAs.

B. Protection:
   1. All input points and output points shall be protected such that shorting of the point to itself, to another point, or to ground shall cause no damage to the controller.
   2. All input and output points shall be protected from voltage up to 24 V of any duration, such that contact with this voltage will cause no controller damage.

C. Binary Inputs.
   1. Allow the monitoring of ON/OFF signals from remote devices.
   2. Provide a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against contact bounce and noise.
   3. Sense dry contact closure without application of power external to the controller.

D. Pulse Accumulation Inputs:
   1. Conform to binary input requirements and shall also accumulate up to 10 pulses per second.

E. Analog Inputs:
   1. Allow for monitoring low-voltage (0-10 Vdc), current (4-20 mA), or resistance (thermistor or RTD) signals.
   2. Compatible with and field configurable to commonly available sensing devices.

F. Binary Outputs:
   1. Used for On/Off operation or a pulsed low-voltage signal for pulse width modulation control.
   2. On building Controllers, outputs provided with three position (On/Off/Auto) override switches.
   3. Status lights for BCs and AACs to be selectable for normally open or normally closed operation.

G. Analog Outputs:
   1. Analog outputs shall not drift more than 0.4% of range annually.
   2. Monitoring signal provides a 0 to 10 VDC or a 4 to 20 mA output signal for end device control.
   3. Each BC and AAC analog output shall have a two-position (auto-manual) switch, a manually adjustable potentiometer for manual override, and status lights.
   4. Drift to not exceed 0.4 percent of range per year.

H. Tri-State Outputs:
   1. Coordinate two binary outputs to control three point, floating type, electronic actuators without feedback.
   2. Limit the use of three point, floating devices to the following zone and terminal unit control applications:
      a. VAV terminal units.
      b. Duct mounted heating coils.
      c. Zone dampers.

d. Radiation.

3. Control algorithms run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.

I. System Object Capacity:

1. System size to be expandable to at keast twice the number of input / output objects required providing additional controllers, including associated devices and wiring as necessary to achieve this capacity requirement.
2. Hardware additions or software revisions for the installed operator interfaces are not to be required for future, system expansions.

2.07 AUXILIARY CONTROL DEVICES

A. Refer to Section 230913 - Instrumentation and Control Devices

2.08 WIRING AND RACEWAYS

A. General. Provide copper wiring, plenum cable, and raceways as specified in applicable sections of Division 26.

B. Insulated wire shall use copper conductors and shall be UL listed for 200°F minimum service.

2.09 FIBER OPTIC CABLE SYSTEM

A. Optical Cable. Optical cables shall be duplex 900 mm tight-buffer construction designed for intra-building environments. Sheath shall be UL listed OFNP in accordance with NEC Article 770. Optical fiber shall meet the requirements of FDDI, ANSI X3T9.5 PMD for 62.5/125mm.

B. Connectors. Field terminate optical fibers with ST type connectors. Connectors shall have ceramic ferrules and metal bayonet latching bodies.

PART 3 EXECUTION

3.01 INSTALLERS

A. Installer List:

1. Automatic Controls Equipment Systems, Inc.http://www.automaticcontrols.net
2. Contact: Michael Kunstel, (314) 722-2987, mkunstel@automaticcontrols.net

B. Substitution Limitations: Not permitted.

3.02 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices, wiring installed prior to installation proceeding.

C. Examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequatem, or if any discrepancies occur between the plans and the contractor's work and the plans and the work of others, report these discrepancies to the Owner and shall obtain written instructions for any changes necessary to accommodate the contractor's work with the work of others. Any changes in the work covered by this specification made necessary by the failure or neglect of the contractor to report such discrepancies shall be made by and at the expense of the contractor.

3.03 PROTECTION

A. The contractor shall protect all work and material from damage by his/her work or employees and shall be liable for all damage thus caused.

B. The contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The contractor shall protect any material that is not immediately installed. The contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.04 COORDINATION

A. Site

1. Where the mechanical work will be installed in close proximity to, or will interfere with, work of other trades, the contractor shall assist in working out space conditions to make a satisfactory adjustment. If the contractor installs his/her work before coordinating with other trades, so as to cause any interference with work of other trades, the contractor shall make the necessary changes in his/her work to correct the condition without extra charge.
2. Coordinate and schedule work with other work in the same area and with work dependent upon other work to facilitate mutual progress.

B. Submittals. See Section 23 09 23 Article 1.10 (Submittals).

C. Test and Balance.
1. Provide a qualified technician to assist in the test and balance process.

D. Life Safety (By Others).
1. Duct smoke detectors required for air handler shutdown are provided and controled under Division 28.
2. Smoke dampers and actuators required for duct smoke isolation are provided under Division 23 and are controled under Division 28.
3. Fire and smoke dampers and actuators required for fire-rated walls are provided under Division 23. Fire and smoke damper control is provided under Division 28.

E. Coordination with controls specified in other sections or divisions. Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the contractor as follows:
1. All communication media and equipment shall be provided as specified in Section 23 09 23 Article 2.2 (Communication).
2. Each supplier of a controls product is responsible for the configuration, programming, start up, and testing of that product to meet the sequences of operation described in Section 23 09 93.
3. The contractor shall coordinate and resolve any incompatibility issues that arise between control products provided under this section and those provided under other sections or divisions of this specification.
4. The contractor is responsible for providing all controls described in the contract documents regardless of where within the contract documents these controls are described.
5. The contractor is responsible for the interface of control products provided by multiple suppliers regardless of where this interface is described within the contract documents.

3.05 GENERAL WORKMANSHIP

A. Install equipment, piping, and wiring/raceway parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.

B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

C. Install equipment in readily accessible locations as defined by Chapter 1 Article 100 Part A of the National Electrical Code (NEC).

D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.

E. All equipment, installation, and wiring shall comply with industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.06 FIELD QUALITY CONTROL

A. All work, materials, and equipment shall comply with rules and regulations of applicable local, state, and federal codes and ordinances as identified in Section 23 09 23 Article 1.8 (Codes and Standards).

B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship.

C. Contractor shall have work inspection by local and/or state authorities having jurisdiction over the work.

3.07 EXISTING EQUIPMENT

A. Wiring. Interconnecting control wiring shall be removed and shall become the property of the contractor unless specifically noted or shown to be reused.

B. Local Control Panels. Remove and deliver existing control panels to Owner.

C. Repair. Unless otherwise directed, the contractor is not responsible for repair or replacement of existing energy equipment and systems, valves, dampers, or actuators. Should the contractor find existing equipment that requires maintenance, the engineer is to be notified immediately.

D. Indicator Gauges. Where these devices remain and are not removed, they must be made operational and recalibrated to ensure reasonable accuracy.

E. Room Thermostats. Remove and deliver existing room thermostats to Owner unless otherwise noted. Patch and finish holes and marks left by removal to match existing walls.

F. Electronic Sensors and Transmitters. Remove and deliver existing sensors and transmitters to Owner.

G. Controllers and Auxiliary Electronic Devices. Remove and deliver existing controllers and auxiliary electronic devices to Owner.

H. Damper Actuators, Linkages, and Appurtenances. Remove and deliver existing damper actuators, linkages and appurtenances to Owner.

I. Control Valves. Replace existing control valves with new. Deliver removed control valves to Owner.

J. Control Compressed Air Systems. Replace existing control compressed air systems with new unless otherwise noted. Deliver removed systems to Owner.

K. Existing System Operating Schedule. Existing mechanical system may be disabled during this work.

L. The scheduling of fans through existing or temporary time clocks or control system shall be maintained throughout the DDC system installation

M. Install control panels where shown.

N. Modify existing starter control circuits, if necessary, to provide hand-off-auto control of each controlled starter. If new starters or starter control packages are required, these shall be included as part of this contract.

O. Patch holes and finish to match existing walls.

3.08 WIRING

A. All control and interlock wiring shall comply with national and local electrical codes, and Division 26 of this specification, Where the requirements of this section differ from Division 26, the requirements of this section shall take precedence.

B. All NEC Class 1 (line voltage) wiring shall be UL listed in approved raceway according to NEC and Division 26 requirements.

C. All low-voltage wiring shall meet NEC Class 2 requirements. Low-voltage power circuits shall be subfused when required to meet Class 2 current limit.

D. Where NEC Class 2 (current-limited) wires are in concealed and accessible locations, including ceiling return air plenums, approved cables not in raceway may be used provided that cables are UL listed for the intended application.

E. All wiring in mechanical, electrical, or service rooms - or where subject to mechanical damage - shall be installed in raceway at levels below 3 m (10ft).

F. Do not install Class 2 wiring in raceways containing Class 1 wiring. Boxes and panels containing high-voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g. relays and transformers).

G. Do not install wiring in raceway containing tubing.

H. Where Class 2 wiring is run exposed, wiring is to be run parallel along a surface or perpendicular to it and neatly tied at 3 m (10 ft) intervals.

I. Where plenum cables are used without raceway, they shall be supported from or anchored to structural members. Cables shall not be supported by or anchored to ductwork, electrical raceways, piping, or ceiling suspension systems.

J. All wire-to-device connections shall be made at a terminal block or terminal strip. All wire-to-wire connections shall be at a terminal block.

K. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.

L. Maximum allowable voltage for control wiring shall be 120 V. If only higher voltages are available, the contractor shall provide step-down transformers.

M. All wiring shall be installed as continuous lengths, with no splices permitted between termination points.

N. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations.

O. Size of raceway and size and type of wire type shall be the responsibility of the contractor in keeping with the manufacturer’s recommendations and NEC requirements, except as noted elsewhere.

P. Include one pull string in each raceway 2.5 cm (1 in.) or larger.

Q. Use color-coded conductors throughout with conductors of different colors.

R. Control and status relays are to be located in designated enclosures only. These enclosures include packaged equipment control panel enclosures unless they also contain Class 1 starters.

S. Conceal all raceways except within mechanical, electrical, or service rooms. Install raceway to maintain a minimum clearance of 15 cm (6 in.) from high-temperature equipment (e.g. steam pipes or flues).

T. Secure raceways with raceway clamps fastened to the structure and spaced according to code requirements. Raceways and pull boxes may not be hung on flexible duct strap or tie rods. Raceways may not be run on or attached to ductwork.

U. Adhere to this specification's Division 26 requirements where raceway crosses building expansion joints.

V. Install insulated bushings on all raceway ends and openings to enclosures. Seal top end of vertical raceways.

W. The contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.

X. Flexible metal raceways and liquid-tight flexible metal raceways shall not exceed 1 m (3 ft) in length and shall be supported at each end. Flexible metal raceway less than ½ in. electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal raceways shall be used.

Y. Raceway must be rigidly installed, adequately supported, properly reamed at both ends, and left clean and free of obstructions. Raceway sections shall be joined with couplings (according to code). Terminations must be made with fittings at boxes, and ends not terminating in boxes shall have bushings installed.

3.09 COMMUNICATION WIRING

A. The contractor shall adhere to the items listed in the "Wiring" article in Part 3 of the specification.

B. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling

C. Do not install communication wiring in raceways and enclosures containing Class 1 or other Class 2 wiring.

D. Maximum pulling, tension, and bend radius for the cable installation, as specified by the cable manufacturer, shall not be exceeded during installation.

E. Contractor shall verify the integrity of the entire network following cable installation. Use appropriate test measures for each particular cable.

F. When a cable enters or exits a building, a lightning arrestor must be installed between the lines and ground. The lighting arrestor shall be installed according to manufacturer’s instructions.

G. All runs of communication wiring shall be unspliced length when that length is commercially available.

H. All communication wiring shall be labeled to indicate origination and destination data.

I. Grounding of coaxial cable shall be in accordance with NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

J. BACnet MS/TP communications wiring shall be installed in accordance with ASHRAE/ANSI Standard 135. This includes but is not limited to:
   1. The network shall use shielded, twisted-pair cable with characteristic impedance between 100 and 120 ohms. Distributed capacitance between conductors shall be less than 100 pF per meter (30 pF per foot.)
   2. The maximum length of an MS/TP segment is 1200 meters (4000 ft) with AWG 18 cable. The use of greater distances and/or different wire gauges shall comply with the electrical specifications of EIA-485.
   3. The maximum number of nodes per segment shall be 32, as specified in the EIA 485 standard. Additional nodes may be accommodated by the use of repeaters.
   4. An MS/TP EIA-485 network shall have no T connections.

3.10 FIBER OPTIC CABLE

A. Maximum pulling tensions as specified by the cable manufacturer shall not be exceeded during installation. Post-installation residual cable tension shall be within cable manufacturer's specifications.

B. All cabling and associated components shall be installed in accordance with manufacturers' instructions. Minimum cable and unjacketed fiber bend radii, as specified by cable manufacturer, shall be maintained.

3.11 INSTALLATION

A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.

B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 230993.

C. Provide with 120v AC, 15 amp dedicated emergency power circuit to each programmable control unit.

D. Provide conduit and electrical wiring in accordance with Section 260583. Electrical material and installation shall be in accordance with appropriate requirements of .

3.12 MANUFACTURER'S FIELD SERVICES

A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

3.13 WARNING LABELS

A. Permanent warning labels shall be affixed to all equipment that can be automatically started by the control system.
   1. Labels shall use white lettering (12-point type or larger) on a red background.
   2. Warning labels shall read as follows.

C A U T I O N

THIS EQUIPMENT IS OPERATING UNDER AUTOMATIC CONTROL AND MAY START OR STOP AT ANY TIME WITHOUT WARNING. SWITCH DISCONNECT TO"OFF"POSITION BEFORE SERVICING.

B. Permanent warning labels shall be affixed to all motor starters and control panels that are connected to multiple power sources utilizing separate disconnects.
   1. Labels shall use white lettering (12-point type or larger) on a red background.
   2. Warning labels shall read as follows.

C A U T I O N

THIS EQUIPMENT IS FED FROM MORE THAN ONE POWER SOURCE WITH SEPARATE DISCONNECTS. DISCONNECT ALL POWER SOURCES BEFORE SERVICING.

3.14 IDENTIFICATION OF HARDWARE AND WIRING

A. All wiring and cabling, including that within factory-fabricated panels shall be labeled at each end within 5 cm (2 in.) of termination with control system address or termination number.

B. All pneumatic tubing shall be labeled at each end within 5 cm (2 in.) of termination with a descriptive identifier.

C. Permanently label or code each point of field terminal strips to show the instrument or item served.

D. Identify control panels with minimum 1 cm (½ in.) letters on laminated plastic nameplates.

E. Identify all other control components with permanent labels. All plug-in components shall be labeled such that label removal of the component does not remove the label.

F. Identify room sensors related to terminal boxes or valves with nameplates.

G. Manufacturers' nameplates and UL or CSA labels shall be visible and legible after equipment is installed.

H. Identifiers shall match record documents.

3.15 CONTROLLERS

A. Provide a separate controller for each AHU or other HVAC system. A DDC controller may control more than one system provided that all points associated with the system are assigned to the same DDC controller. Points used for control loop reset, such as outside air or space temperature, are exempt from this requirement.

B. Building Controllers and Custom Application Controllers shall be selected to provide the required I/O point capacity required to monitor all of the hardware points listed in Section 23 09 93 (Sequences of Operation).

3.16 PROGRAMMING

A. Provide sufficient internal memory for the specified sequences of operation and trend logging.

B. Point Naming. Name points as shown on the equipment points list provided with each sequence of operation. See Section 23 09 93 (Sequences of Operation). If character limitations or space restrictions make it advisable to shorten the name, the abbreviations given in Appendix B to Section 23 09 93 may be used. Where multiple points with the same name reside in the same controller, each point name may be customized with its associated Program Object number. For example, "Zone Temp 1" for Zone 1, "Zone Temp 2" for Zone 2.

C. Software Programming.
   1. Provide programming for the system and adhere to the sequences of operation provided. All other system programming necessary for the operation of the system, but not specified in this document, also shall be provided by the contractor. Embed into the control program sufficient comment statements to clearly describe each section of the program. The comment statements shall reflect the language used in the sequences of operation. Use the appropriate technique based on the following programming types:
      a. Text-based:
         1) Must provide actions for all possible situations
         2) Must be modular and structured
         3) Must be commented
      b. Graphic-based:
         1) Must provide actions for all possible situations
         2) Must be documented
      c. Parameter-based:
         1) Must provide actions for all possible situations
         2) Must be documented.

D. Operator Interface.
   1. Standard Graphics. Provide graphics for all mechanical systems and floor plans of the building. This includes each chilled water system, hot water system, chiller, boiler, air handler, and all terminal equipment. Point information on the graphic displays shall dynamically update. Show on each graphic all input and output points for the system. Also show relevant calculated points such as setpoints. As a minimum, show on each equipment graphic the input and output points and relevant calculated points as indicated on the applicable Points List in Section 23 09 93.
   2. The contractor shall provide all the labor necessary to install, initialize, start up, and troubleshoot all operator interface software and its functions as described in this section. This includes any operating system software, the operator interface database, and any third-party software installation and integration required for successful operation of the operator interface.

3.17 CONTROL SYSTEM CHECKOUT AND TESTING

A. Startup Testing. All testing listed in this article shall be performed by the contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the owner’s representative is notified of the system demonstration.
   1. The contractor shall furnish all labor and test apparatus required to calibrate and prepare for service of all instruments, controls, and accessory equipment furnished under this specification.
   2. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
   3. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures according to manufacturers’ recommendations.
   4. Verify that all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starters, etc.) operate properly and that the normal positions are correct.

5. Verify that all analog output devices (I/Ps, actuators, etc.) are functional, that start and span are correct, and that direction and normal positions are correct. The contractor shall check all control valves and automatic dampers to ensure proper action and closure. The contractor shall make any necessary adjustments to valve stem and damper blade travel.
6. Verify that the system operation adheres to the sequences of operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops.
7. Alarms and Interlocks:
    a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm.
    b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.
    c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action

3.18 CLEANING

A. The contractor shall clean up all debris resulting from his/her activities daily. The contractor shall remove all cartons, containers, crates, etc., under his/her control as soon as their contents have been removed. Waste shall be collected and placed in a designated location.

B. At the completion of work in any area, the contractor shall clean all work, equipment, etc., keeping it free from dust, dirt, and debris, etc.

C. At the completion of work, all equipment furnished under this section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.19 TRAINING

A. Provide training for a designated staff of Owner’s representatives. Training shall be provided via self-paced training, web-based or computer-based training, classroom training, or a combination of training methods.

3.20 CONTROLS COMMUNICATION PROTOCOL

A. General. The electronic controls packaged with this equipment shall communicate with the building direct digital control (DDC) system. The DDC system shall communicate with these controls to read the information and change the control setpoints as shown in the points list, sequences of operation, and control schematics. The information to be communicated between the DDC system and these controls shall be in the standard object format as defined in ANSI/ASHRAE Standard 135 (BACnet). Controllers shall communicate with other BACnet objects on the internetwork using the Read (Execute) Property service as defined in Clause 15.5 of Standard 135.

B. Distributed Processing. The controller shall be capable of stand-alone operation and shall continue to provide control functions if the network connection is lost.

C. I/O Capacity. The controller shall contain sufficient I/ O capacity to control the target system.

D. The Controller shall have a physical connection for a laptop computer or a portable operator’s tool.

E. Environment. The hardware shall be suitable for the anticipated ambient conditions.
    1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at 40°C to 60°C (40°F to 140°F).
    2. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).

F. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field removable, modular terminal strips or to a termination card connected by a ribbon cable.

G. Memory. The Controller shall maintain all BIOS and programming information in the event of a power loss for at least 30 days.

H. Power. Controller shall be able to operate at 90% to 110% of nominal voltage rating.

I. Transformer. Power supply for the Controller must be rated at minimum of 125% of ASC power consumption and shall be fused or current limiting type.

3.21 START-UP AND CHECKOUT PROCEDURES

A. Start up, check out, and test all hardware and software and verify communication between all components.
   1. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
   2. Verify that all analog and binary input/output points read properly.
   3. Verify alarms and interlocks.
   4. Verify operation of the integrated system.

3.22 SEQUENCES OF OPERATION

A. See Section 230993 - Sequences of Operation, With Points Lists.

END OF SECTION

SECTION 230993
SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.

B. Sequence of operation for:

1.02 RELATED REQUIREMENTS

A. Section 230913 - Instrumentation and Control Devices for HVAC.

B. Section 230923 - Direct-Digital Control System for HVAC.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Submit all submittal documents listed in this Section under Section 230923 - Direct-Digital Control System for HVAC.

C. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
   1. Preface: 1 or 2 paragraph overview narrative of the system describing its purpose, components and function.
   2. State each sequence in small segments and give each segment a unique number for referencing in Functional Test procedures; provide a complete description regardless of the completeness and clarity of the sequences specified in Contract Documents.
   3. Include at least the following sequences:
      a. Start-up.
      b. Warm-up mode.
      c. Normal operating mode.
      d. Unoccupied mode.
      e. Shutdown.
      f. Capacity control sequences and equipment staging.
      g. Temperature and pressure control, such as setbacks, setups, resets, etc.
      h. Detailed sequences for all control strategies, such as economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
      i. Effects of power or equipment failure with all standby component functions.
      j. Sequences for all alarms and emergency shut downs.
      k. Seasonal operational differences and recommendations.
      l. Interactions and interlocks with other systems.
   4. Include initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
   5. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system, indicating which points are adjustable control points and which points are only monitored.
   6. Include schedules, if known.

D. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.
   1. Label with settings, adjustable range of control and limits.
   2. Include flow diagrams for each control system, graphically depicting control logic.

3. Include the system and component layout of all equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
4. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.
5. Include all monitoring, control and virtual points specified in elsewhere.
6. Include a key to all abbreviations.

E. Points List: Submit list of all control points indicating at least the following for each point.
1. Name of controlled system.
2. Point abbreviation.
3. Point description; such as dry bulb temperature, airflow, etc.
4. Display unit.
5. Control point or setpoint (Yes / No); i.e. a point that controls equipment and can have its setpoint changed.
6. Monitoring point (Yes / No); i.e. a point that does not control or contribute to the control of equipment but is used for operation, maintenance, or performance verification.
7. Intermediate point (Yes / No); i.e. a point whose value is used to make a calculation which then controls equipment, such as space temperatures that are averaged to a virtual point to control reset.
8. Calculated point (Yes / No); i.e. a “virtual” point generated from calculations of other point values.

F. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 BOILER INTERFACE

A. Current boiler status and operating conditions will be monitored through its communications interface port. The interface will monitor and trend the points as shown on the Points List.

B. Boiler are provided with factory control system to maintain heating water supply temperature.

C. Control heating water at maximum 180 degrees F at outdoor temperature of 0 degrees F, and minimum 120 degrees F at outdoor temperture of 75 degrees F, with straight line relationship between.

D. Hot water pumps shall operate in parrallel configuration. Factory installed controls shall vary the speed to maintain correct flow through the system. System shall monitor flow meter to maintain minimum flow through the boilers.

END OF SECTION

SECTION 231123
FACILITY NATURAL-GAS PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.
   1. Natural Gas.

1.02 RELATED REQUIREMENTS

A. Section 09 9000 - Painting and Coating.

B. Section 230553 - Mechanical Identification: Product requirements for valve and pipe identification for placement by this section.

C. Section 230548 - Vibration and Seismic Controls for HVAC Piping and Equipment.

1.03 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:
   1. ASME B16.3 - Malleable Iron Threaded Fittings.
   2. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
   3. ASME B31.9 - Building Services Piping.
   4. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

B. ASTM International:
   1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   2. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
   3. ASTM B68 - Standard Specification for Seamless Copper Tube, Bright Annealed.
   4. ASTM B75 - Standard Specification for Seamless Copper Tube.
   5. ASTM B749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.
   6. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

C. American Welding Society:
   1. AWS D1.1 - Structural Welding Code - Steel.

D. Manufacturers Standardization Society of the Valve and Fittings Industry:,
   1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
   2. MSS SP 67 - Butterfly Valves.
   3. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
   4. MSS SP 78 - Cast Iron Plug Valves, Flanged and Threaded Ends.
   5. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
   6. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

E. National Fire Protection Association:
   1. NFPA 54 - National Fuel Gas Code.

F. Underwriters Laboratories Inc.:
   1. UL 842 - Valves for Flammable Fluids.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with State of Missouri, standards.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.

D. Welder Qualifications: Certified in accordance with ASME (BPV IX).

E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

A. Section 016000 - Product Requirements.

B. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe and Regulator Vent Piping: ASTM A 53/A 53M Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A 234/A 234M, wrought steel welding type.
   2. Joints: NFPA 54, threaded to ASME B1.20.1or welded to ASME B31.1.
      a. Piping size 3" or under: threaded.
         1) Number of threads:
            (a) Piping size 1/2" to 1": 10
            (b) Piping size 1-1/4" to 2": 11
            (c) Piping size 2-1/2" to 3": 12
      b. Piping size 4" or larger: welded.
      c. Piping in concealed and plenum space all size: welded.

B. Copper Tube and Regulator Vent Piping: ASTM B 88 or ASTM B280, Type L (B) annealed.
   1. Fittings: ASME B16.26, cast bronze.
   2. Joints: Flared or brazed.
   3. Joints in concealed locations: Brazed.
      a. Brazing filler metal: AWS A5.8 BAg Series.

2.02 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 inches and Under:
   1. Ferrous pipe: ASME B16.1, ASME B16.20 or MSS SP-6, Class 150 malleable iron threaded unions.
   2. Copper tube and pipe: ASME B16.1, ASME B16.20 or MSS SP-6, Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 inches:
   1. Ferrous pipe: ASME B16.1, ASME B16.20 or MSS SP-6, Class 150 malleable iron threaded or forged steel slip-on flanges; preformed full face, metal-jacketed asbestos gaskets.
   2. Copper tube and pipe: ASME B16.1, ASME B16.20 or MSS SP-6, Class 150 slip-on bronze flanges; preformed full face, metal-jacketed asbestos gaskets.

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier. 150 psi for natural gas application.

2.03 PIPE HANGERS AND SUPPORTS

A. Manufacturers:
   1. Carpenter & Paterson Inc.
   2. Creative Systems Inc.
   3. Flex-Weld, Inc. Model.
   4. Globe Pipe Hanger Products Inc.
   5. Michigan Hanger Co.
   6. Miro Industries, Inc.
   7. Superior Valve Co.
   8. Substitutions: Not permitted.

B. Piping hangers and supports:
   1. Conform to NFPA 54, ASME B31.9.
   2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
   3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
   7. Vertical Support: Steel riser clamp.
   8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
   10. Sheet Lead: ASTM B749, 2.5 lb/sq ft, 0.039 inch thick.

2.04 GLOBE VALVES

A. Manufacturers:
   1. Conbraco Industries: www.conbraco.com.
   2. Nibco, Inc: www.nibco.com.
   3. Milwaukee Valve Company: www.milwaukeevalve.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Up To and Including 3 Inches:
   1. MSS SP-80, Class 125, bronze body, bronze trim, handwheel, bronze disc, solder ends.

C. 2 Inches and Larger:
   1. MSS SP-85, Class 125, iron body, bronze trim, handwheel, outside screw and yoke, renewable bronze plug-type disc, renewable seat, flanged ends. Provide chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.05 BALL VALVES

A. Manufacturers:
   1. Crane Valve, North America.
   2. Hammond Valve.
   3. Milwaukee Valve.
   4. NIBCO, Inc.
   5. Stockham Valves & Fittings.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. 1/4 inch to 1 inch: MSS SP 110, Class 125, two pieces, threaded or welded ends, bronze body, chrome plated bronze ball, reinforced teflon seats, blow-out proof stem, lever handle, UL 842 listed for flammable liquids and LPG, full port.

C. 1-1/4 inch to 3 inch: MSS SP 110, Class 125, two piece, threaded or welded ends, bronze body, chrome plated bronze ball, reinforced teflon seats, blow-out proof stem, lever handle, UL 842 listed for flammable liquids and LPG, conventional port.

2.06 PLUG VALVES

A. Manufacturers:
   1. DeZURIK, Unit of SPX Corp.
   2. Flow Control Equipment, Inc.
   3. Homestead Valve.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. 2 inches and Smaller: MSS SP 78, Class 150, construction, round port, full pipe area, pressure lubricated, teflon packing, threaded or welded ends. Furnish one plug valve wrench for every ten plug-valves with minimum of one wrench.

C. 2-1/2 inches and Larger: MSS SP 78, Class 150 construction, round port, full pipe area, pressure lubricated, teflon packing, flanged ends. Furnish worm gear-operated.

2.07 STRAINERS

A. Manufacturers:
   1. Mueller Steam Specialty Model.
   2. O.C. Keckley Company Model.
   3. Spirax Sarco, Inc. Model.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Size 2 inch and Under:
   1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

C. Size 1-1/2 inch to 4 inch:
   1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

D. Size 5 inch and Larger:
   1. Class 125, flanged iron body, basket pattern with 1/8 inch stainless steel perforated screen.

2.08 NATURAL GAS PRESSURE REGULATORS

A. Manufacturers:
   1. Fisher Controls International; Division of Emerson.
   2. Invensys.
   3. Schlumberger Limited, Inc; Jordan Valve Div.
   4. Substitutions: 016000 - Product Requirements.

B. Product Description: Spring loaded, general purpose, self-operating service regulator including internal relief type diaphragm assembly and vent valve. Diaphragm case can be rotated 360 degrees in relation to body.
   1. Temperatures: minus 20 degrees F to 150 degrees F.
   2. Body: Cast iron.
   3. Spring case, lower diaphragm casing, union ring, seat ring and disk holder: Aluminum.
   4. Disk, diaphragm, and O-ring: Nitrile.
   5. Maximum inlet pressure: 150 psig
   6. Furnish sizes 2 inches and smaller with threaded ends. Furnish sizes 2-1/2 inches and larger with flanged ends.

2.09 NATURAL GAS PRESSURE RELIEF VALVES

A. Manufacturers:
   1. Fisher Controls International, Inc.; Division of Emerson.
   2. Invensys.
   3. Schlumberger Limited, Inc.; Jordan Valve Div.

4. Substitutions: 016000 - Product Requirements.

B. Product Description: Spring loaded type relief valve.
   1. Body: Aluminum.
   2. Diaphragm: Nitrile.
   3. Orifice: Brass.
   4. Maximum operating temperature: 150 degrees F.
   5. Inlet Connections: Threaded.
   6. Outlet or Vent Connection: Same size as inlet connection.

2.10 FLEX CONNECTORS

A. Manufacturers:
   1. Mercer Rubber Co.
   2. Mason Industries, Inc.
   3. Substitutions: 01600 - Product Requirements.

B. Product Description:
   1. ANSI Z21.24
   2. Braided stainless steel hose with male nipples.
   3. Working pressure rating: minimum 150 psi at 70 F degree.

2.11 SEISMIC GAS SHUT OFF VALVE

A. Manufacturers:
   1. California Valves
   2. Pacific Seismic Products

B. Product Description:
   1. Size: Same as gas piping size, see plan.
   2. Connection: Flanged
   3. Inlet pressure: 2 psi
   4. Mounting position: Horizontal gas flow.
   5. Valves utilize a swing-check valve arrangement with an acceleration-sensitive triggering mechanism. The trip mechanism consists of a steel ball that rests on a tapered cup-shaped support. The horizontal motions of an earthquake cause the ball to move from the center of the support, which allows the ball's mass to act upon the movable pipe of the trip mechanism to actuate the valve and initiate closure. Valve remains closed until manually reset.
   6. Springs assist the valve's disc to close, and gas pressure assists in holding the disc in the closed position. The trip mechanism is factory set and sealed. A sight glass combined with an open/closed indicator that has green (i.e., open) and red (i.e, closed) bars enables the valve's position to be easily and quickly determined.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

B. Inspect piping damages. Pipe with threads that are stripped, chipped or corroded or otherwise damaged shall not be used. Where a weld opens during the operation of cutting or threading, that portion of the pipe shall not be used.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install natural gas piping in accordance with NFPA 54.

C. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

D. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

E. Install piping to maintain headroom, conserve space, and not interfere with use of space.

F. Group piping whenever practical at common elevations.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

H. Sleeve pipe passing through partitions, walls and floors.

I. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to Section 078400.

J. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 3100.

K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

L. Provide support for utility meters in accordance with requirements of utility companies.

M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 9000.

N. Install identification on piping systems including underground piping.

O. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

P. Paint exposed interior and exterior steel piping. Color for exposed interior piping and piping along the exterior wall to be selected by the Owner. Yellow for piping on roof. Refer to Section 099000 for paint material and procedures.

Q. Install pipe to elevation as indicated on Drawings.

R. Route pipe in straight line.

S. Install pipe to allow for expansion and contraction without stressing pipe or joints.

T. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

U. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as scheduled.
   3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   4. Place hangers within 12 inches of each horizontal elbow.
   5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping.
9. Prime coat exposed steel hangers and supports. Refer to Section 09 9000. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
10. Provide hangers adjacent to motor driven equipment with vibration isolation.

3.04 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

C. Install ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Provide plug valves in natural gas systems for shut-off service.

E. Install flex piping connector at equipment gas connection per seismic requirement.

3.05 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements: Testing and Inspection Services.

B. Pressure test natural gas piping in accordance with NFPA 54.

3.06 PRESSURE TEST NATURAL GAS PIPING IN ACCORDANCE WITH NFPA 54.

3.07 SCHEDULES

A. Pipe Hanger Spacing:
1. Metal Piping:
a. Horizontal Runs

Pipe size (inches)	Maximum hanger spacing (feet)	Hanger rod diameter (inches)
1/2 to 1-1/4	6	3/8
1-1/2 to 2	10	3/8
2-1/2 to 3	10	1/2
4 to 6	10	5/8
8 to 12	14	7/8
14 and Over:	20	1

b. Vertical Runs
1) Spacing of supports is not to exceed 10 feet, requiring hangers only where the height of each floor is greater than 10 feet.

2. Flexible Piping:
a. Horizontal Runs

Piping Size (inches)	Maximum hanger spacing (feet)	Hanger rod diameter (inches)
3/8	4	3/8
1/2	6	3/8
3/4 to 2	8	3/8

b. Vertical Runs
1) Spacing of supports is not to exceed 10 feet, requiring hangers only where the height of each floor is greater than 10 feet.

END OF SECTION

SECTION 232113
HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hydronic system requirements.

B. Heating water piping, above grade.

C. Chilled water piping, buried.

D. Chilled water piping, above grade.

E. Condenser water piping, buried.

F. Condenser water piping, above grade.

G. Equipment drains and overflows.

H. Pipe hangers and supports.

I. Unions, flanges, mechanical couplings, and dielectric connections.

J. Valves:
   1. Globe or angle valves.
   2. Ball valves.
   3. Butterfly valves.
   4. Check valves.
   5. Pressure independent temperature control valves and balancing valves.

K. Flow controls.

1.02 RELATED REQUIREMENTS

A. Section 083100 - Access Doors and Panels.

B. Section 099123 - Interior Painting.

C. Section 230516 - Expansion Fittings and Loops for HVAC Piping.

D. Section 230523 - General-Duty Valves for HVAC Piping.

E. Section 230548 - Vibration and Seismic Controls for HVAC.

F. Section 230553 - Identification for HVAC Piping and Equipment.

G. Section 230719 - HVAC Piping Insulation.

H. Section 232114 - Hydronic Specialties.

I. Section 232500 - HVAC Water Treatment: Pipe cleaning.

1.03 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300.

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.

D. ASME B31.9 - Building Services Piping.

E. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators.

F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

G. ASTM A106/A106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.

H. ASTM A183 - Standard Specification for Carbon Steel Track Bolts and Nuts.

I. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

J. ASTM A536 - Standard Specification for Ductile Iron Castings.

K. ASTM B32 - Standard Specification for Solder Metal.

L. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

M. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric).

N. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

O. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications.

P. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

Q. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

R. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

S. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets.

T. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

U. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

V. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

W. AWS D1.1/D1.1M - Structural Welding Code - Steel.

X. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems.

Y. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast.

Z. AWWA C606 - Grooved and Shouldered Joints.

AA. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Include data on pipe materials, pipe fittings, valves, and accessories.
   2. Show grooved joint couplings, fittings, valves, and specialties on drawings and product submittals, specifically identified with the manufacturer's style or series designation.

1.05 QUALITY ASSURANCE

A. Provide all grooved joint couplings, fittings, valves, specialties, and grooving tools from a single manufacturer.

B. Date stamp all castings used for coupling housings, fittings, valve bodies, etc. for quality assurance and traceability.

C. Coupling Manufacturer:
   1. Perform on-site training by factory-trained representative to the Contractor's field personnel in the proper use of grooving tools and installation of grooved joint products.
   2. Periodic job site visits by factory-trained representative to ensure best practices in grooved joint installation.
   3. A distributor's representative is not considered qualified to perform the training.

D. Welder Qualifications: Certify in accordance with ASME BPVC-IX.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:
   1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
   2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
   3. Grooved mechanical joints may be used in accessible locations only.
      a. Accessible locations include those exposed on interior of building, in mechanical rooms, and above ground outdoors.
      b. Grooved mechanical connections and joints comply with AWWA C606.
         1) Ductile Iron: Comply with ASTM A536, Grade 65-45-12.
         2) Steel: Comply with ASTM A106/A106M, Grade B or ASTM A53/A53M.
      c. Use rigid joints unless otherwise indicated.
      d. Use flexible joints at pump connections.
         1) Depending on pipe size, three or four flexible joints may be used in lieu of a flexible connector.
            (a) Piping size 3" and under: three flexible joints
            (b) Piping size 4" and over: four flexible joints
      e. Use gaskets of molded synthetic rubber with central cavity, pressure responsive configuration and complying with ASTM D2000, Grade 2CA615A15B44F17Z for circulating medium up to maximum 250 degrees F or Grade M3BA610A15B44Z for circulating medium up to maximum 200 degrees F.
      f. Provide steel coupling nuts and bolts complying with ASTM A183.
   4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.
   1. Where grooved joints are used in piping, provide grooved valve/equipment connections if available; if not available, provide flanged ends and grooved flange adapters.

D. Valves: Provide valves where indicated on drawings:
   1. Provide drain valves where indicated, and if not indicated provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch ball valves with hose end and cap, or pipe to nearest floor drain as indicated on drawing.
   2. On discharge of hydronic pumps, use spring loaded check valves.
   3. Isolate equipment:
      a. Piping 2" or under: using ball valves with union or grooved mechanical couplings

b. Piping 2-1/2": using butterfly valves with lug end flanges or grooved mechanical couplings
4. For throttling, bypass, or manual flow control services, use the following valves.
a. 2" and under: Ball valve.
b. 2-1/2" and over: Globe or butterfly valve.
5. For throttling and isolation service in chilled and condenser water systems, use only butterfly valves.
6. In heating water, chilled water, or condenser water systems, butterfly valves may be used interchangeably with globe valves.
7. For shut-off and to isolate parts of systems or vertical risers, use the following valves.
a. 2" and under: Ball valve.
b. 2-1/2" and over: Globe or butterfly valve.

E. Welding Materials and Procedures: Comply with ASME BPVC-IX.

2.02 HEATING WATERWITH OR WITHOUT GLYCOL PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black, using one of the following joint types:
1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
2. Threaded Joints: ASME B16.3, malleable iron fittings.
a. Do not use in inaccessible concealed area.
3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
a. Do not use in inaccessible concealed area.

B. Steel Pipe Sizes 3 Inches and Greater: ASTM A53/A53M, 3/8 inch wall, black, using one of the following joint types:
1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
2. Threaded Joints: ASTM A536 ductile iron fittings.
3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

C. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), hard drawn, using one of the following joint types:
1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.
a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.

2.03 CHILLED WATER PIPING WITH OR WITHOUT GLYCOL, BURIED

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black with AWWA C105/A21.5 polyethylene jacket, or double layer, half-lapped polyethylene tape.
1. Fittings: ASTM A234/A234M, wrought steel welding type with double layer, half-lapped polyethylene tape.
2. Joints: Welded in accordance with AWS D1.1/D1.1M.
3. Casing: Closed glass cell insulation.

B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A) annealed.
1. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy.

2.04 CHILLED WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black; using one of the following joint types:
1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
2. Threaded Joints: ASME B16.3, malleable iron fittings.
a. Do not use in inaccessible concealed area.

3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
    a. Do not use in inaccessible concealed area.

2.05 CONDENSER WATER PIPING WITH OR WITHOUT GLYCOL, BURIED

A. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26.
1. Fittings: ASTM D2466 or ASTM D2467, PVC.
2. Joints: Solvent welded in accordance with ASTM 2855.

2.06 CONDENSER WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black.
1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings with finish matching piping; AWS D1.1/D1.1M welded.
2. Threaded Joints: ASME B16.3, malleable iron fittings with finish matching piping.
    a. Do not use in inaccessible concealed area.
3. Threaded Joints: ASTM A536 ductile iron fittings.
4. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
    a. Do not use in inaccessible concealed area.

2.07 EQUIPMENT DRAINS AND OVERFLOWS

A. Steel Pipe: ASTM A53/A53M, Schedule 40 galvanized; using one of the following joint types:
1. Threaded Joints: Galvanized cast iron, or ASME B16.3 malleable iron fittings.
2. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

B. Copper Tube: ASTM B88 (ASTM B88M), Type M (C), drawn; using one of the following joint types:
1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
2. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

C. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26.
1. Fittings: ASTM D2466 or D2467, PVC.
2. Joints: Solvent welded in accordance with ASTM D2855.
3. Application: For outdoor on roof only, unless indicated on drawings otherwise.
    a. Do not install in plenum area whether it is return air plenum or non-return air plenum! Do not install in rated wall!

2.08 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
2. Hangers for Cold Pipe Sizes 2 Inches and Greater: Carbon steel, adjustable, clevis.
3. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 6 Inches and Greater: Adjustable steel yoke, cast iron roll, double hanger.
5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
6. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Greater: Steel channels with welded spacers and hanger rods, cast iron roll.
7. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
8. Wall Support for Pipe Sizes 4 Inches and Greater: Welded steel bracket and wrought steel clamp.
9. Wall Support for Hot Pipe Sizes 6 Inches and Greater: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.

10. Vertical Support: Steel riser clamp.
11. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
12. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Floor Support for Hot Pipe Sizes 6 Inches and Greater: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
14. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
15. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
16. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

B. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge-shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

2.09 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe of 2 Inches and Less:
1. Ferrous Piping: 150 psi brass or malleable iron, threaded.
2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe 2 Inches and Greater:
1. Ferrous Piping: 150 psig forged steel, slip-on.
2. Copper Piping: Bronze.
3. Gaskets: 1/16 inch thick, preformed neoprene.

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, offsetting angled bolt-pad requiring visual verification only for correct installation, circular C-profile gasket, and bolts to secure and compress gasket.
1. Rigid Coupling description:
   a. Two curved housing segments with offsetting angled bolt-pad and continuous key to engage pipe groove.
      1) Designed for visual verification of correct installation only; minimum bolt torque setting will not be allowed.
      2) Couplings 14 inch and greater designed for an advance groove system for large diameter pipe based upon an extended "A" dimension (pipe end to groove) for wider gasket seat area and a wedge shaped groove for ease of coupling installation and alignment.
   b. Circular C-profile gasket shall be manufactured in-house by coupling manufacturer and shall be designed and tested for the entire life of the piping system.
      1) Gaskets 2 inch through 12 inch shall feature an integrated pipe-stop to insure coupling alignment over the pipe groove.
      2) Gaskets 14 inch and greater shall be designed specifically for large diameter pipe and feature an extended gasket seat area.
   c. Bolts to secure and compress gasket.
   d. Installation-ready with no loose parts or requirement to be disassembled for installation.
2. Dimensions and Testing: In accordance with AWWA C606.
3. Mechanical Couplings: Comply with ASME B31.9 and ASTM F1476.
4. Housing Material: Ductile iron complying with ASTM A536.
5. Gasket Material: EPDM suitable for operating temperature range from -30 degrees F to 250 degrees F.
6. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
7. When pipe is field grooved, provide coupling manufacturer's grooving tools.

8. Manufacturers:
    a. Victaulic Company: www.victaulic.com.
        1) Model Series 107N Rigid Coupling for sizes 2 inch through 12 inch.

D. Dielectric Connections:
1. Waterways:
    a. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
    b. Dry insulation barrier able to withstand 600-volt breakdown test.
    c. Construct of galvanized steel with threaded end connections to match connecting piping.
    d. Suitable for the required operating pressures and temperatures.
2. Flanges:
    a. Dielectric flanges with same pressure ratings as standard flanges.
    b. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
    c. Dry insulation barrier able to withstand 600-volt breakdown test.
    d. Construct of galvanized steel with threaded end connections to match connecting piping.
    e. Suitable for the required operating pressures and temperatures.
3. Unions:
    a. 1/2 to 1 Inches: Brass solder to galvanized FPT.
    b. 1/2 to 2 Inches: Brass solder to galvanized FPT.
    c. 1/2 to 1 Inches: Brass to galvanized FPT or FIP (Female Iron Pipe).
    d. 3/4 to 1/2 Inch Reducer: Brass solder to galvanized FPT.
    e. Service: 250 psi, minus 20 to 180 deg F.

2.10 GLOBE OR ANGLE VALVES

A. Manufacturers:
1. Conbraco Industries: www.apollovalves.com.
2. Milwaukee Valve Company: www.milwaukeevalve.com.
3. Nibco, Inc: www.nibco.com.
4. Tour Andersson, a Victaulic company: www.imi-hydronic.com.
5. Substitutions: See Section 016000 - Product Requirements.

B. Up To and Including 2 Inches:
1. Bronze body, bronze trim, screwed bonnet, rising stem and handwheel, inside screw with backseating stem, renewable composition disc and bronze seat, solder ends.

C. Over 3 Inches:
1. Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and yoke, rotating plug-type disc with renewable seat ring and disc, flanged ends.

2.11 BALL VALVES

A. Manufacturers:
1. Conbraco Industries: www.apollovalves.com.
2. Grinnell Products, a Tyco Business: www.grinnell.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.
4. Nibco, Inc: www.nibco.com.
5. Victaulic Company; _____: www.victaulic.com/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

B. Up To and Including 2 Inches:
1. Bronze one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends with union.

C. Over 2 Inches:

1. Ductile iron body, chrome platedstainless steel ball, teflon or Virgin TFE seat and stuffing box seals, lever handle or gear operated, flanged ends, rated to 800 psi.

2.12 PLUG VALVES

A. Manufacturers:
   1. Conbraco Industries: www.apollovalves.com.
   2. Milwaukee Valve Company: www.milwaukeevalve.com.
   3. Nibco, Inc: www.nibco.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Up To and Including 2 Inches:
   1. Bronze body, bronze tapered plug, 40 percent port opening, non-lubricated, teflon packing, threaded ends.
   2. Operator: One plug valve wrench for every ten plug valves minimum of one.

C. Over 2 Inches:
   1. Cast iron body and plug, 40 percent port opening, pressure lubricated, teflon packing, flanged ends.
   2. Operator: Each plug valve with a wrench with set screw.

2.13 BUTTERFLY VALVES

A. Manufacturers:
   1. Crane Co.: www.craneco.com.
   2. Grinnell Products, a Tyco Business: www.grinnell.com.
   3. Shurjoint Piping Products, Inc., a Tyco Business: www.shurjoint.com.
   4. Hammond Valve: www.hammondvalve.com.
   5. Milwaukee Valve Company: www.milwaukeevalve.com.
   6. Victaulic Company: www.victaulic.com.
   7. Substitutions: See Section 016000 - Product Requirements.

B. Body: Cast or ductile iron with resilient replaceable EPDM seat, wafer, lug, or grooved ends, extended neck.

C. Disc: Construct of aluminum bronze, chrome plated ductile iron, stainless steel, ductile iron with EPDM enscapsulation, or Buna-N enscapsulation.

D. Stem: Stainless steel with stem offset from the centerline to provide full 360-degree circumferential setting.

E. Operator: 10 position lever handle.

2.14 SWING CHECK VALVES

A. Manufacturers:
   1. Grinnell Products, a Tyco Business: www.grinnell.com.
   2. Hammond Valve: www.hammondvalve.com.
   3. Milwaukee Valve Company: www.milwaukeevalve.com.
   4. Nibco, Inc: www.nibco.com.
   5. Victaulic Company: www.victaulic.com.
   6. Substitutions: See Section 016000 - Product Requirements.

B. Up To and Including 2 Inches:
   1. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder ends.

C. Over 2 Inches:
   1. Iron body, bronze trim, stainless steel, bronze, or bronze faced rotating swing disc, renewable disc and seat, flanged or grooved ends.

2.15 SPRING LOADED CHECK VALVES

A. Manufacturers:
   1. Crane Co.: www.craneco.com.

2. Hammond Valve: www.hammondvalve.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.
4. Victaulic Company; _____: www.victaulic.com/#sle.
5. Substitutions: See Section 016000 - Product Requirements.

B. Iron body, bronze trim, split plate, hinged with stainless steel spring, resilient seal bonded to body, wafer, or threaded lug ends.

2.16 FLOW CONTROLS

A. Manufacturers:
1. Griswold Controls: www.griswoldcontrols.com.
2. ITT Bell & Gossett: www.bellgossett.com.
3. Taco, Inc: www.taco-hvac.com.
4. Tour Andersson, a Victaulic company: www.imi-hyronic.com.
5. Substitutions: See Section 016000 - Product Requirements.

B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

C. Calibration: Control flow within 10 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, minimum pressure 2 psi.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.

C. Remove scale and dirt on inside and outside before assembly.

D. Prepare piping connections to equipment using jointing system specified.

E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

F. After completion, fill, clean, and treat systems. See Section 232500 for additional requirements.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install heating water, glycol piping to ASME B31.9 requirements.

C. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

D. Route piping in orderly manner, parallel to building structure, and maintain gradient.

E. Install piping to conserve building space and to avoid interference with use of space.

F. Group piping whenever practical at common elevations.

G. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified _____.

H. Slope piping and arrange to drain at low points.

I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 230516.

J. Grooved Joints:
1. Install in accordance with the manufacturer's latest published installation instructions.
2. Gaskets to be suitable for the intended service, molded, and produced by the coupling manufacturer.

K. Inserts:
1. Provide inserts for placement in concrete formwork.

2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

L. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inches minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping.
9. Prime coat exposed steel hangers and supports. See Section 09 9123. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

M. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. See Section 230719.

N. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 083100 .

O. Use eccentric reducers to maintain top of pipe level.

P. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting. See Section 099123.

Q. Install valves with stems upright or horizontal, not inverted.

3.03 SCHEDULES

A. Hanger Spacing for Copper Tubing.
1. 1/2 Inch and 3/4 inch: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. 1 Inch: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. 1-1/2 Inches and 2 Inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
4. 2-1/2 Inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
5. 3 Inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
6. 4 Inches: Maximum span, 12 feet; minimum rod size, 1/2 inch.
7. 6 Inches: Maximum span, 14 feet; minimum rod size, 1/2 inch.

B. Hanger Spacing for Steel Piping.
1. 1/2 Inch, 3/4 Inch, and 1 Inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
2. 1-1/4 Inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
3. 1-1/2 Inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. 2 Inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. 2-1/2 Inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.
6. 3 Inches: Maximum span, 12 feet; minimum rod size, 3/8 inch.
7. 4 Inches: Maximum span, 14 feet; minimum rod size, 1/2 inch.
8. 6 Inches: Maximum span, 17 feet; minimum rod size, 1/2 inch.

C. Hanger Spacing for Plastic Piping.

END OF SECTION

SECTION 232114
HYDRONIC SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Bladder Expansion tanks.

B. Air vents.

C. Air separators.

D. Strainers.

E. Suction diffusers.

F. Combination pump discharge valves.

G. Pressure-temperature test plugs.

H. Balancing valves.

I. Automatic flow control valves.

J. Flow meters.

K. Radiator valves.

L. Relief valves.

M. Pressure reducing valves.

1.02 RELATED REQUIREMENTS

A. Section 232113 - Hydronic Piping.

1.03 REFERENCE STANDARDS

A. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

B. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.

C. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 BLADDER EXPANSION TANKS

A. Manufacturers:

1. Amtrol Inc: www.amtrol.com.
2. ITT Bell & Gossett: www.bellgossett.com.
3. Taco, Inc: www.taco-hvac.com.

4. Substitutions: See Section 016000 - Product Requirements.

B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, adjustable flexible EPDM diaphragm or bladder seal factory precharged to 12 psi, and steel support stand.

2.02 AIR VENTS

A. Manufacturers:
1. Armstrong International, Inc: www.armstronginternational.com.
2. ITT Bell & Gossett: www.bellgossett.com.
3. Taco, Inc: www.taco-hvac.com.

B. Manual Air Vent: Short vertical sections of 2-inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

C. Maximum Fluid Pressure: 150 psi.

D. Maximum Fluid Temperature: 250 degrees F.

2.03 AIR SEPARATORS

A. Coalescing Air/Dirt Separators:
1. Manufacturers:
a. Armstrong International, Inc: www.armstronginternational.com.
b. ITT Bell & Gossett: www.bellgossett.com.
c. Spirotherm, Inc: www.spirotherm.com.
2. Tank: Fabricated steel tank; tested and stamped in accordance with ASME BPVC-VIII-1 for maximum fluid service subject to application requirements and manufacturer's standard maximum operating conditions.
3. Coalescing Medium: Provide structured copper or stainless steel medium filling the entire vessel to suppress turbulence and provide air elimination efficiency of 100 percent free air, 100 percent entrained air, and 99.6 percent dissolved air at the installed location.
4. Air Vent: Integral float actuated air vent at top fitting of tank rated at 150 psi, threaded to top of separator.
5. End Connections: Class 150 flanged for 2-1/2 inch and larger otherwise threaded.
6. Blowdown Connection: Threaded.
7. Size: Match system flow capacity.
8. Maximum Fluid Service Pressure: 150 psi.
9. Maximum Fluid Service Temperature: 250 degrees F.

2.04 STRAINERS

A. Manufacturers:
1. Armstrong International, Inc: www.armstronginternational.com.
2. Flexicraft Industries: www.flexicraft.com.
3. Grinnell Products, a Tyco Business: www.grinnell.com.
4. Shurjoint Piping Products, Inc., a Tyco Business: www.shurjoint.com.
5. The Metraflex Company: www.metraflex.com.
6. Substitutions: See Section 016000 - Product Requirements.

B. Size 2-1/2 inch to 4 inch:
1. Body Material by Fluid Service:
2. Provide flanged or grooved iron body for 175 psi working pressure, Y pattern with stainless steel perforated screen.

C. Size 5 inch and Larger:
1. Provide flanged or grooved iron body for up to 175 psi working pressure, basket pattern with 1/8 inch stainless steel perforated screen.
2. Liquid Fluid Service: Up to 285 psi at 100 degrees F.

3. Provide flanged or grooved iron body for 175 psi working pressure, basket pattern with stainless steel perforated screen.

D. Perforated Mesh Size (verify with applicable equipment manufactuer):
   1. Condensing Boiler Inlet: Minimum Mesh number 30 (0.0232")
   2. Pump Sunction: Minimum Mesh number 30 (0.0232")

2.05 SUCTION DIFFUSERS

A. Manufacturers:
   1. Anvil International, Inc: www.anvilintl.com.
   2. Grinnell Products, a Tyco Business: www.grinnell.com.
   3. Victaulic Company of America: www.victaulic.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Fitting: Angle pattern, cast-iron body, threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger, rated for 175 psi working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable 5/32 inch mesh strainer to fit over cylinder strainer, 20 mesh startup screen, and permanent magnet located in flow stream and removable for cleaning.

C. Accessories: Adjustable foot support, blowdown tapping in bottom, gauge tapping in side.

2.06 PUMP CONNECTORS

A. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.
   1. Maximum Operating Service: 150 psi at 120 degrees F.
   2. Accommodate the Following:
      a. Axial Deflection in Compression and Expansion: 1 inch.
      b. Lateral Movement: 1 inch.
      c. Angular Rotation: 15 degrees.
      d. Force developed by 1.5 times specified maximum allowable operating pressure.
   3. End Connections: Flanged ductile iron; complying with ASME B16.1 Class 125.
   4. Provide pump connector with integral vanes to reduce turbulent flow.
   5. Provide necessary accessories including, but not limited to, swivel joints.

2.07 COMBINATION PUMP DISCHARGE VALVES

A. Manufacturers:
   1. Crane Co.: www.craneco.com.
   2. Taco, Inc: www.taco-hvac.com.
   3. Victaulic Company of America: www.victaulic.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Quarter-Turn Plug Type: Flanged cast-iron body with bolt-on bonnet, position indicator, stainless steel stem, backflow preventer, memory stop, metering connectors, bubble-tight shutoff, and wrench-adjustable plug flow regulator.

2.08 PRESSURE-TEMPERATURE TEST PLUGS

A. Manufacturers:
   1. Ferguson Enterprises Inc: www.fnw.com.
   2. Peterson Equipment Company Inc: www.petesplug.com.
   3. Sisco Manufacturing Company Inc: www.siscomfg.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Construction: Brass body designed to receive temperature or pressure probe with removable protective cap, and Neoprene rated for minimum 200 degrees F.

C. Application: Use extended length plugs to clear insulated piping.

2.09 BALANCING VALVES

A. Manufacturers:

1. Armstrong International, Inc: www.armstronginternational.com.
2. Bell & Gossett, a brand of Xylem, Inc: www.bellgossett.com/#sle.
3. Taco, Inc: www.taco-hvac.com.
4. Substitutions: See Section 016000 - Product Requirements.

B. Size 2 inch and Smaller:
1. Provide ball or globe style with flow balancing, shut-off capabilities, memory stops, and minimum of two metering ports and female sweat, NPT threaded, press, or soldered connections.
2. Metal construction materials consist of bronze or brass.
3. Non-metal construction materials consist of Teflon, EPDM, or engineered resin.

C. Size 2-1/2 inch and Larger:
1. Provide ball, globe, or butterfly style with flow balancing, shut-off capabilities, memory stops, and minimum of two metering ports and flanged, grooved, or weld-end connections.
2. Valve body construction materials consist of cast iron, carbon steel, or ductile iron.
3. Internal components construction materials consist of brass, aluminum bronze, bronze, Teflon, EPDM, NORYL, or engineered resin.

2.10 AUTOMATIC FLOW CONTROL VALVES

A. Construction:
1. Brass, bronze, or iron body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet with blowdown/backflush drain.
2. Built-in lug-type outlet butterfly valve with 2-position handle.

B. Calibration: Control flow within 10 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, minimum pressure 2 psi.

C. Control Mechanism: Provide stainless steel or nickel-plated, brass piston or regulator cup, operating against stainless steel helical or wave formed spring or elastomeric diaphragm and polyphenylsulfone orifice plate.

2.11 FLOW METERS

A. Manufacturers:
1. Dwyer Instruments, Inc: www.dwyer-inst.com.
2. EMCO Flow Systems: www.emcoflow.com.
3. Substitutions: See Section 016000 - Product Requirements.

B. Orifice principle by-pass circuit with direct reading gauge, soldered or flanged piping connections for 125 psi working pressure, with shut off valves, and drain and vent connections.

C. Direct reading with insert pitot tube, threaded coupling, for 150 psi working pressure, maximum 240 degrees F, 5 percent accuracy.

D. Cast iron, wafer type, orifice insert flow meter for 250 psi working pressure, with read-out valves equipped with integral check valves with gasketed caps.

E. Calibrated, plug type balance valve with precision machined orifice, readout valves equipped with integral check valves and gasketed caps, calibrated nameplate, and indicating pointer.

F. Portable meter consisting of case containing two, 3 percent accuracy pressure gauges with 0-135 inches and 0-60 feet pressure ranges for 500 psi maximum working pressure, color coded hoses for low and high pressure connections, and connectors suitable for connection to read-out valves.

2.12 RADIATOR VALVES

A. Angle or straight pattern, rising stem, inside screw globe valve for 125 psi working pressure, with bronze body and integral union for screwed connections, renewable composition disc, plastic wheel handle for shut-off service, and lockshield key cap and set screw memory bonnet for balancing service.

2.13 RELIEF VALVES

A. Manufacturers:
   1. Armstrong International, Inc: www.armstronginternational.com.
   2. ITT Bell & Gossett: www.bellgossett.com.
   3. Substitutions: See Section 016000 - Product Requirements.

B. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

2.14 PRESSURE REDUCING VALVES

A. Manufacturers:
   1. Armstrong International, Inc: www.armstronginternational.com.
   2. ITT Bell & Gossett: www.bellgossett.com.
   3. Taco, Inc: www.taco-hvac.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Operation: Automatically feeds make-up water to the hydronic system whenever pressure in the system drops below the pressure setting of the valve. Refer to Section 232113.

C. Materials of Construction:
   1. Valve Body: Constructed of bronze, cast iron, brass, iron, or _____.
   2. Internal Components: Construct of stainless steel or brass and engineered plastics or composition material.

D. Connections:
   1. NPT threaded: 0.50 inch or 0.75 inch.
   2. Soldered: 0.50 inch.

E. Provide integral check valve and strainer.

F. Maximum Inlet Pressure: 400 psi.

G. Maximum Fluid Temperature: 180 degrees F.

H. Adjustable Pressure Range: From 10 to 45 psi, set to 25 psi.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install specialties in accordance with manufacturer's instructions.

B. Provide manual air vents at system high points and as indicated.

C. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

D. Provide air separator on suction side of system circulation pump and connect to expansion tank.

E. Provide valved drain and hose connection on strainer blowdown connection.

F. Provide pump suction fitting on suction side of base-mounted centrifugal pumps where indicated. Remove temporary strainers after cleaning systems.

G. Provide combination pump discharge valve on discharge side of base mounted centrifugal pumps where indicated.

H. Support pump fittings with floor-mounted pipe and flange supports.

I. Where one line vents several relief valves, make cross-sectional area equal to sum of individual vent areas.

J. Provide strainer at inlet of chiller evaporator, water cooled chiller condenser, boiler, pump, etc. HVAC equipment as applicable.

END OF SECTION

SECTION 232123
HYDRONIC PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Circulators.

B. In-line pumps.

C. End-suction pumps.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 230548 - Vibration and Seismic Controls for HVAC.

C. Section 230716 - HVAC Equipment Insulation.

D. Section 230719 - HVAC Piping Insulation.

E. Section 232113 - Hydronic Piping.

F. Section 232114 - Hydronic Specialties.

G. Section 253500 - Integrated Automation Instrumentation and Terminal Devices for HVAC.

H. Section 260583 - Wiring Connections.

1.03 REFERENCE STANDARDS

A. NEMA MG 00001 - Motors and Generators.

B. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

C. NFPA 70 - National Electrical Code.

D. UL 778 - Standard for Motor-Operated Water Pumps.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate hanging and support requirements and recommendations.

D. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Armstrong Pumps Inc: www.armstrongpumps.com.

B. Bell & Gossett, a Xylem Inc. brand: www.bellgossett.com.

C. Taco, inc.: www.tacocomfort.com.

D. Substitutions: See Section 016000 - Product Requirements.

2.02 GENERAL

A. Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

B. Minimum Quality Standard: UL 778.

C. Base Mounted Pumps: Aligned by qualified millwright.

D. Electrical Requirements:
   1. Listed and classified by UL or testing agency acceptable to authority having jurisdiction as suitable for the purpose specified and indicated.
   2. Variable Frequency Drives (VFDs): Provide in accordance with Section 230934, except for integral-VFDs.
   3. Enclosures: Provide unspecified product(s) required to fit motor:

2.03 IN-LINE PUMPS

A. Closed-Coupled, Single-Stage Pump: Vertical pump with radially- or horizontally-split casing; rated for discharge pressures up to 175 psi.

B. Casing: Cast iron with seal flush connection, threaded suction, and discharge ports with gauge port and drain plug.

C. Impeller: Bronze, fully enclosed, keyed directly to motor shaft or extension.

D. Shaft: Carbon steel with stainless steel impeller cap screw or nut and bronze sleeve.

E. Seal: Packing gland with minimum four rings graphite impregnated packing and bronze lantern rings, 250 degrees F maximum continuous duty temperature.

F. Performance: Refer to schedule on drawing.

G. Electrical Characteristics: Refer to schedule on drawing.
   1. Motor:
      a. Constant Speed: open drip proof, built-in overload protection, NEMA F.
      b. VFD: Inverter Duty.
         1) VFD Controller: support direct communication with the building management system (BMS) with built-in support for protocol of BACnet™ MS/TP.
   2. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

2.04 END-SUCTION PUMPS

A. Split-Coupled Pump: Base-mounted, single-stage pump with horizontal shaft and radially- or horizontally-split casing rated for discharge pressures up to 175 psi.

B. Casing: Cast iron or ductile iron with renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction, and discharge flanged connections with gauge ports.

C. Impeller: Stainless steel, balanced, fully enclosed, keyed to shaft.

D. Bearings: Oil lubricated roller or ball bearings.

E. Shaft: Alloy steel with copper, bronze, or stainless steel shaft sleeve.

F. Seal: Mechanical, 225 degrees F maximum continuous duty temperature.

G. Drive: Flexible coupling with coupling guard.

H. Baseplate: Cast iron or fabricated steel with integral drain rim.

I. Performance: Refer to schedule on drawing.

J. Electrical Characteristics: Refer to schedule on drawing.
      a. VFD: Inverter Duty.
         1) VFD Controller: support direct communication with the building management system (BMS) with built-in support for protocol of BACnet™ MS/TP.
   2. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.

C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For close-coupled or base-mounted pumps, provide supports under elbows on pump suction and discharge line sizes 4 inches and over.
   1. See Section 230548.

D. Provide air cock and drain connection on horizontal pump casings.

E. Provide drains for bases and seals, piped to and discharging into floor drains.

F. Check, align, and certify alignment of base-mounted pumps prior to start-up.

G. Controls Human-Machine Interface (HMI): HVAC operator terminal; see Section 253500.

END OF SECTION

SECTION 232500
HVAC WATER TREATMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Materials.
   1. System cleaner.
   2. Closed system treatment (water).
   3. Condenser water system treatment (cooling towers).
   4. Open system treatment (humidifiers, air washers, evaporative condensers, small cooling towers, liquid coolers).

B. By-pass (pot) feeder.

C. Test equipment.

1.02 RELATED REQUIREMENTS

A. Section 232113 - Hydronic Piping.

B. Section 232114 - Hydronic Specialties.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.

C. Shop Drawings: Indicate system schematic, equipment locations, and controls schematics, electrical characteristics and connection requirements.

D. Manufacturer's Installation Instructions: Indicate placement of equipment in systems, piping configuration, and connection requirements.

E. Manufacturer's Field Reports: Indicate start-up of treatment systems when completed and operating properly. Indicate analysis of system water after cleaning and after treatment.

F. Operation and Maintenance Data: Include data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs. Include step by step instructions on test procedures including target concentrations.

1.04 REGULATORY REQUIREMENTS

A. Conform to applicable code for addition of non-potable chemicals to building mechanical systems and to public sewage systems.

B. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MATERIALS

A. System Cleaner:
   1. Manufacturers:
      a. AmSolv-Amrep, Inc: www.amsolv.com/#sle.
      b. GE Water & Process Technologies: www.gewater.com/#sle.
      c. Nalco, an Ecolab Company: www.nalco.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.
   2. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products; sodiumtripoly phosphate and sodium molybdate.
   3. Biocide chlorine release agents such as sodium hypochlorite or calcium hypochlorite.

B. Closed System Treatment (Water):
   1. Manufacturers:

a. AmSolv-Amrep, Inc: www.amsolv.com/#sle.
b. GE Water & Process Technologies: www.gewater.com/#sle.
c. Nalco, an Ecolab Company: www.nalco.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

2. Sequestering agent to reduce deposits and adjust pH; polyphosphate.
3. Corrosion inhibitors; boron-nitrite, sodium nitrite and borax, sodium totyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulphites.
4. Conductivity enhancers; phosphates or phosphonates.

2.02 BY-PASS (POT) FEEDER

A. Manufacturers:
1. Griswold Controls: www.griswoldcontrols.com.
2. J. L. Wingert Company: www.jlwingert.com.
3. Neptune, a brand of the Dover Company: www.neptune1.com.
4. Substitutions: See Section 016000 - Product Requirements.

B. 6.0 gal quick opening cap for working pressure of 175 psi.

C. Quick opening cap for working pressure of 175 psi.

2.03 TEST EQUIPMENT

A. Provide white enamel test cabinet with local and fluorescent light, capable of accommodating 4 - 10 ml zeroing titrating burettes and associated reagents.

B. Provide the following test kits:
1. Alkalinity titration test kit.
2. Chloride titration test kit.
3. Sulphite titration test kit.
4. Total hardness titration test kit.
5. Low phosphate test kit.
6. Conductivity bridge, range 0 - 10,000 micro-ohms.
7. Creosol red pH slide complete with reagent.
8. Portable electronic conductivity meter.
9. High nitrite test kit.

PART 3 EXECUTION

3.01 PREPARATION

A. Systems shall be operational, filled, started, and vented prior to cleaning. Use water meter to record capacity in each system.

B. Place terminal control valves in open position during cleaning.

C. Verify that electric power is available and of the correct characteristics.

3.02 CLEANING SEQUENCE

A. Concentration:
1. As recommended by manufacturer.
2. Fill steam boilers only with cleaner and water.

B. Hot Water Heating Systems:
1. Apply heat while circulating, slowly raising temperature to 160 degrees F and maintain for 12 hours minimum.
2. Remove heat and circulate to 100 degrees F or less; drain systems as quickly as possible and refill with clean water.
3. Circulate for 6 hours at design temperatures, then drain.
4. Refill with clean water and repeat until system cleaner is removed.

C. Chilled Water Systems:
1. Circulate for 48 hours, then drain systems as quickly as possible.

2. Refill with clean water, circulate for 24 hours, then drain.
3. Refill with clean water and repeat until system cleaner is removed.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.04 CLOSED SYSTEM TREATMENT

A. Provide one bypass feeder on each system. Install isolating and drain valves and necessary piping. Install around balancing valve downstream of circulating pumps unless indicated otherwise.

B. Introduce closed system treatment through bypass feeder when required or indicated by test.

C. Provide 3/4 inch water coupon rack around circulating pumps with space for 4 test specimens.

3.05 CLOSEOUT ACTIVITIES

A. Training: Train Owner's personnel on operation and maintenance of chemical treatment system.
1. Provide minimum of two hours of instruction for two people.
2. Have operation and maintenance data prepared and available for review during training.
3. Conduct training using actual equipment after treated system has been put into full operation.

3.06 MAINTENANCE

A. Perform maintenance work using competent and qualified personnel under the supervision and in the direct employ of the equipment manufacturer or original installer.

B. Provide service and maintenance of treatment systems for one year from Date of Substantial Completion.

C. Provide monthly technical service visits to perform field inspections and make water analysis on-site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report after each visit.

D. Provide laboratory and technical assistance services during this maintenance period.

E. Provide on-site inspections of equipment during scheduled or emergency shutdown to properly evaluate success of water treatment program, and make recommendations in writing based upon these inspections.

END OF SECTION

SECTION 235216
CONDENSING BOILERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured units.

B. Boiler construction.

C. Boiler trim.

D. Fuel burning system.

E. Factory installed controls.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 230913 - Instrumentation and Control Devices for HVAC.

C. Section 232114 - Hydronic Specialties.

D. Section 232123 - Hydronic Pumps.

E. Section 232500 - HVAC Water Treatment.

F. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. AHRI 1500 (I-P) - Performance Rating of Commercial Space Heating Boilers.

B. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI).

C. ANSI Z21.13 - American National Standard for Gas-Fired Low-Pressure Steam and Hot Water Boilers.

D. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings.

E. ASHRAE Std 103 - Method of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers.

F. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers.

G. NBBI Manufacturer and Repair Directory - The National Board of Boiler and Pressure Vessel Inspectors (NBBI).

H. NFPA 54 - National Fuel Gas Code.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data:
   1. Provide data indicating general assembly, components, controls, safety controls, and wiring diagrams with electrical characteristics and connection requirements, and service connections.
   2. Information required for state permit.
      a. Form H Manufacturer's Data Report, ASME Code Rules, Section IV.
      b. Controls and Safety Devices, CSD-1 report.

C. Manufacturer's Installation Instructions: Indicate assembly, support details, connection requirements, and include start up instructions.

D. Manufacturer's Factory Inspection Report: Submit boiler inspection prior to shipment.

E. Manufacturer's Field Reports: Burner manifold gas pressure, percent carbon monoxide (CO), percent oxygen (O), percent excess air, flue gas temperature at outlet, ambient temperature, net stack temperature, percent stack loss, percent combustion efficiency, and heat output.
   1. Indicate compliance with specified performance and efficiency.
   2. Provide results of the following combustion tests:
      a. Boiler firing rate.
      b. Over fire draft.
      c. Gas flow rate.
      d. Heat input.
      e. Burner manifold gas pressure.
      f. Percent carbon monoxide.
      g. Percent oxides of nitrogen.
      h. Percent oxygen.
      i. Percent excess air.
      j. Flue gas temperature at outlet.
      k. Ambient temperature.
      l. Net stack temperature.
      m. Percent stack loss.
      n. Percent combustion efficiency.
      o. Heat output.

F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.

G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect boilers from damage by leaving factory inspection openings and shipping packaging in place until final installation.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide a 10 year warranty to include coverage for heat exchanger assembly.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Natural Gas for Indoor Applications:
   1. Lochinvar LLC: www.lochinvar.com/#sle.
   2. Substitutions: Not permitted.

2.02 MANUFACTURED UNITS

A. Factory assembled, factory fire-tested, self-contained, readily transported unit ready for automatic operation except for connection of water, fuel, electrical, and vent services.

B. Unit: Metal membrane wall, stainless fire tube, condensing boiler on integral structural steel frame base with integral fuel burning system, firing controls, BACnet Ethernet protocal for BAS interface, boiler trim, insulation, and removable jacket, suitable for indoor application.

C. Electrical Characteristics:
   1. Refer to Section 260583.

D. Thermal Efficiency as defined by AHRI 1500 (I-P): ____.

E. Burner Modulation Turndown: Refer to boiler schedule on drawing.

F. Suitable for use with polypropylene glycol, up to 50% concentration.

2.03 BOILER CONSTRUCTION

A. Comply with the minimum requirements of ASME BPVC-IV and ANSI Z21.13 for construction of boilers.

B. Assembly to bear the ASME "H" stamp for 160 psi working pressure and comply with the efficiency requirements of the latest edition of ASHRAE 90.1.

C. Required Directory Listings:
   1. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI).
      a. minimum 92% thermal efficiency at full full fire as registered with AHRI.
      b. 97% thermal efficiency with return water temperatures at 90°F or below at 20°F temperature rise.
   2. NBBI Manufacturer and Repair Directory - The National Board of Boiler and Pressure Vessel Inspectors (NBBI).

D. Heat Exchanger: Wave Fire Tubes, construct with welded 316L stainless steel. A liquid impact die is used to form the Wave Fire Tube.
   1. No banding material, bolts, gaskets of "O" rings in the heat exchanger construction.
   2. Single-pass water flow.
   3. 316L stainless steel condensate collection basin.

E. Heavy gauge steel jacket assembly, primed and pre-painted ion both side.

F. Sealed and completely enclosed combustion chamber, independent of the outer jacket assembly.

G. Provide adequate tappings, burner/flame observation ports, removable panels, and access doors for entry, cleaning, and inspection.

H. Insulate casing with insulation material, protected and covered by heavy-gauge metal jacket.

I. Factory apply boiler base and other components, that are subject to corrosion, with durable, acrylic, powder coated, painted, or weather-proofed finish.

2.04 BOILER TRIM

A. ASME rated pressure relief valve set for 50 psi.

B. Flow switch.

C. Outlet water temperature sensor (dual thermistor);

D. Return water temperature sensor;

E. Outdoor air sensor,

F. Flue temperature sensor (dual thermistor);

G. Blocked drain switch and a condensate trap for the heat exchanger condensate drain.

H. Electronic Low Water Cut-off with Manual Reset: Complete with test light and manual reset button to automatically prevent firing operation whenever boiler water falls below safe level.

I. Temperature and pressure gauge.

J. Pressure Switches:
   1. High gas pressure.
   2. Low gas pressure.
   3. Air pressure.

K. Manual reset high limit temperature control.

L. Boiler Pump (where required by boiler design):
   1. Primary pump, factory supplied and sized for field installation to ensure minimum, continuous circulation through boiler.
   2. Where pump is not provided by boiler manufacturer, provide pump in accordance with boiler manufacturer's recommendations.

3. Pump time delay.

M. Accessories:
1. Condensate drain trap.
2. Neutralizer kit.
3. Vent starter adapter
4. Combustion air intake boiler adapter and gasket.
5. Vent Damper for common vent system.

2.05 FUEL BURNING SYSTEM

A. Gas Burner:
1. The single burner shall be a premix design with an upper and a lower chamber supplied by individual combustion systems and constructed of high temperature stainless steel with a woven Fecralloy outer covering to provide modulating firing rates.
2. The BOILER shall be supplied with two gas valves designed with negative pressure regulation and be equipped with a pulse width modulation blower system, to precisely control the fuel/air mixture to provide modulating boiler firing rates for maximum efficiency.
3. The BOILER shall operate in a safe condition with gas supply pressures as low as 4 inches of water column.
4. The burner flame shall be ignited by direct spark ignition with flame monitoring via a flame sensor.

B. Gas Train: Plug valve, safety gas valve, gas-air ratio control valve, and pressure regulator controls air and gas mixture.

C. Emission of Oxides of Nitrogen Requirements: Comply with SCAQMD 1146.1 for natural gas fired system, as applicable.

D. Intakes: Combustion air intake capable of accepting free mechanical room air or direct outside air through a sealed intake pipe.

2.06 FACTORY INSTALLED CONTROLLER AND CONTROL COMPONENTS

A. Microprocessor Controller with 8" liquid crystal touch screen display on front and top of the jacket for boiler set up, boiler status and boiler diagnostics with following features:
1. utilize a 24 VAC control circuit and components
2. password security,
3. outdoor air reset,
4. pump delay with freeze protection, pump exercise, ramp delay featuring six steps, domestic hot water prioritization with limiting capabilities
5. PC port connection.
6. alarm contacts for any failure, runtime contacts and data logging of runtime at given modulation rates, ignition attempts and ignition failures.
7. a built-in “Cascade” to sequence and rotate while maintaining modulation of up to eight boilers of different Btu inputs without utilization of an external controller. The internal “Cascade” function shall be capable of lead-lag, efficiency optimization, front-end loading, and rotation of lead boiler every 24 hours.
8. capable of controlling an isolation valve (valve shall be offered by manufacturer) during heating operation and rotation of open valves in standby operation for full flow applications.
9. be equipped with gateway device which will allow integration with BACnet (MSTP or IP) protocols, minimum 55 readable points.

B. Temperature Controls:
1. Automatic reset type to control fuel burning system on-off and firing rate to maintain temperature.
2. Manual reset type to control fuel burning system to prevent boiler water temperature from exceeding safe system water temperature.
3. Low-fire start time delay relay.

C. Electronic PI setpoint/modulation control system.

D. Microprocessor-based, fuel/air mixing controls.
   1. The “SMART TOUCH™” control shall increase fan speed to boost flame signal when a weak flame signal is detected during normal operation.

E. Pump Controls:
   1. A 0 -10 VDC output signal shall control a variable speed boiler pump (pump to be offered by manufacturer) to keep a fixed delta t across the boiler regardless of the modulation rate.
   2. The BOILER shall have the capability to receive a 0 – 10 VDC input signal from a variable speed system pump to anticipate changes in system heat load in order to prevent flow related issues such as erratic temperature cycling.

F. The BOILER shall be equipped with two terminal strips for electrical connections.
   1. A low voltage connection board with 30 data points for safety and operating controls, i.e.
      a. Alarm Contacts, Runtime Contacts, Louver Proving Switch, Tank Thermostat, Remote Enable/Disable, System Supply Sensor, Outdoor Sensor, Tank Sensor, BACnet Building Management System signal and Cascade control circuit.
   2. A high voltage terminal strip shall be provided for Supply voltage.
      a. Up to 3,500 MBH: 120 volt / 60 hertz / single phase.
      b. Models 4,000 MBH and up: 208 volt / 60 hertz / three phase.
      c. The high voltage terminal strip plus integral relays shall be provided for independent pump control of the System pump, the Boiler pump, and the Domestic Hot Water pump.

2.07 FLUE VENT AND COMBUSTION AIR INTAKE PIPE

A. Manufacturers:
   1. Simpson Dura-Vent Co.; Model: FasNSeal Vent
   2. Nova Flex Group; Model: Z-Vent
   3. Selkirk Corporation; Model: Saf-T Vent
   4. Metal Fab; Model: Corr/Guard
   5. Schebler Chimney Systems: Model: eVent
   6. Substitutions: Not permitted

B. Material: Category IV approved stainless steel, UL-1738 listed.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install boiler and provide connection of natural gas service in accordance with requirements of NFPA 54 and applicable codes.

C. Install boiler on concrete housekeeping base, sized minimum of 4 inches larger than boiler base in accordance with Section 033000.

D. Coordinate factory installed controls with Section 230913.

E. Coordinate provisions for water treatment in accordance with Section 232500.

F. Pipe relief valves to nearest floor drain.

G. Extend condensate drain from drain trap to floor drain.

H. Pipe cooled condensate produced by the combustion process from the boiler condensate connection and/or flue stack to neutralizer prior to discharging into nearest floor drain. Extend condensate drain from drain trap to floor drain.
   1. PVC or CPVC pipe: comply with ASTM D1785 or D2845.
   2. Cement and primer: comply with ASME D2564 or F493.

I. Provide piping connection and accessories in accordance with Section 232114.

J. Provide for connection to electrical service in accordance with Section 260583.

K. Flue Vent and Combustion Air Intake in accordance with manufacturer's recommendations:
   1. Direct Vent system with horizontal sidewall termination of both the exhaust vent and combustion air.
      a. Flue Vent Pipe:
         1) Directly from the boiler to the outside, seal air tight.
         2) Flue termination: at the rooftop with the manufacturer’s specified vent termination.
         3) The total combined exhaust venting length shall not exceed 100 equivalent feet.
      b. Combustion Air Pipe:
         1) Directly to the boiler from the outside, seal air tight.
         2) Combustion Air Inlet: On the same rooftop with the exhaust.
         3) The total combined air intake length shall not exceed 100 equivalent feet.
   2. Support breechings from building structure, rigidly with suitable ties, braces, hangers and anchors to hold to shape and prevent buckling. Support vertical breechings, chimneys, and stacks at 12 foot spacing, to adjacent structural surfaces, or at floor penetrations. Refer to SMACNA HVAC Duct Construction Standards for equivalent duct support configuration and size.
   3. Pitch vent pipe with positive slope down to boiler.

3.02 START-UP

A. Check the installation before starting the boiler in accordance with manufacturer's instructions.

B. Perform start-up in accordance with manufacturer's instructions.

C. Set up the control parameter in accordance with specified boiler/pump/valve operating sequence.

D. Check the boiler operation in accordance with manufacturer's instructions.

E. Verify the boiler sequence operation.

END OF SECTION

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Wiring connectors.

C. Electrical tape.

D. Heat shrink tubing.

E. Oxide inhibiting compound.

F. Wire pulling lubricant.

G. Cable ties.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 284600 - Fire Detection and Alarm: Fire alarm system conductors and cables.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire.

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes.

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation.

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape.

F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction.

H. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.

I. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems.

J. NFPA 70 - National Electrical Code.

K. UL 44 - Thermoset-Insulated Wires and Cables.

L. UL 83 - Thermoplastic-Insulated Wires and Cables.

M. UL 267 - Outline of Investigation for Wire-Pulling Compounds.

N. UL 486A-486B - Wire Connectors.

O. UL 486C - Splicing Wire Connectors.

P. UL 486D - Sealed Wire Connector Systems.

Q. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables.

R. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. No submittals required.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated.

C. Nonmetallic-sheathed cable is not permitted.

D. Underground feeder and branch-circuit cable is not permitted.

E. Service entrance cable is not permitted.

F. Armored cable is not permitted.

G. Metal-clad cable is not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide new conductors and cables manufactured not more than one year prior to installation.

D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

E. Comply with NEMA WC 70.

F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

H. Conductors for Grounding and Bonding: Also comply with Section 260526.

I. Conductors and Cables Installed in Cable Tray: Listed and labeled as suitable for cable tray use.

J. Conductors and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.

K. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.

L. Conductor Material:
   1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   3. Tinned Copper Conductors: Comply with ASTM B33.

M. Minimum Conductor Size:
   1. Branch Circuits: 12 AWG.
      a. Exceptions:
         1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
         2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
         3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
   2. Control Circuits: 16 AWG.

N. Conductor Color Coding:
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. Color Coding Method: Integrally colored insulation.
      a. Conductors size 6 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
   3. Color Code (Power and Lighting):
      a. 480Y/277 V, 3 Phase, 4 Wire System:
         1) Phase A: Brown.
         2) Phase B: Orange.
         3) Phase C: Yellow.
         4) Neutral/Grounded: Gray.
      b. 208Y/120 V, 3 Phase, 4 Wire System:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
         4) Neutral/Grounded: White.
      c. Equipment Ground, All Systems: Green.
      d. Travelers for 3-Way and 4-Way Switching: Purple or purple electrical tape wrapped around jacket of conductor utilized.
      e. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
      f. For control circuits, comply with manufacturer's recommended color code.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
   1. Copper Building Wire:
      a. Cerro Wire LLC: www.cerrowire.com/#sle.

b. Encore Wire Corporation: www.encorewire.com/#sle.
c. Southwire Company: www.southwire.com/#sle.
d. Houston Wire and Cable Company: www.houwire.com
e. General Cable Technologies Corporation: www.generalcable.com
f. Coleman Cable, Inc: www.colemancable.com
g. Substitutions: See Section 016000 - Product Requirements.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:
1. Feeders and Branch Circuits:
a. Size 10 AWG and Smaller: Solid.
b. Size 8 AWG and Larger: Stranded.
2. Control Circuits: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:
1. Copper Building Wire: Type THHN/THWN, THHN/THWN-2, or XHHW-2.
2. Any Copper Wire Installed Underground: Type XHHW-2.

2.04 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 260526.

C. Wiring Connectors for Splices and Taps:
1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:
1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
7. Conductors for Control Circuits: Use crimped terminals for all connections.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
1. Manufacturers:
a. 3M: www.3m.com/#sle.

b. Ideal Industries, Inc: www.idealindustries.com/#sle.
c. NSI Industries LLC: www.nsiindustries.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

H. Mechanical Connectors: Provide bolted type or set-screw type.
1. Manufacturers:
a. Burndy LLC: www.burndy.com/#sle.
b. Ilsco: www.ilsco.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
1. Manufacturers:
a. Burndy LLC: www.burndy.com/#sle.
b. Ilsco: www.ilsco.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
1. Manufacturers:
a. Burndy LLC: www.burndy.com/#sle.
b. Ilsco: www.ilsco.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. 3M: www.3m.com.
e. Substitutions: See Section 016000 - Product Requirements.

2.05 ACCESSORIES

A. Electrical Tape:
1. Manufacturers:
a. 3M: www.3m.com/#sle.
b. Plymouth Rubber Europa: www.plymouthrubber.com/#sle.
c. Substitutions: See Section 016000 - Product Requirements.
2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
6. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
1. Manufacturers:
a. 3M: www.3m.com/#sle.
b. Burndy LLC: www.burndy.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
   1. Manufacturers:
      a. Burndy LLC: www.burndy.com/#sle.
      b. Ideal Industries, Inc: www.idealindustries.com/#sle.
      c. Ilsco: www.ilsco.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.

D. Wire Pulling Lubricant:
   1. Manufacturers:
      a. 3M: www.3m.com/#sle.
      b. American Polywater Corporation: www.polywater.com/#sle.
      c. Ideal Industries, Inc: www.idealindustries.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.
   2. Listed and labeled as complying with UL 267.
   3. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
   4. Suitable for use at installation temperature.

E. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:
   1. Arrange circuiting to minimize splices.
   2. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
   3. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
   4. Common Neutrals: Sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
   5. Provide oversized neutral/grounded conductors where indicated and as specified below.
      a. Provide 200 percent rated neutral for feeders fed from K-rated transformers.
      b. Provide 200 percent rated neutral for feeders serving panelboards with 200 percent rated neutral bus.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Installation in Raceway:
   1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
   2. Pull all conductors and cables together into raceway at same time.

3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

G. Terminate cables using suitable fittings.

H. Install conductors with a minimum of 12 inches of slack at each outlet.

I. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

J. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

K. Make wiring connections using specified wiring connectors.
1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

L. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

M. Insulate ends of spare conductors using vinyl insulating electrical tape.

N. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

O. Identify conductors and cables in accordance with Section 260553.

P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Perform continuity test on all branch circuit conductors.

C. Verify proper phasing of connections and correct, if necessary.

D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
   1. Includes oxide inhibiting compound.

B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction.

B. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems.

C. NFPA 70 - National Electrical Code.

D. UL 467 - Grounding and Bonding Equipment.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify exact locations of underground metal water service pipe entrances to building.
   2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. No submittals required.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

C. Provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
   1. Use insulated copper conductors:
      a. Exceptions:
         1) Use bare tinned copper conductors where installed underground in direct contact with earth.
         2) Use bare tinned copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
   1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
   2. Use exothermic welded connections for underground, concealed and other inaccessible connections.
   3. Use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
      a. Exceptions:
         1) Use exothermic welded connections for connections to metal building frame.
   4. Manufacturers - Mechanical and Compression Connectors:
      a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
      b. Burndy LLC: www.burndy.com/#sle.
      c. Erico International Corporation: www.erico.com
      d. ILSCO: www.ilsco.com
      e. Harger Lightning & Grounding: www.harger.com/#sle.
      f. Thomas & Betts Corporation: www.tnb.com/#sle.
      g. Substitutions: See Section 016000 - Product Requirements.
   5. Manufacturers - Exothermic Welded Connections:
      a. Burndy LLC: www.burndy.com/#sle.
      b. Harger Lightning & Grounding: www.harger.com.
      c. ThermOweld: www.thermoweld.com.
      d. Substitutions: See Section 016000 - Product Requirements.

D. Oxide Inhibiting Compound: Comply with Section 260519.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Make grounding and bonding connections using specified connectors.
   1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
   2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
   3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.

4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

D. Identify grounding and bonding system components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

SECTION 260529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 055000 - Metal Fabrications: Materials and requirements for fabricated metal supports.

C. Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

D. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

D. MFMA-4 - Metal Framing Standards Publication.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction.

F. NFPA 70 - National Electrical Code.

G. UL 5B - Strut-Type Channel Raceways and Fittings.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
   2. Coordinate work to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
   4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
   5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 033000.

1.05 SUBMITTALS

A. No submittals required.

1.06 QUALITY ASSURANCE

A. Products: Listed and classified by a Nationally Recognized Testing Laboratory as suitable for the purpose specified and indicated.

B. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with the following. Where requirements differ, comply with most stringent.
      a. NFPA 70.
      b. Requirements of authorities having jurisdiction.
   2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
   3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
   4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   5. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
      a. Indoor Dry Locations: Use zinc-plated steel.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel or stainless steel.
      c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type.

C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
   1. Manufacturers:
      a. Substitutions: See Section 016000 - Product Requirements.

D. Metal Channel/Strut Framing Systems:
   1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
   2. Comply with MFMA-4.
   3. Channel Material:
      a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
   4. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
   5. Minimum Channel Dimensions: 1-5/8 inch wide by 13/16 inch high.

E. Anchors and Fasteners:
   1. Concrete: Use preset concrete inserts or expansion anchors.
      a. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
         1) Comply with MFMA-4.
         2) Channel Material: Use galvanized steel.
   2. Solid or Grout-Filled Masonry: Use expansion anchors.
   3. Hollow Masonry: Use toggle bolts.
   4. Hollow Stud Walls: Use toggle bolts.
   5. Steel: Use beam clamps.
   6. Sheet Metal: Use sheet metal screws.
   7. Plastic and lead anchors are not permitted.
   8. Powder-actuated fasteners are not permitted.
   9. Hammer-driven anchors and fasteners are not permitted.

10. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    a. Comply with MFMA-4.
    b. Channel Material: Use galvanized steel.
    c. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch minimum base metal thickness.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Field Welding, Where Approved by Architect: See Section 055000.

H. Equipment Support and Attachment:
    1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
    2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
    3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
    4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Conduit Support and Attachment: See Section 260533.13 for additional requirements.

J. Box Support and Attachment: See Section 260533.16 for additional requirements.

K. Interior Luminaire Support and Attachment: See Section 265100 for additional requirements.

L. Exterior Luminaire Support and Attachment: See Section 265600 for additional requirements.

M. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

N. Secure fasteners in accordance with manufacturer's recommended torque settings.

O. Remove temporary supports.

P. Identify independent electrical component support wires above accessible ceilings, where permitted, with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 260533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).
B. Stainless steel rigid metal conduit (RMC).
C. Stainless steel intermediate metal conduit (IMC).
D. PVC-coated galvanized steel rigid metal conduit (RMC).
E. Flexible metal conduit (FMC).
F. Liquidtight flexible metal conduit (LFMC).
G. Galvanized steel electrical metallic tubing (EMT).
H. Stainless steel electrical metallic tubing (EMT).
I. Rigid polyvinyl chloride (PVC) conduit.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.
B. Section 260526 - Grounding and Bonding for Electrical Systems.
   1. Includes additional requirements for fittings for grounding and bonding.
C. Section 260529 - Hangers and Supports for Electrical Systems.
D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
E. Section 312316 - Excavation.
F. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC).
B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S).
C. NECA 1 - Standard for Good Workmanship in Electrical Construction.
D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT).
E. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC).
F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.
G. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit.
H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit.
I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.
J. NFPA 70 - National Electrical Code.
K. UL 1 - Flexible Metal Conduit.
L. UL 6 - Electrical Rigid Metal Conduit-Steel.
M. UL 360 - Liquid-Tight Flexible Metal Conduit.
N. UL 514A - Metallic Outlet Boxes.
O. UL 514B - Conduit, Tubing, and Cable Fittings.
P. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings.
Q. UL 797 - Electrical Metallic Tubing-Steel.

R. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel.

S. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations.

T. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
   4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
   5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

1.06 QUALITY ASSURANCE

A. Products: Listed and classified by a Nationally Recognized Testing Laboratory as suitable for the purpose specified and indicated.

B. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Use the conduit types indicated for the specified applications. Where conduit type for a particular application is not specified, consult Architect.

B. Underground:
   1. Exterior, Direct-Buried: Use rigid PVC conduit.
   2. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or schedule 80 rigid PVC conduit where emerging from underground.
   3. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows, stainless steel rigid metal conduit (RMC) elbows, galvanized steel intermediate metal conduit (IMC) elbows, stainless steel intermediate metal conduit (IMC) elbows, PVC-coated galvanized steel rigid metal conduit (RMC) elbows, or concrete-encased PVC elbows for bends.

C. Embedded Within Concrete:
   1. Within Slab on Grade: Not permitted.
   2. Within Slab Above Ground: Not permitted.

D. Exposed, Interior, Not Subject to Physical Damage: Use electrical metallic tubing (EMT).

E. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.

F. Exposed, Exterior: Use galvanized steel rigid metal conduit.

G. Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or stainless steel intermediate metal conduit (IMC).

H. Hazardous/Classified Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit (RMC).

I. Flexible Connections to Vibrating Equipment:
   1. Dry Locations: Use flexible metal conduit (FMC).
   2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).
   3. Maximum Length: 6 feet unless otherwise indicated.

J. Fished in Existing Walls, Where Necessary: Use flexible metal conduit (FMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.

C. Structured Cabling for Voice and Data Systems: Conduits Only. See Owners low-voltage matrix of responsibility.

D. Fittings for Grounding and Bonding: See Section 260526 for additional requirements.

E. Provide conduit, fittings, supports, and accessories required for complete raceway system.

F. Provide products listed, classified, and labeled by testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.

G. Minimum Conduit Size:
   1. Interior: 3/4 inch (21 mm) trade size.
   2. Exterior: 1 inch (27 mm) trade size.

H. Where conduit size is not indicated, size to comply with NFPA 70.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
   1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
   2. Nucor Tubular Products: www.nucortubular.com/#sle.
   3. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
   4. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:
   1. Manufacturers:
      a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
      b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
      c. Substitutions: See Section 016000 - Product Requirements.
   2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
   3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
   4. Material: Use steel or malleable iron.

a. Do not use die cast zinc fittings.

5. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.04 STAINLESS STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC stainless steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6A.

B. Fittings:
   1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
   2. Material: Use stainless steel with corrosion resistance equivalent to conduit.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.05 STAINLESS STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
   1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.

2.06 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
   1. Thomas & Betts Corporation: www.tnb.com.
   2. Robroy Industries: www.robroy.com.
   3. Substitutions: Not permitted.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

C. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch.

D. Interior Coating: Urethane, minimum thickness of 2 mil, 0.002 inch.

E. PVC-Coated Boxes and Fittings:
   1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
   2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.
   3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
   4. Material: Use steel or malleable iron.
   5. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch.
   6. Interior Coating: Urethane, minimum thickness of 2 mil, 0.002 inch.

F. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch.

2.07 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:
   1. AFC Cable Systems, Inc: www.afcweb.com.
   2. Electri-Flex Company: www.electriflex.com.
   3. International Metal Hose: www.metalhose.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

C. Fittings:

1. Manufacturers:
    a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
    b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
    c. Substitutions: See Section 016000 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
    a. Do not use die cast zinc fittings.

2.08 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:
1. AFC Cable Systems, Inc: www.afcweb.com.
2. Electri-Flex Company: www.electriflex.com.
3. International Metal Hose: www.metalhose.com.
4. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:
1. Manufacturers:
    a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
    b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
    c. Substitutions: See Section 016000 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
    a. Do not use die cast zinc fittings.

2.09 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
1. Allied Tube & Conduit: www.alliedeg.com.
2. Nucor Tubular Products: www.nucortubular/#sle.
3. Wheatland Tube Company: www.wheatland.com.
4. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:
1. Manufacturers:
    a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
    b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
    c. Substitutions: See Section 016000 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
    a. Do not use die cast zinc fittings.
4. Connectors and Couplings: Use compression/gland or set-screw type.
    a. Do not use indenter type connectors and couplings.

2.10 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT stainless steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797A.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Connectors and Couplings: Use compression/gland or set-screw type.

2.11 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:
1. Cantex Inc: www.cantexinc.com/#sle.
2. JM Eagle: www.jmeagle.com/#sle.
3. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.12 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch.

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.

E. Sealing Compound for Hazardous/Classified Location Sealing Fittings: Listed for use with particular fittings to be installed.

F. Sealing Systems for Concrete Penetrations:
1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify routing and termination locations of conduit prior to rough-in.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1.

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by manufacturer.

E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

F. Conduit Routing:
1. Unless dimensioned, conduit routing indicated is diagrammatic.

2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conceal conduits unless specifically indicated to be exposed.
4. Conduits in the following areas may be exposed, unless otherwise indicated:
    a. Electrical rooms.
    b. Mechanical equipment rooms.
    c. Within joists in areas with no ceiling.
5. Unless otherwise approved, do not route exposed conduits:
    a. Across floors.
    b. Across top of parapet walls.
    c. Across building exterior surfaces.
6. Arrange conduit to maintain adequate headroom, clearances, and access.
7. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
8. Arrange conduit to provide no more than 150 feet between pull points.
9. Route conduits above water and drain piping where possible.
10. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
11. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
12. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
    a. Heaters.
    b. Hot water piping.
    c. Flues.
13. Group parallel conduits in same area on common rack.

G. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 260529.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use conduit strap to support single surface-mounted conduit.
    a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
5. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
7. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.
8. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.
9. Use of spring steel conduit clips for support of conduits is not permitted.
10. Use of wire for support of conduits is not permitted.
11. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with most stringent requirements.

H. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.

4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
7. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
8. Secure joints and connections to provide mechanical strength and electrical continuity.

I. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces.
3. Provide sleeves for penetrations as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Provide suitable sealing system where conduits penetrate exterior wall below grade.
6. Where conduits penetrate waterproof membrane, seal to maintain integrity of membrane.
7. Provide decorative metal escutcheon plates for conduit penetrations exposed to public view.
8. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.

J. Underground Installation:
1. Provide trenching and backfilling; see Section 312316.13.
2. Backfill with red flowable-fill to a minimum of 4 inches above underground conduits.
   a. Anchor underground conduits at 10 foot intervals to trench bottom to avoid floating after flowable fill is poured.
3. Minimum Conduit Depth:
   a. Underground, Exterior: 18 inches.
   b. Under Slab on Grade: 12 inches to bottom of slab.

K. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where conduits are subject to earth movement by settlement or frost.

L. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
   a. Where conduits enter building from outside.
   b. Where service conduits enter building from underground distribution system.
   c. Where conduits enter building from underground.
   d. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
   a. Where conduits pass from outdoors into conditioned interior spaces.
   b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

M. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

N. Provide grounding and bonding; see Section 260526.

O. Identify conduits; see Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

D. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 260533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

C. Boxes for hazardous (classified) locations.

D. Floor boxes.

E. Underground boxes/enclosures.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 078400 - Firestopping.

C. Section 083100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

D. Section 260526 - Grounding and Bonding for Electrical Systems.

E. Section 260529 - Hangers and Supports for Electrical Systems.

F. Section 260533.13 - Conduit for Electrical Systems:
   1. Conduit bodies and other fittings.
   2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

G. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

H. Section 262726 - Wiring Devices:
   1. Wall plates.
   2. Additional requirements for locating boxes for wiring devices.

I. Section 271000 - Structured Cabling: Additional requirements for communications systems outlet boxes.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

F. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.

G. NFPA 70 - National Electrical Code.

H. SCTE 77 - Specifications for Underground Enclosure Integrity.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.

K. UL 508A - Industrial Control Panels.

L. UL 514A - Metallic Outlet Boxes.

M. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers.

N. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
   4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
   5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
   6. Coordinate the work with other trades to preserve insulation integrity.
   7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
   8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for boxes for hazardous (classified) locations, floor boxes, underground boxes/enclosures, and boxes/cabinets/enclosures over 100 cubic inches.
   1. Outlet and device box submittals are not required.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Keys for Lockable Enclosures: Two of each different key.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Comply with NEMA 250 for electrical cabinets and enclosures larger than 100 cubic inches (1,650 cu cm).

C. Comply with SCTE 77 for Polymer Concrete Underground Boxes/Enclosures.

D. Products: Listed and classified by a Nationally Recognized Testing Laboratory as suitable for the purpose specified and indicated.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
   2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.

3. Provide products listed, classified, and labeled as suitable for the purpose intended.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes for damp or wet locations; furnish with compatible weatherproof gasketed covers.
3. Use cast iron boxes where exposed galvanized steel rigid metal conduit is used.
4. Use suitable concrete type boxes where flush-mounted in concrete.
5. Use suitable masonry type boxes where flush-mounted in masonry walls.
6. Use raised covers suitable for the type of wall construction and device configuration where required.
7. Use shallow boxes where required by the type of wall construction.
8. Do not use "through-wall" boxes designed for access from both sides of wall.
9. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
10. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
11. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
12. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
13. Wall Plates: Comply with Section 262726.
14. Manufacturers:
    a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.
    b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com/#sle.
    c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com/#sle.
    d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
    e. Thomas & Betts Corporation: www.tnb.com/#sle.
    f. Substitutions: See Section 016000 - Product Requirements.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated:
    a. Indoor Clean, Dry Locations: Type 1, painted steel.
    b. Outdoor Locations: Type 3R, painted steel.
    c. Wet, Damp, or Corrosive Locations: Type 4X, stainless steel or fiberglass.
3. Junction and Pull Boxes Larger Than 100 cubic inches:
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
    b. Boxes 6 square feet and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
    b. Back Panels: Painted steel, removable.
    c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.

6. Manufacturers:
    a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.
    b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com/#sle.
    c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com/#sle.
    d. Substitutions: See Section 016000 - Product Requirements.

D. Boxes for Hazardous (Classified) Locations: Listed and labeled as complying with UL 1203 for the classification of the installed location.
    1. Manufacturers:
        a. Appleton, a brand of Emerson Electric Co: www.emerson.com/#sle.
        b. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.
        c. Hubbell Incorporated; Killark Products: www.hubbell-killark.com/#sle.
        d. Substitutions: See Section 016000 - Product Requirements.

E. Floor Boxes:
    1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 262726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
    2. Use nonmetallic floor boxes within slab on grade.
    3. Use sheet-steel or nonmetallic floor boxes within slab above grade.
    4. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
    5. Non-Metallic Floor Boxes: Adjustable (with means for leveling adjustment prior to and after concrete pour).
    6. Manufacturer: Same as manufacturer of floor box service fittings.

F. In-ground Boxes/Enclosures:
    1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
    2. Size: As indicated on drawings.
    3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.
    4. Provide logo on cover to indicate type of service.
    5. Applications:
        a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures with minimum SCTE 77 Tier 5 load rating.
        b. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
    6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
        a. Manufacturers:
            1) Hubbell Incorporated; Quazite Products: www.hubbellpowersystems.com/#sle.
            2) MacLean Highline: www.macleanhighline.com/#sle.
            3) Oldcastle Precast, Inc: www.oldcastleprecast.com/#sle.
            4) Substitutions: See Section 016000 - Product Requirements.
        b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas.

G. Boxes may be surface-mounted where exposed conduits are permitted.

H. Box Locations:
   1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100.
   2. Unless dimensioned, box locations indicated are approximate.
      a. Owner must approve any adjustment to box locations for wall devices.
   3. Locate boxes for devices installed under other sections:
      a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.
      b. Communications Systems Outlets: Comply with Section 271000.
   4. Locate boxes so that wall plates do not span different building finishes.
   5. Locate boxes so that wall plates do not cross masonry joints.
   6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
   7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
   8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
   9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
      a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
      b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
   10. Locate junction and pull boxes to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260534.
   11. Locate junction and pull boxes in the following areas:
      a. Concealed above accessible suspended ceilings.
      b. Within joists in areas with no ceiling.
      c. Electrical rooms.
      d. Mechanical equipment rooms.

I. Box Supports:
   1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
   4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Replace supports for boxes that permit excessive movement.

J. Install boxes plumb and level.

K. Flush-Mounted Boxes:
   1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
   2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.

L. Floor-Mounted Cabinets: Mount on properly sized 4 inch high concrete pad constructed in accordance with Section 033000.

M. Install boxes as required to preserve insulation integrity.

N. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

O. Nonmetallic Floor Boxes: Cut box flush with finished floor after concrete pour.

P. In-ground Boxes/Enclosures:
   1. Install enclosure on gravel base, minimum 6 inches deep.
   2. Flush-mount enclosures located in concrete or paved areas.
   3. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.
   4. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

Q. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

R. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

S. Close unused box openings.

T. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

U. Provide grounding and bonding in accordance with Section 260526.

V. Identify boxes in accordance with Section 260553.

3.03 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 260548
VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vibration isolation requirements.

B. Seismic control requirements.
   1. Includes requirements for seismic qualification of equipment not specified in this section.

C. Vibration-isolated equipment support bases.

D. Vibration isolators.

E. External seismic snubber assemblies.

F. Seismic restraint systems.

1.02 RELATED REQUIREMENTS

A. Section 014533 - Code-Required Special Inspections and Procedures.

B. Section 033000 - Cast-in-Place Concrete.

C. Section 055000 - Metal Fabrications: Materials and requirements for fabricated metal supports.

D. Section 260529 - Hangers and Supports for Electrical Systems.

1.03 DEFINITIONS

A. Electrical Component: Where referenced in this section in regards to seismic controls, applies to any portion of the electrical system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., conduit, cable tray).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.04 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

B. ASCE 19 - Structural Applications of Steel Cables for Buildings.

C. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications.

D. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.

E. FEMA 413 - Installing Seismic Restraints for Electrical Equipment.

F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage.

G. ICC (IBC) - International Building Code.

H. ICC-ES AC156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components.

I. MFMA-4 - Metal Framing Standards Publication.

J. NECA 1 - Standard for Good Workmanship in Electrical Construction.

K. NFPA 70 - National Electrical Code.

L. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.

2. Coordinate the work with other trades to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Seismic Controls:
    a. Coordinate the arrangement of seismic restraints with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
    b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
2. Seismic Controls: Include seismic load capacities.

D. Shop Drawings - Vibration Isolation Systems:
1. Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.
2. Vibration-Isolated Equipment Support Bases: Include base weights, including concrete fill where applicable; indicate equipment mounting provisions.

E. Shop Drawings - Seismic Controls:
1. Include dimensioned plan views and sections indicating proposed electrical component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
2. Identify mounting conditions required for equipment seismic qualification.
3. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
4. Indicate proposed arrangement of distributed system trapeze support groupings.
5. Indicate proposed locations for distributed system flexible fittings and/or connections.
6. Indicate locations of seismic separations where applicable.

F. Seismic Design Data:
1. Compile information on project-specific characteristics of actual installed electrical components necessary for determining seismic design forces required to design appropriate seismic controls, including but not limited to the following.
2. Include structural calculations, stamped or sealed by seismic controls designer, demonstrating suitability of seismic controls for seismic design forces.

G. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

H. Evidence of qualifications for seismic controls designer.

I. Evidence of qualifications for manufacturer.

1.07 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

C. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State in which the Project is located and with minimum five years experience designing seismic restraints for nonstructural components.
   1. Designer may be employed by the manufacturer of the seismic restraint products.

D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing electrical equipment and/or electrical connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
   1. Select vibration isolators to provide required static deflection.
   2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
   3. Select seismic type vibration isolators to comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
   4. Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2-inch operating clearance beneath base unless otherwise indicated.

D. Conduit Isolation:
   1. Use flexible conduit or cable for electrical connections to vibration-isolated equipment, including equipment installed under other sections or by others.
   2. Vibration Isolators:
      a. Provide vibration isolators for conduit supports:
         1) Located within 50 feet of connected vibration-isolated equipment where flexible connection to equipment is not possible.
         2) For conduits over 2 inch trade size located below or within 50 feet of noise-sensitive areas indicated.
      b. Minimum Static Deflection:
         1) First Three Supports Closest to Isolated Equipment: Same as static deflection of equipment; maximum of 2 inch deflection required.
         2) Remainder of Supports: 0.75 inch deflection unless otherwise indicated.
      c. Suspended Conduits, Nonseismic Applications: Use resilient material isolator hangers, spring isolator hangers, or combination resilient material/spring isolator hangers.
      d. Suspended Conduits, Seismic Applications: Use seismic type resilient material isolator hangers, seismic type spring isolator hangers, or seismic type combination resilient material/spring isolator hangers.

e. Use modular seal or approved resilient material where vibration-isolated conduits penetrate building elements (e.g., walls, floors) arranged to prevent vibration transmission to structure.

2.02 SEISMIC CONTROL REQUIREMENTS

A. Design and provide electrical component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor electrical components.

B. Seismic Design Criteria: ICC (IBC).
   1. Seismic Design Category: C.
   2. Risk Category: 3.

C. Component Importance Factor (Ip): Electrical components essential to life safety to be assigned a component importance factor (Ip) of 1.5 as indicated or as required. This includes but is not limited to:
   1. Electrical components required to function for life safety purposes after an earthquake.
   2. Electrical components that support or otherwise contain hazardous substances.

D. Seismic Qualification of Equipment:
   1. Provide special certification for electrical equipment furnished under other sections and assigned a component importance factor (Ip) of 1.5, certifying that equipment will remain operable following a design level earthquake.
   2. Seismic qualification to be by shake table testing in accordance with recognized testing standard procedure, such as ICC-ES AC156, acceptable to authorities having jurisdiction.
   3. Notify Architect and obtain direction where mounting restrictions required by conditions of seismic certification conflict with specified requirements.
   4. Seismically qualified equipment to be furnished with factory-installed labels referencing certificate of compliance and associated mounting restrictions.

E. Seismic Restraints:
   1. Provide seismic restraints for electrical components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
   2. Seismic Restraint Exemptions:
      a. Exemptions for Seismic Design Category C:
         1) Electrical components where either of the following apply:
            (a) The component importance factor (Ip) is 1.0 and the component is positively attached to the structure.
            (b) The component weighs 20 pounds or less or, in the case of a distributed system, 5 pounds per foot or less.
      b. Exemptions for Seismic Design Category D, E, and F:
         1) Discrete electrical components that are positively attached to the structure where either of the following apply:
            (a) The component weighs 400 pounds or less, has a center of mass located 4 feet or less above the adjacent floor level, flexible connections are provided between the component and associated ductwork, piping, and conduit, and the component importance factor (Ip) is 1.0.
            (b) The component weighs 20 pounds or less or, in the case of a distributed system, 5 pounds per foot or less.
      c. Conduit, Cable Tray, and Raceway Exemptions, All Seismic Design Categories:
         1) Raceways with component importance factor (Ip) of 1.0 where flexible connections are provided between cable tray or raceway and associated components, where cable tray or raceway is positively attached to the structure, and where one of the following apply:

(a) Trapeze supported conduits, cable trays, or raceways with trapeze assemblies using 3/8 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 100 pounds or less.
(b) Trapeze supported conduits, cable trays, or raceways with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 200 pounds or less.
(c) Trapeze supported conduits, cable trays, or raceways with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 24 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 100 pounds or less.
(d) Hanger supported conduits, cable trays, or raceways with individual rod hangers 3/8 inch or 1/2 inch in diameter not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single rod is 50 pounds or less.

2) Conduits less than 2-1/2 inch trade size.

d. Lighting Exemptions, All Seismic Design Categories:
1) Suspended luminaires where attachments are designed to accommodate 1.4 times the operating weight acting in both the vertical and horizontal directions and connections to structure allow for 360 degree range of motion in the horizontal plane; arrange to prevent impact between luminaires and the structure or other nonstructural components.
2) Lay-in luminaires weighing less than 56 pounds secured to ceiling grid and provided with safety wires in accordance with ASTM E580/E580M.

3. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
a. ASHRAE (HVACA).
b. FEMA 413.
c. FEMA E-74.
d. SMACNA (SRM).
4. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
5. Seismic Type Vibration Isolators:
a. Comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
6. External Seismic Snubber Assemblies:
a. Provide quantity and arrangement of external seismic snubber assemblies as required to restrain equipment in all directions (both lateral and vertical).
b. Do not use external seismic snubber assemblies that restrain equipment only in one or more lateral directions (but not vertical) except where uplift forces are zero or are addressed by other restraints.
7. Seismic Restraint Systems:
a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
b. Use only cable restraints to restrain vibration-isolated electrical components, including distributed systems.
c. Use only one restraint system type for a given electrical component or distributed system (e.g., conduit, cable tray) run; mixing of cable and rigid restraints on a given component/run is not permitted.
d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain electrical component in all lateral directions; consider bracket geometry in anchor load calculations.

e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported electrical component weight.
f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported electrical component weight.
g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.
j. Manufacturer's certified seismic restraint design may be submitted as an alternative to project-specific design and documentation, subject to approval of authorities having jurisdiction.

F. Seismic Attachments:
1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
3. Do not use power-actuated fasteners.
4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
6. Concrete Housekeeping Pads:
a. Increase size of pad as required to comply with anchor requirements.
b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

G. Seismic Interactions:
1. Include provisions to prevent seismic impact between electrical components and other structural or nonstructural components.
2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.

H. Seismic Relative Displacement Provisions:
1. Use suitable fittings or flexible connections to accommodate:
a. Relative displacements at connections between components, including distributed systems (e.g., conduit, cable tray); do not exceed load limits for equipment utility connections.
b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
c. Design displacements at seismic separations.
d. Anticipated drifts between floors.

2.03 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

A. Manufacturers:

1. Vibration-Isolated Equipment Support Bases:
    a. Kinetics Noise Control, Inc: www.kineticsnoise.com/#sle.
    b. Mason Industries: www.mason-ind.com/#sle.
    c. Vibration Eliminator Company, Inc: www.veco-nyc.com/#sle.
2. Substitutions: See Section 016000 - Product Requirements.
3. Source Limitations: Furnish vibration-isolated equipment support bases and associated components and accessories produced by the same manufacturer as the vibration isolators and obtained from a single supplier.

B. Vibration-Isolated Concrete Inertia Bases:
1. Description: Concrete-filled engineered steel forms with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.
2. Minimum Base Depth: 6 inches.
3. Minimum Base Mass (Including Concrete): 1.5 times weight of supported equipment.
4. Concrete Reinforcement: Welded or tied reinforcing bars running both ways in a single layer.
5. Concrete: Filled on site with minimum 3000 psi concrete in accordance with Section 033000.

2.04 VIBRATION ISOLATORS

A. Manufacturers:
1. Vibration Isolators:
    a. Kinetics Noise Control, Inc: www.kineticsnoise.com/#sle.
    b. Mason Industries: www.mason-ind.com/#sle.
    c. Vibration Eliminator Company, Inc: www.veco-nyc.com/#sle.
2. Substitutions: See Section 016000 - Product Requirements.
3. Source Limitations: Furnish vibration-isolators and associated accessories produced by a single manufacturer and obtained from a single supplier.

B. General Requirements:
1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
2. Spring Elements for Spring Isolators:
    a. Color code or otherwise identify springs to indicate load capacity.
    b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
    c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
    d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
    e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
    f. Selected to function without undue stress or overloading.
3. Seismic Snubbing Elements for Seismic Isolators:
    a. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
    b. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

C. Vibration Isolators for Nonseismic Applications:
1. Resilient Material Isolator Pads:
    a. Description: Single or multiple layer pads utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material.
    b. Pad Thickness: As required for specified minimum static deflection; minimum 0.25 inch thickness.
    c. Multiple Layer Pads: Provide bonded, galvanized sheet metal separation plate between each layer.
2. Resilient Material Isolator Mounts, Nonseismic:

a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material; fail-safe type.

3. Open (Unhoused) Spring Isolators:
   a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) without a housing.
   b. Bottom Load Plate: Nonskid, molded, elastomeric isolator material or steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.
   c. Furnished with integral leveling device for positioning and securing supported equipment.
4. Housed Spring Isolators:
   a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing.
   b. Furnished with integral elastomeric snubbing elements, nonadjustable type, for limiting equipment movement and preventing metal-to-metal contact between housing elements.
   c. Bottom Load Plate: Steel with nonskid, elastomeric isolator pad with provisions for bolting to supporting structure as required.
   d. Furnished with integral leveling device for positioning and securing supported equipment.
5. Restrained Spring Isolators, Nonseismic:
   a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop.
   b. Bottom Load Plate: Steel with nonskid, elastomeric isolator pad with provisions for bolting to supporting structure as required.
   c. Furnished with integral leveling device for positioning and securing supported equipment.
   d. Provides constant free and operating height.
6. Resilient Material Isolator Hangers, Nonseismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the lower hanger rod connection.
7. Spring Isolator Hangers, Nonseismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.
   b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.
8. Combination Resilient Material/Spring Isolator Hangers, Nonseismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the upper hanger rod connection.
   b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

D. Vibration Isolators for Seismic Applications:
1. Resilient Material Isolator Mounts, Seismic:
   a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) isolator material; specifically designed and rated for seismic applications with integral snubbing in all directions.

2. Restrained Spring Isolators, Seismic:
    a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) in series with elastomeric (e.g., neoprene, rubber) isolator material within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop; specifically designed and rated for seismic applications with integral snubbing in all directions.
    b. Bottom Load Plate: Steel with provisions for bolting to supporting structure as required.
    c. Furnished with integral leveling device for positioning and securing supported equipment.
    d. Provides constant free and operating height.
3. Resilient Material Isolator Hangers, Seismic:
    a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) isolator material for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
4. Spring Isolator Hangers, Seismic:
    a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
    b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.
5. Combination Resilient Material/Spring Isolator Hangers, Seismic:
    a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g., neoprene, rubber) isolator material for the upper hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
    b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

2.05 EXTERNAL SEISMIC SNUBBER ASSEMBLIES

A. Manufacturers:
    1. External Seismic Snubber Assemblies:
        a. Kinetics Noise Control, Inc: www.kineticsnoise.com/#sle.
        b. Mason Industries: www.mason-ind.com/#sle.
        c. Vibration Eliminator Company, Inc: www.veco-nyc.com/#sle.
    2. Substitutions: See Section 016000 - Product Requirements.
    3. Source Limitations: Furnish external seismic snubber assemblies and associated accessories produced by the same manufacturer as the vibration isolators and obtained from a single supplier.

B. Description: Steel snubbing assemblies designed for external attachment to both equipment and supporting structure that, as part of a complete system, restrain equipment motion in all directions during a seismic event while maintaining vibration isolation during normal operation.

C. Seismic Snubbing Elements:
    1. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
    2. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

2.06 SEISMIC RESTRAINT SYSTEMS

A. Manufacturers:
   1. Seismic Restraint Systems:
      a. AFCON, a brand of Anvil International: www.anvilintl.com/#sle.
      b. Eaton Corporation: www.eaton.com/#sle.
      c. Kinetics Noise Control, Inc: www.kineticsnoise.com/#sle.
      d. Mason Industries: www.mason-ind.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.
   3. Source Limitations: Furnish seismic restraint system components and accessories produced by a single manufacturer and obtained from a single supplier.

B. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

C. Cable Restraints:
   1. Comply with ASCE 19.
   2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
   3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
   4. Use protective thimbles for cable loops where potential for cable damage exists.

D. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 CODE-REQUIRED SPECIAL INSPECTIONS

A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Architect in accordance with Section 014533 and statement of special inspections as required by applicable building code.

B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
   1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
   2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

C. Seismic special inspections include, but are not limited to:
   1. Seismically Qualified Equipment: Verification that label, anchorage, and mounting comply with certificate of compliance.

D. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.

E. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install products in accordance with applicable requirements of NECA 1 (general workmanship).

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Secure fasteners according to manufacturer's recommended torque settings.

E. Install flexible conduit and cable connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

F. Vibration Isolation Systems:
   1. Vibration-Isolated Equipment Support Bases:
      a. Provide specified minimum clearance beneath base.
   2. Spring Isolators:
      a. Position equipment at operating height; provide temporary blocking as required.
      b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
      c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
   3. Isolator Hangers:
      a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
      b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
   4. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
   5. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
   6. Adjust isolators to be free of isolation short circuits during normal operation.
   7. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

G. Seismic Controls:
   1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris or other obstructions.
   2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
   3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
   4. Equipment with Sheet Metal Housings:
      a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
      b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
      c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
   5. Concrete Housekeeping Pads:
      a. Size in accordance with seismic design to meet anchor requirements.
      b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
   6. Seismic Restraint Systems:
      a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.

b. Install restraints within permissible angles in accordance with seismic design.
c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect vibration isolation and/or seismic control components for damage and defects.

C. Vibration Isolation Systems:
1. Verify isolator static deflections.
2. Verify required clearance beneath vibration-isolated equipment support bases.
3. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

D. Seismic Controls:
1. Verify snubbing element air gaps.

E. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

END OF SECTION

SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Underground warning tape.

F. Warning signs and labels.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

1.03 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs.

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels.

C. NFPA 70 - National Electrical Code.

D. NFPA 70E - Standard for Electrical Safety in the Workplace.

E. UL 969 - Marking and Labeling Systems.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:
   1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
   2. Do not install identification products until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. No submittals required.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use lamicoid/phenolic identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
      a. Switchboards:
         1) Identify unique Owner asset code with equipment number.
         2) Identify ampere rating.
         3) Identify voltage and phase.

4) Identify power source and circuit number.
5) Use identification nameplate to identify main overcurrent protective device.
6) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

b. Motor Control Centers:
1) Identify unique Owner asset code with equipment number.
2) Identify ampere rating.
3) Identify voltage and phase.
4) Identify power source and circuit number.
5) Use identification nameplate to identify main overcurrent protective device.
6) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

c. Panelboards:
1) Identify unique Parkway School District asset code with equipment number.
2) Identify ampere rating.
3) Identify voltage and phase.
4) Identify power source and circuit number.
5) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
6) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
7) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

d. Transformers:
1) Identify unique Parkway School District asset code with equipment number.
2) Identify kVA rating.
3) Identify voltage and phase for primary and secondary.
4) Identify power source and circuit number.
5) Identify load(s) served.

2. Use identification labels to identify each piece of electrical distribution and control equipment.
a. Enclosed remote located switches, circuit breakers, and motor controllers:
1) Identify voltage and phase.
2) Identify power source and circuit number.
3) Identify load(s) served.

3. Use identification label to identify disconnect location for equipment with remote disconnecting means.
4. Use identification label on inside of door at each fused switch to identify required NEMA fuse class and size.
5. Use identification label on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
6. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
a. Minimum Size: 5 by 7 inches.
b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.

7. Use warning signs to identify electrical hazardsat electrical room or area entrances with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.

B. Identification for Conductors and Cables:
   1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
   2. Use identification label to identify color code for ungrounded and grounded power conductors at each piece of feeder or branch-circuit distribution equipment.
   3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
      a. At each source and load connection.
      b. Within boxes when more than one circuit is present.
      c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
   4. Use underground warning tape to identify direct buried cables.

C. Identification for Raceways:
   1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.
   2. Use voltage markers, color-coded bands, or factory-painted conduits to identify systems other than normal power system for accessible conduits.
      a. Maximum Intervals: 20 feet.
      b. Color-Coded Bands: Use vinyl color coding electrical tape to mark bands 3 inches wide.
         1) Color Code:
            (a) Fire Alarm System: Red.
            (b) HVAC Control System: Green.
            (c) Cat5e Data System: Blue.
            (d) Cat6 Data System: Violet.
            (e) Security System: White.
            (f) CCTV System: Yellow
         2) Vinyl Color Coding Electrical Tape: Comply with Section 260519.
      c. Color Code:
   3. Use toneable underground warning tape to identify underground raceways.
   4. Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet.

D. Identification for Boxes and Enclosures larger than 100 cubic inches:
   1. Use voltage markers to identify highest voltage present in power and lighting systems.
   2. Use color coded vinyl labels with printed system name to identify specified systems.
      a. Vinyl Tape Color Code:
         1) Fire Alarm System: Red.
         2) HVAC Control System: Green.
         3) Data System: Blue.
         4) Security System: White.
         5) CCTV System: Yellow
   3. Use warning labels to identify electrical hazards with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".

E. Identification for Devices:
   1. Use identification label to identify fire alarm system device number.
      a. For fire alarm devices concealed above suspended ceilings, provide identification labeling on a white, standard size, single-gang, LED indicator cover plate flush mounted to ceiling tile below device location. Install a standard, signle-gang switch box in the ceiling to attach blank cover plate.
   2. Use identification label to identify serving branch circuit for all receptacles.

a. For receptacles in public areas, provide identification on inside surface of wallplate.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
   1. Materials:
      a. Indoor Clean, Dry Locations: Use plastic nameplates.
      b. Outdoor Locations: Use plastic nameplates suitable for exterior use.
   2. Plastic Nameplates: Two-layer or three-layer laminated electrically non-conductive phenolic with beveled edges; minimum thickness of 1/8 inch; engraved text.
      a. Minimum Text Size: 1/2 inch
   3. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:
   1. Manufacturers:
      a. Brady Corporation: www.bradyid.com.
      b. Brother International Corporation: www.brother-usa.com/#sle.
      c. Panduit Corp: www.panduit.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.
   2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
      a. Use only for indoor locations.
   3. Text: Use machine-printed text. Do not use handwritten text.

C. Format for Receptacle Identification:
   1. Legend: Power source and circuit number or other designation indicated.
   2. Text: All capitalized.
   3. Minimum Text Height: 3/16 inch.
   4. Color: Black text on clear background.

D. Format for Fire Alarm Device Identification:
   1. Legend: Fire Alarm Device ID indicated on drawings.
   2. Text: All capitalized unless otherwise indicated.
   3. Minimum Text Height: 3/16 inch.
   4. Color: Red text on white background.

2.03 WIRE AND CABLE MARKERS

A. Manufacturers:
   1. Brady Corporation: www.bradyid.com.
   2. HellermannTyton: www.hellermanntyton.com/#sle.
   3. Panduit Corp: www.panduit.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl self-laminating type markers suitable for the conductor or cable to be identified.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use machine-printed text, all capitalized unless otherwise indicated.
   1. Do not use handwritten text.

F. Minimum Text Height: 1/8 inch.

G. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradyid.com.
2. Substitutions: See Section 016000 - Product Requirements.

B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl type markers.

C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl type markers.

D. Minimum Size:
1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
4. Markers for Junction Boxes: 1/2 by 2 1/4 inches.

E. Legend:
1. Markers for Voltage Identification: Highest voltage present.

F. Color: Black text on orange background.

2.05 UNDERGROUND WARNING TAPE

A. Manufacturers:
1. Brady Corporation: www.bradyid.com/#sle.
2. Substitutions: See Section 016000 - Product Requirements.

B. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial.

C. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

D. Legend: Type of service, continuously repeated over full length of tape.

E. Color:
1. Tape for Buried Power Lines: Black text on red background.
2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.06 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:
1. Materials:
a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
b. Outdoor Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
3. Minimum Size: 7 by 10 inches unless otherwise indicated.

C. Warning Labels:
1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
a. Do not use labels designed to be completed using handwritten text.
2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
3. Minimum Size: 2 by 4 inches.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Locate products as follows:
   1. Surface-Mounted Equipment: Enclosure front.
   2. Flush-Mounted Equipment: Enclosure front.
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Interior Components: Legible from the point of access.
   6. Conduits: Legible from the floor.
   7. Conductors and Cables: Legible from the point of access.
   8. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws, rivets, self-adhesive backing, or epoxy cement and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

G. Secure rigid signs using stainless steel screws.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 260583
WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 260533.13 - Conduit for Electrical Systems.

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 262726 - Wiring Devices.

E. Section 262816.16 - Enclosed Switches.

1.03 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices.

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications.

C. NFPA 70 - National Electrical Code.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
   2. Determine connection locations and requirements.

B. Sequencing:
   1. Install rough-in of electrical connections before installation of equipment is required.
   2. Make electrical connections before required start-up of equipment.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Comply with NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Disconnect Switches: As specified in Section 262816.16 and in individual equipment sections.

C. Wiring Devices: As specified in Section 262726.

D. Flexible Conduit: As specified in Section 260533.13.

E. Wire and Cable: As specified in Section 260519.

F. Boxes: As specified in Section 260533.16.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 262813
FUSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fuses.

1.02 RELATED REQUIREMENTS

A. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

B. Section 262413 - Switchboards: Fusible switches.

C. Section 262416 - Panelboards: Fusible switches.

D. Section 262419 - Motor-Control Centers: Fusible switches.

E. Section 262513 - Low-Voltage Busways: Fusible switches.

F. Section 262816.16 - Enclosed Switches: Fusible switches.

G. Section 262913 - Enclosed Controllers: Fusible switches.

1.03 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses.

B. NFPA 70 - National Electrical Code.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements.

D. UL 248-4 - Low-Voltage Fuses - Part 4: Class CC Fuses.

E. UL 248-8 - Low-Voltage Fuses - Part 8: Class J Fuses.

F. UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses.

G. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses.

H. UL 248-15 - Low-Voltage Fuses - Part 15: Class T Fuses.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Fuses: One set(s) of three for each type and size installed.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bussmann, a division of Eaton Corporation: www.cooperindustries.com.

B. Littelfuse, Inc: www.littelfuse.com.

C. Mersen: ep-us.mersen.com.

D. Substitutions: See Section 016000 - Product Requirements.

2.02 APPLICATIONS

A. Service Entrance:

1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.
2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.

B. Feeders:
1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.
2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.

C. General Purpose Branch Circuits: Class RK1, time-delay.

D. Individual Motor Branch Circuits: Class RK1, time-delay.

E. In-Line Protection for Pole-Mounted Luminaires: Class CC, time-delay.

F. Primary Protection for Control Transformers: Class CC, time-delay.

2.03 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Class R Fuses: Comply with UL 248-12.

H. Class J Fuses: Comply with UL 248-8.

I. Class L Fuses: Comply with UL 248-10.

J. Class T Fuses: Comply with UL 248-15.

K. Class CC Fuses: Comply with UL 248-4.

L. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

M. Provide the following accessories where indicated or where required to complete installation:
1. Fuseholders: Compatible with indicated fuses.
2. Fuse Reducers: For adapting indicated fuses to permit installation in switch designed for fuses with larger ampere ratings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

SECTION 262816.13
ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed circuit breakers.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 260573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

C. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems.

D. NFPA 70 - National Electrical Code.

E. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.

F. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.

G. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.

H. UL 869A - Reference Standard for Service Equipment.

I. UL 943 - Ground-Fault Circuit-Interrupters.

J. UL 1053 - Ground-Fault Sensing and Relaying Equipment.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted enclosed circuit breakers where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.

C. Shop Drawings:

1. Include dimensioned plan and elevation views of enclosed circuit breakers and adjacent equipment with all required clearances indicated.

2. Include wiring diagrams showing all factory and field connections.

D. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed circuit breaker internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB/GE: www.geindustrial.com/#sle.

B. Eaton Corporation: www.eaton.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Substitutions: See Section 016000 - Product Requirements.

F. Source Limitations: Furnish enclosed circuit breakers and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED CIRCUIT BREAKERS

A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
1. Altitude: Less than 6,600 feet.
2. Ambient Temperature: Between 23 degrees F and 104 degrees F.

D. Short Circuit Current Rating:
1. Provide enclosed circuit breakers with listed short circuit current rating as indicated on the drawings.

E. Conductor Terminations: Suitable for use with the conductors to be installed.

F. Provide thermal magnetic circuit breakers unless otherwise indicated.

G. Provide electronic trip circuit breakers where indicated.

H. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

I. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

J. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.
b. Outdoor Locations: Type 4X stainless steel.

2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
3. Provide surface-mounted enclosures.

K. Provide externally operable handle with means for locking in the OFF position.

L. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

2.03 MOLDED CASE CIRCUIT BREAKERS

A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489; ratings, configurations, and features as indicated on the drawings.

B. Interrupting Capacity:
1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating as indicated on drawings.
2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

C. Conductor Terminations:
1. Provide mechanical lugs.
2. Provide compression lugs.
3. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

D. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

E. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
1. Provide the following field-adjustable trip response settings:
a. Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
b. Long time delay.
c. Short time pickup and delay.
d. Instantaneous pickup.
e. Ground fault pickup and delay where ground fault protection is indicated.

F. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

G. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.

H. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.

I. Do not use handle ties in lieu of multi-pole circuit breakers.

J. Do not utilize multi-pole circuit breakers for multi-wire branch circuits. Utilize single-pole breakers and single neutrals for every branch circuit instead.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed circuit breakers.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 260529.

E. Provide required seismic controls in accordance with Section 260548.

F. Install enclosed circuit breakers plumb.

G. Install flush-mounted, as indicated on drawings, enclosed circuit breakers so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

I. Provide grounding and bonding in accordance with Section 260526.

J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

K. Set field-adjustable circuit breaker tripping function settings as indicated.

L. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

M. Identify enclosed circuit breakers in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with manufacturer's instructions and NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1for circuit breakers used for service entrance and for circuit breakers larger than 200 amperes. Tests listed as optional are not required.

D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

E. Test GFCI circuit breakers to verify proper operation.

F. Test shunt trips to verify proper operation.

G. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from circuit breaker enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 262816.16
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 262813 - Fuses.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction.

B. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum).

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems.

E. NFPA 70 - National Electrical Code.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.

H. UL 98 - Enclosed and Dead-Front Switches.

I. UL 869A - Reference Standard for Service Equipment.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of enclosed switches.
   2. Include wiring diagrams showing all factory and field connections.

D. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB/GE: www.geindustrial.com/#sle.

B. Eaton Corporation: www.eaton.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Substitutions: Not permitted.

F. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project.

2.02 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy or general duty as indicated; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:
   1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating as indicated on the drawings.

G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

H. Provide with switch blade contact position that is visible when the cover is open.

I. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
   1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

J. Conductor Terminations: Suitable for use with the conductors to be installed.

K. Provide insulated, groundable fully rated solid neutral assembly, with a suitable lug for terminating each neutral conductor.

L. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

M. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 4X stainless steel.
   2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

N. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

O. Heavy Duty Switches:
   1. Comply with NEMA BS 31047.
   2. Conductor Terminations:
      a. Provide mechanical lugs.
      b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

P. General Duty Switches:
   1. Conductor Terminations:
      a. Provide mechanical lugs.
      b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Provide externally operable handle with means for locking in the OFF position, capable of accepting two padlocks.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 260529.

E. Provide required seismic controls in accordance with Section 260548.

F. Install enclosed switches plumb.

G. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

H. Provide grounding and bonding in accordance with Section 260526.

I. Provide fuses complying with Section 262813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

K. Identify enclosed switches in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 262923
VARIABLE-FREQUENCY MOTOR CONTROLLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Variable-frequency motor controllers for low-voltage (600 V and less) AC motor applications.

B. Overcurrent protective devices for motor controllers, including overload relays.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260548 - Vibration and Seismic Controls for Electrical Systems.
   1. Includes requirements for seismic qualification of equipment specified in this section.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 262813 - Fuses.

1.03 REFERENCE STANDARDS

A. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

E. NEMA IA 10030 - Industrial Control and Systems: Enclosures.

F. NEMA IA 10039 - Control Circuit and Pilot Devices.

G. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts.

H. NEMA ICS 61800-2 - Adjustable Speed Electrical Power Drive Systems, Part 2: General Requirements-Rating Specifications for Low Voltage Adjustable Frequency AC Power Drive Systems.

I. NEMA IS 10033 - Industrial Control and Systems: Adjustable-Speed Drives.

J. NEMA IS 10033 - Industrial Control and Systems: Adjustable-Speed Drives.

K. NEMA IS 10034 - Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems.

L. NEMA IS 10035 - Application Guide for AC Adjustable Speed Drive Systems.

M. NEMA MG 00001 - Motors and Generators.

N. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems.

O. NFPA 70 - National Electrical Code.

P. UL 508A - Industrial Control Panels.

Q. UL 61800-5-1 - Standard for Adjustable Speed Electrical Power Drive Systems - Part 5-1: Safety Requirements – Electrical, Thermal, and Energy (Ed. 2).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate work to avoid placement of ductwork, piping, equipment, and other obstructions within dedicated equipment spaces and working clearances required by NFPA 70.
   2. Coordinate work to provide motor controllers suitable for use with motors.

3. Coordinate work to provide controllers and associated wiring suitable for interface with control devices.
4. Coordinate arrangement of electrical equipment with dimensions and clearance requirements.
5. Verify with manufacturer that conductor terminations are suitable for use with conductors.
6. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for motor controllers, enclosures, overcurrent protective devices, and other installed components and accessories.

C. Shop Drawings: Indicate dimensions, voltage, controller sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
1. Include wiring diagrams showing factory and field connections.
2. Identify mounting conditions required for equipment seismic qualification.

D. Manufacturer's equipment seismic qualification certification.

E. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

F. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

G. Project Record Documents: Record actual installed locations of controllers and final equipment settings.
1. Include nameplate data of actual installed motors and associated overload relay selections and settings.
2. Motor Circuit Protectors: Include magnetic instantaneous trip settings.

H. Operation Data: NEMA IS 10034. Include instructions for starting and operating controllers, and describe operating limits that may result in hazardous or unsafe conditions.

I. Maintenance Data: NEMA IS 10034. Include routine preventive maintenance schedule.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in clean, dry space. Maintain factory wrapping or provide additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to internal components, enclosure, and finish.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide minimum 18-month manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Variable-Frequency Motor Controllers:
1. ABB: www.abb.com/#sle.
2. ABB/GE: www.electrification.us.abb.com/#sle.

3. Danfoss: www.danfoss.com/#sle.
4. Eaton Corporation: www.eaton.com/#sle.
5. Rockwell Automation, Inc.; Allen-Bradley Products: ab.rockwellautomation.com/#sle.
6. Schneider Electric; Square D Products: www.se.com/#sle.
7. Siemens Industry, Inc: www.new.siemens.com/#sle.

B. Substitutions: See Section 016000 - Product Requirements.

C. Source Limitations: Furnish variable-frequency motor controllers and associated components produced by a single manufacturer and obtained from a single supplier.

2.02 VARIABLE-FREQUENCY MOTOR CONTROLLERS

A. Provide variable-frequency motor control system consisting of required controller assemblies, operator interfaces, control power transformers, instrumentation and control wiring, sensors, accessories, system programming, etc. as necessary for complete operating system.

B. Provide products listed, classified, and labeled as suitable for purpose intended.

C. Controller Assemblies: Comply with NEMA IS 10033, NEMA IS 10034, and NEMA ICS 61800-2; list and label as complying with UL 61800-5-1 or UL 508A as applicable.

D. Provide controllers selected for actual installed motors and coupled mechanical loads in accordance with NEMA IS 10035, NEMA MG 00001 Part 30, and recommendations of manufacturers of both controller and load, where not in conflict with specified requirements; considerations include, but are not limited to:
1. Motor type (e.g., induction, reluctance, and permanent magnet); consider NEMA MG 00001 design letter or inverter duty rating for induction motors.
2. Motor load type (e.g., constant torque, variable torque, and constant horsepower); consider duty cycle, impact loads, and high inertia loads.
3. Motor nameplate data.
4. Requirements for speed control range, speed regulation, and braking.
5. Motor suitability for bypass starting method, where applicable.

E. Devices on Load Side of Controller: Suitable for application across full controller output frequency range.

F. Operating Requirements:
1. Input Voltage Tolerance: Plus/minus 10 percent of nominal.
2. Input Frequency Tolerance: Plus/minus 5 percent of nominal.
3. Efficiency: Minimum of 96 percent at full speed and load.
4. Input Displacement Power Factor: Minimum of 0.96 throughout speed and load range.
5. Overload Rating:
   a. Variable Torque Loads: Minimum of 110 percent of nominal for 60 seconds.
   b. Constant Torque Loads: Minimum of 150 percent of nominal for 60 seconds.

G. Power Conversion System: Microprocessor-based, pulse width modulation type consisting of rectifier/converter, DC bus/link, and inverter.
1. Rectifier/Converter: Diode-based, 6-pulse type unless otherwise indicated.

H. Control System:
1. Provide microprocessor-based control system for automatic control, monitoring, and protection of motors. Include sensors, wiring, and connections necessary for functions and status/alarm indications specified.
2. Provide integral operator interface for controller programming, display of status/alarm indications, fault reset, and local control functions including motor run/stop, motor forward/reverse selection, motor speed increase/decrease, and local/remote control selection.
3. Control Functions:
   a. Control Method: Selectable vector and scalar/volts per hertz unless otherwise indicated.

1) Scalar/Volts per Hertz Control: Provide IR compensation for improved low-speed torque.
2) Vector Control: Provide selectable autotuning function.

b. Adjustable acceleration and deceleration time; linear and S-curve ramps; selectable coast to stop.
c. Selectable braking control; DC injection or flux braking.
d. Adjustable minimum/maximum speed limits.
e. Adjustable pulse width modulation switching carrier frequency.
f. Adjustable motor slip compensation.
g. Selectable autorestart after noncritical fault; programmable number of time delay between restart attempts.

4. Status Indications:
   a. Motor run/stop status.
   b. Motor forward/reverse status.
   c. Local/remote control status.
   d. Output voltage.
   e. Output current.
   f. Output frequency.
   g. DC bus voltage.
   h. Motor speed.
5. Protective Functions/Alarm Indications:
   a. Overcurrent.
   b. Motor overload.
   c. Undervoltage.
   d. Overvoltage.
   e. Controller overtemperature.
   f. Input/output phase loss.
   g. Output short circuit protection.
   h. Output ground fault protection.
6. Inputs:
   a. Digital Input(s): Three.
   b. Analog Input(s): Two.
7. Outputs:
   a. Analog Output(s): One.
   b. Relay Output(s): Two.
8. Communications: Compatible with connected systems. Provide accessories necessary for proper interface.
   a. Serial Communications: RS-485; support for Modbus RTU protocol.
   b. Ethernet Communications: Support for Modbus TCP protocol.
   c. Remote Monitoring Capabilities:
      1) Motor run/stop status.
      2) Hand-off-auto status.
      3) Fault information.
      4) Discrete input/output status.
      5) Analog input/output values.
9. Features:
   a. Password-protected security access.
   b. Event log.

I. Power Conditioning/Filtering:
   1. Provide DC link choke or input/line reactor for each controller unless otherwise indicated or required.
   2. Provide input surge protection.

3. Reactor Impedance: 3 percent, unless otherwise indicated or required.

J. Packaged Controllers: Controllers factory-mounted in separate enclosure with externally operable disconnect and specified accessories.
   1. Disconnects: Circuit breaker or disconnect switch type.
      a. Disconnect Switches: Fusible type or nonfusible type with separate input fuses.
      b. Provide externally operable handle with means for locking in OFF position. Provide safety interlock to prevent opening cover with disconnect in ON position with capability of overriding interlock for testing purposes.
      c. Provide auxiliary interlock for disconnection of external control power sources where applicable.
   2. Provide door-mounted remote operator interface.
   3. Packaged Controllers with Bypass: Provide contactors and controls to enable removal of variable-frequency controller from circuit.
      a. Bypass Method: Manual, unless otherwise indicated.
      b. Bypass Configuration: 3-contactor type, with contactors for bypass, drive output, and drive input.
      c. Bypass Motor Starting Method: Full-voltage (across-the-line) with overload relay, unless otherwise indicated or required.
      d. Overload Relays: Solid state or bimetallic thermal type.
   4. Pilot Devices Required:
      a. Furnish local pilot devices for each unit as specified below unless otherwise indicated on drawings, except where equivalent function is provided by remote operator interface.
      b. Packaged Controllers with Bypass:
         1) Bypass Mode Selector Switch: DRIVE/OFF/BYPASS.
         2) Motor Control Selector Switch: HAND/OFF/AUTO.
         3) Indicating Lights: For drive/bypass mode status, drive/bypass run status, and drive/bypass fault status.

K. Seismic Qualification: Provide controllers and associated components suitable for application under seismic design criteria specified in Section 260548 where required. Include certification of compliance with submittals.

L. Service Conditions:
   1. Provide controllers and associated components suitable for operation under following service conditions without derating:
      a. Altitude: Less than 3,300 feet.
      b. Ambient Temperature: Between 32 degrees F and 104 degrees F.
   2. Provide controllers and associated components suitable for operation at indicated ratings under service conditions at installed location.

M. Short Circuit Current Rating:
   1. Provide line/input reactors where specified by manufacturer for required short circuit current rating.

N. Conductor Terminations: Suitable for use with conductors to be installed.

O. Enclosures:
   1. Comply with NEMA IA 10030.
   2. NEMA EN 10250 Environment Type or Equivalent IEC 60529 Rating: Unless otherwise indicated, as specified for following installation locations:
   3. Finish: Manufacturer's standard unless otherwise indicated.
   4. Cooling: Forced air or natural convection as determined by manufacturer.

2.03 OVERCURRENT PROTECTIVE DEVICES

A. Overload Relays:

1. Provide overload relays and, where applicable, associated current elements/heaters selected for actual installed motor nameplate data, in accordance with manufacturer's recommendations and NFPA 70; include consideration for motor service factor and ambient temperature correction, where applicable.
2. Comply with NEMA ICS 2.
3. Inverse-Time Trip Class Rating: Class 20 unless otherwise indicated or required.
4. Trip-free operation.
5. Visible trip indication.
6. Resettable.
    a. Employ manual reset unless otherwise indicated.
    b. Do not employ automatic reset with two-wire control.
7. Bimetallic Thermal Overload Relays:
    a. Interchangeable current elements/heaters.
    b. Adjustable trip; plus/minus 10 percent of nominal, minimum.
    c. Trip test function.
8. Solid State Overload Relays:
    a. Adjustable full load current.
    b. Phase loss protection.
    c. Phase imbalance protection.
    d. Ambient temperature insensitive.
    e. Thermal memory.
    f. Trip test function.
    g. Provide isolated alarm contact.

2.04 ACCESSORIES

A. Auxiliary Contacts:
1. Comply with NEMA IA 10039.
2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each bypass motor starter, minimum.

B. Pilot Devices:
1. Comply with NEMA IA 10039; heavy-duty type.
2. Pushbuttons: Unless otherwise indicated, provide momentary, nonilluminated type with flush button operator; normally open or normally closed as indicated or as required.
3. Selector Switches: Unless otherwise indicated, provide maintained, nonilluminated type with knob operator; number of switch positions as indicated or as required.
4. Indicating Lights: Push-to-test type unless otherwise indicated.
5. Provide LED lamp source for indicating lights and illuminated devices.

C. Control and Timing Relays:
1. Comply with NEMA IA 10039.
2. Provide number and type of relays indicated or required to perform necessary functions.

D. Control Power Transformers:
1. Size to accommodate burden of contactor coil(s) and connected auxiliary devices, plus _____ VA spare capacity.
2. Include primary and secondary fuses.

E. Control Terminal Blocks: Include 25 percent spare terminals.

F. Variable Frequency Controllers: Enclosed controllers suitable for operating the indicated loads, in compliance with requirements of NEMA IS 10033. Select unspecified features and options in accordance with NEMA ICS 3.1.

G. Enclosures: NEMA EN 10250, Type 1, suitable for equipment application in places restricted to persons employed on the premises.

H. Finish: Manufacturer's standard enamel.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install controllers in accordance with NECA 1 (general workmanship).

C. Install in accordance with NEMA IS 10034 and manufacturer's instructions.

D. Do not exceed manufacturer's recommended maximum cable length between controller and motor.

E. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

F. Provide required support and attachment in accordance with Section 260529.

G. Install controllers plumb and level.

H. Provide grounding and bonding in accordance with Section 260526.

I. Install field-installed devices, components, and accessories.

J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

K. Set field-adjustable settings of controllers and associated components according to installed motor requirements, in accordance with recommendations of manufacturers of controller and load.

L. Set field-adjustable circuit breaker tripping function settings as indicated.

M. Tighten accessible connections and mechanical fasteners after placing controller.

N. Provide fuses in fusible switches; refer to Section 262813 for product requirements.

O. Select and install overload heater elements in motor controllers to match installed motor characteristics.

P. Identify controllers in accordance with Section 260553.

3.02 FIELD QUALITY CONTROL

A. Provide the service of the manufacturer's field representative to prepare and start controllers.

B. Perform field inspection and testing in accordance with Section 014000.

C. Inspect and test in accordance with NETA ATS, except Section 4.

D. Perform inspections and tests listed in NETA ATS, Section 7.17. Insulation-resistance test on control wiring listed as optional is not required.

E. Packaged Controllers with Bypass: Test for proper operation in both drive and bypass modes.

F. Correct deficiencies and replace damaged or defective controllers or associated components.

3.03 CLEANING

A. Clean dirt and debris from controller enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

3.04 CLOSEOUT ACTIVITIES

A. Demonstrate operation of controllers in automatic and manual modes.

END OF SECTION

SECTION 311000
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing and protection of vegetation.

B. Removal of existing debris.

1.02 RELATED REQUIREMENTS

A. Section 011010 - Project Summary - Bid Packages : Limitations on Contractor's use of site and premises.

B. Section 011010 - Project Summary - Bid Packages : Sequencing and staging requirements.

C. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

D. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.

E. Section 017419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

F. Section 312200 - Grading: Topsoil removal.

G. Section 312200 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

H. Section 312323 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

I. Section 329300 - Plants: Relocation of existing trees, shrubs, and other plants.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 PREPARATION

A. Call Missouri One Call System at 1-800-DIG-RITE (1-800-344-7483) not less than two working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

3.02 SITE CLEARING

A. Comply with other requirements specified in Section 017000.

B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.03 EXISTING UTILITIES AND BUILT ELEMENTS

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Protect existing structures and other elements that are not to be removed.

3.04 VEGETATION

A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, playing fields, lawns, and planting beds.

B. Do not remove or damage vegetation beyond the limits indicated on drawings.

C. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
   1. At vegetation removal limits.
   2. Around trees to remain within vegetation removal limits; locate no closer to tree than at the drip line.
   3. See Section 015000 for fence construction requirements.

D. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

E. Vegetation Removed: Do not burn, bury, landfill, or leave on site.
   1. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.

F. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.05 DEBRIS

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 312200
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of topsoil.

B. Rough grading the site for pavements.

C. Replacement of topsoil and finish grading.

1.02 RELATED REQUIREMENTS

A. Section 311000 - Site Clearing.

B. Section 312316 - Excavation.

C. Section 312316.13 - Trenching: Trenching and backfilling for utilities.

D. Section 312323 - Fill: Filling and compaction.

E. Section 329223 - Sodding: Finish ground cover.

F. Section 329300 - Plants: Topsoil in beds and pits.

1.03 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil- Soil Type S2: Topsoil excavated on-site.
   1. Graded.
   2. Acidity range (pH) of 5.5 to 7.5.
   3. Containing a minimum of 4 percent and a maximum of 30 percent inorganic matter.
   4. Conforming to ASTM D2487 Group Symbol OL, OH, and PT.
   5. Limit decaying matter to 10 percent of total content by volume.
   6. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Verify the absence of standing or ponding water.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Call Missouri One Call System at 1-800-DIG-RITE (1-800-344-7483) not less than two working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

C. Stake and flag locations of known private utilities.

D. Locate, identify, and protect from damage above- and below-grade utilities to remain.

E. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.

F. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.

3.03 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded.

B. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

C. Do not remove wet subsoil , unless it is subsequently processed to obtain optimum moisture content.

D. When excavating through roots, perform work by hand and cut roots with sharp axe.

E. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

F. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

G. Level and contour surfaces to elevations and gradients indicated.

3.04 SOIL REMOVAL AND STOCKPILING

A. Remove excavated topsoil from site.

B. Stockpile subsoil to be re-used on site; remove remainder from site.

C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

3.05 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1 inch in size. Remove soil contaminated with petroleum products.

C. Where topsoil is to be placed, scarify surface to depth of 3 inches.

D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 6 inches.

E. Place topsoil in areas where sodding and planting are indicated.

F. Place topsoil where required to level finish grade.

G. Place topsoil to the following compacted thicknesses:
   1. Areas to be Sodded: 6 inches.

H. Place topsoil during dry weather.

I. Remove roots, weeds, rocks, and foreign material while spreading.

J. Near plants and buildings spread topsoil manually to prevent damage.

K. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

L. Roll placed topsoil.

M. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.06 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.

B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

C. Top Surface of Finish Grade at Curbs and Sidewalks: Top of curb or sidewalk elevation or greater.

D. Top Surface of Finish Grade at Pavement Edges: Top of pavement elevation.

3.07 REPAIR AND RESTORATION

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition at no cost to Owner.

B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Architect as to remedy.

C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

3.08 FIELD QUALITY CONTROL

A. See Section 312323 - Fill for compaction density testing.

3.09 CLEANING

A. Remove unused stockpiled subsoil. Grade stockpile area to prevent standing water.

B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 312316
EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for paving and site structures.

1.02 RELATED REQUIREMENTS

A. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring. General requirements for dewatering of excavations and water control.

B. Section 311000 - Site Clearing: Vegetation and existing debris removal; topsoil removal.

C. Section 312200 - Grading: Grading.

D. Section 312316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

E. Section 312323 - Fill: Fill materials, backfilling, and compacting.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for general requirements applicable to unit prices for excavation.

B. Excavating Unsuitable Soil Materials:
   1. Measurement method: By the cubic yard.
   2. Includes: Excavating below required elevations to remove unsuitable soil materials, loading and removing from site.
   3. Does Not Include Over-Excavation: Payment will not be made for over-excavated work nor for replacement materials.

C. See Section 312323 - Fill, for measurement and payment provisions related to fill.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Call Missouri One Call System at 1-800-DIG-RITE (1-800-344-7483) not less than two working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

C. Locate, identify, and protect utilities that remain and protect from damage.

D. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Architect.

3.03 EXCAVATING

A. Underpin adjacent structures that could be damaged by excavating work.

B. Excavate to accommodate new structures and construction operations.

C. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

D. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

E. Do not interfere with 45 degree bearing splay of foundations.

F. Cut utility trenches wide enough to allow inspection of installed utilities.

G. Hand trim excavations. Remove loose matter.

H. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 312323.

I. Provide temporary means and methods, as required, to remove all water from excavations until directed by Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

J. Determine the prevailing groundwater level prior to excavation. If the proposed excavation extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Architect. If the proposed excavation extends more than 1 foot into the excavation, control groundwater intrusion with a comprehensive dewatering procedures, or as directed by the Geotechnical Engineer.

K. Remove excavated material that is unsuitable for re-use from site.

L. Stockpile excavated material to be re-used in area designated on site in accordance with Section 312200.

M. Remove excess excavated material from site.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces by Architect before placement of foundations.

3.05 PROTECTION

A. Divert surface flow from rains or water discharges from the excavation.

B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.

D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION

SECTION 312316.13
TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Section 312200 - Grading: Site grading.

B. Section 312316 - Excavation: Building and foundation excavating.

C. Section 312323 - Fill: Backfilling at building and foundations.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for general requirements applicable to unit prices for earthwork.

B. Excavating Unsuitable Soil Materials:
   1. Measurement method: By the cubic yard.
   2. Includes: Excavating below required elevations, loading and removing from site.
   3. Does Not Include Over-Excavation: Payment will not be made for over-excavated work nor for replacement materials.

C. Granular Fill Replacing Unsuitable Soil:
   1. Measurement Method: By the cubic yard in place.
   2. Includes: Supplying fill, stockpiling, scarifying substrate surface, placing where required, and compacting.

D. Geotextile Stabilization Fabric:
   1. Measurement Method: By the Square Yard in place.
   2. Includes: Cutting and placing where required.

1.04 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings and to meet requirements for topsoil placement specified in Section 312200 - Grading.

1.05 REFERENCE STANDARDS

A. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

C. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.

D. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

E. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

F. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

G. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Samples: 10 lb sample of each type of imported fill; submit in air-tight containers to testing laboratory.

C. Materials Sources: Submit name of imported materials source.

D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

E. Compaction Density Test Reports by Owner's Testing Agency.

1.07 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where designated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill- Fill Type S1: Subsoil excavated on site or imported borrow material.
   1. Graded.
   2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
   3. Complying with ASTM D2487 Group Symbol CL.

B. Concrete for Fill: Lean concrete. Minimum compressive strength of 2500 psi.

C. Granular Fill Under Pavements and Structures - Fill Type A1: Coarse aggregate, conforming to County of St. Louis Department of Highways and Traffic standard specification section 1007 - Aggregate Base Material, Type 5.
   1. Graded in accordance with ASTM C 136, within the following limits:
      a. 1 inch sieve: 100 percent passing.
      b. 1/2 inch sieve: 90 to 60 percent passing.
      c. No. 4 sieve: 60 to 35 percent passing.
      d. No. 30 sieve: 35 to 10 percent passing.
      e. No. 200 sieve: 15 to 0 percent passing.
      f. The fraction passing the No. 40 sieve shall have a maximum plasticity index of 6.

D. Granular Fill Replacing Unsuitable Soil - Fill Type A2: Coarse aggregate, conforming to ASTM D448 standard specification size number 357.
   1. Graded in accordance with ASTM C 136, within the following limits:
      a. 2-1/2 inch sieve: 100 percent passing.
      b. 2 inch sieve: 100 to 95 percent passing.
      c. 1 inch sieve: 70 to 35 percent passing.
      d. 1/2 inch sieve: 30 to 10 percent passing.
      e. No. 4 sieve: 5 to 0 percent passing.

E. Granular Fill for Drainage - Fill Type A3: Coarse aggregate, conforming to County of St. Louis Department of Highways and Traffic standard specification section 1009 - Aggregate For Drainage, Grade 3.
   1. Graded in accordance with ASTM C 136, within the following limits:
      a. 1 inch sieve: 100 percent passing.
      b. 3/4 inch sieve: 100 to 85 percent passing.
      c. 3/8 inch sieve: 55 to 15 percent passing.
      d. No. 4 sieve: 10 to 0 percent passing.

F. Bedding for Utility Pipes and Conduits, 3 Inch Diameter And Over - Fill Type A4: Coarse aggregate, conforming to ASTM D 448 standard specification size number 68.
   1. Graded in accordance with ASTM C 136, within the following limits:
      a. 1 inch sieve: 100 percent passing.

b. 3/4 inch sieve: 100 to 90 percent passing.
c. 3/8 inch sieve: 65 to 30 percent passing.
d. No. 4 sieve: 25 to 5 percent passing.
e. No. 8 sieve: 10 to 0 percent passing.

G. Bedding for Sanitary and Storm Sewer Pipes - Fill Type A5: Coarse aggregate, conforming to Metropolitan St. Louis Sewer District standard specification section 2.K.2 - MSD-1 Bedding.
1. Graded in accordance with ASTM C 136, within the following limits:
a. 1 inch sieve: 100 percent passing.
b. 3/4 inch sieve: 100 to 90 percent passing.
c. 1/2 inch sieve: 60 to 35 percent passing.
d. No. 100 sieve: 10 to 0 percent passing.

H. Topsoil: See Section 312200.

2.02 ACCESSORIES

A. Geotextile Stabilization Fabric: Non-biodegradable, woven; Mirafi-HP570 manufactured by TenCate. www.tencate.com

B. Substitutions: See Section 016000 - Product Requirements.

2.03 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, testing of samples for compliance will be provided before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Call Missouri One Call System at 1-800-DIG-RITE (1-800-344-7483) not less than two working days before performing Work.
1. Request underground utilities to be located and marked within and surrounding construction areas.

C. Locate, identify, and protect utilities that remain and protect from damage.

D. Notify utility company to remove and relocate utilities.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Protect plants, lawns, rock outcroppings, and other features to remain.

G. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Architect.

3.03 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.
1. Architect reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.04 TRENCHING

A. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet to angle of repose or less until sheeted or shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches 2 feet wider than outside diameter of pipe or conduit unless indicated otherwise on Drawings.

E. Hand trim excavations. Hand trim for bell and spigot pipe joints. Remove loose matter.

F. Provide uniform and continuous bearing and support for bedding material, pipes, and conduits.

G. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

H. Remove water or materials from the trench that interfere with Work.

I. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard measured by volume. See Section 312316.26 for removal of larger material.

J. Remove excavated material that is unsuitable for re-use from site.

K. Stockpile excavated material to be re-used in area designated on site in accordance with Section 312200.

L. Remove excess excavated material from site.

M. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

N. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Architect.

O. Do not advance open trench more than 200 feet ahead of installed pipe.

3.05 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support trenches more than 4 feet deep excavated through unstable, loose, or soft material.
   1. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.
   2. Design sheeting, shoring, bracing, or other protection to be removed at completion of excavation work.

C. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil at no cost to Owner.

D. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing at no cost to Owner.

3.06 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place to elevations directed by Architect. Line over excavated trench bottom and sides with Geotextile Stabilization Fabric. Backfill to original subgrade elevation with Fill Type A2.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.07 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Fill up to subgrade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

H. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

I. Correct areas that are over-excavated.
   1. Thrust bearing surfaces: Fill with concrete.
   2. All areas except thrust bearing surfaces: Use Fill Type A1, flush to required elevation, compacted to minimum 95 percent of maximum dry density.

J. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving, slabs-on-grade, and similar construction: 95 percent of maximum dry density.
   2. At other locations: 90 percent of maximum dry density.

K. Do not leave more than 50 feet of trench open at end of working day.

L. Protect open trench to prevent danger to Owner and the public.

M. Reshape and re-compact fills subjected to vehicular traffic.

3.08 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Utility Piping and Conduits Under 3 Inch Diameter:
   1. Bedding: Use Fill Type A7.
   2. Cover with Fill Type S1 under landscape areas.
   3. Cover with Fill Type A1 under pavements and structures.

B. Utility Piping and Conduits 3 Inch Diameter And Over:
   1. Bedding: Use Fill Type A4.
   2. Cover with Fill Type S1 under landscape areas.
   3. Cover with Fill Type A1 under pavements and structures.

C. Sanitary and Storm Sewer Piping:
   1. Bedding: Use Fill Type A5 or A6 as appropriate for pipe size and material.
   2. Cover with Fill Type S1 under landscape areas.
   3. Cover with Fill Type A1 under pavements and structures.

D. Pipe Culverts:
   1. Bedding: Use Fill Type A5 or A6 as appropriate for pipe size and material.
   2. Cover with Fill Type A1.

E. Subdrainage Piping at Foundation Perimeter, Under Slabs, and Behind Retaining Walls:
   1. Filter aggregate and geotextile fabric: Section 33 4600.
   2. Cover filter aggregate with Fill Type A3.
   3. Place geotextile fabric in trench to separate drainage fill from soil.

F. At French Drains:
   1. Use Fill Type A3.
   2. Place geotextile fabric in trench to separate drainage fill from soil.

3.09 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1/2 inch from required elevations.

3.10 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.

C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Tests: 1 test for each lift for each 100 feet of trench length.

3.11 CLEANING

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 312323
FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Section 312200 - Grading: Removal and handling of soil to be re-used.

B. Section 312200 - Grading: Site grading.

C. Section 312316 - Excavation: Removal and handling of soil to be re-used.

D. Section 312316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for general requirements applicable to unit prices for earthwork.

B. Granular Fill Replacing Unsuitable Soil:
   1. Measurement Method: By the cubic yard.
   2. Includes: Excavating existing material, stockpiling, scarifying substrate surface, placing where required, compacting, and dewatering.

C. Geotextile Stabilization Fabric:
   1. Measurement Method: By the Square Yard in place.
   2. Includes: Cutting and placing where required.

1.04 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings.

1.05 REFERENCE STANDARDS

A. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.

C. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

D. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

E. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Samples: 10 pounds sample of each type of imported fill; submit in air-tight containers to testing laboratory.

C. Materials Sources: Submit name of imported materials source.

D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.

1.07 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where designated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill- Fill Type S1: Subsoil excavated on site or imported borrow material.
   1. Graded.
   2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
   3. Complying with ASTM D2487 Group Symbol CL.

B. Concrete for Fill: Lean concrete Minimum compressive strength of 2500 psi.

C. Granular Fill - Fill Type A1: Coarse aggregate, conforming to County of St. Louis Department of Highways and Traffic standard specification section 1007 - Aggregate Base Material, Type 5.
   1. Graded in accordance with ASTM C 136, within the following limits:
      a. 1 inch sieve: 100 percent passing.
      b. 1/2 inch sieve: 90 to 60 percent passing.
      c. No. 4 sieve: 60 to 35 percent passing.
      d. No. 30 sieve: 35 to 10 percent passing.
      e. No. 200 sieve: 15 to 0 percent passing.
      f. The fraction passing the No. 40 sieve shall have a maximum plasticity index of 6.

D. Granular Fill Replacing Unsuitable Soil - Fill Type A2: Coarse aggregate, conforming to ASTM D448 standard specification size number 357.
   1. Graded in accordance with ASTM C 136, within the following limits:
      a. 2-1/2 inch sieve: 100 percent passing.
      b. 2 inch sieve: 100 to 95 percent passing.
      c. 1 inch sieve: 70 to 35 percent passing.
      d. 1/2 inch sieve: 30 to 10 percent passing.
      e. No. 4 sieve: 5 to 0 percent passing.

E. Topsoil: See Section 312200.

2.02 ACCESSORIES

A. Geotextile Stabilization Fabric: Non-biodegradable, woven; Mirafi-HP570 manufactured by TenCate. www.tencate.com

B. Substitutions: See Section 016000 - Product Requirements.

2.03 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, testing of samples for compliance will be provided before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the Work are as indicated.

B. Identify required lines, levels, contours, and datum locations.

C. See Section 312200 - Grading for additional requirements.

D. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

A. Scarify subgrade surface to a depth of 6 inches to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Concrete Fill Type S1 Fill Type A1 or Fill Type A2 as directed by Architect.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Fill up to subgrade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

H. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

I. Correct areas that are over-excavated.
   1. Load-bearing foundation surfaces: Fill with concrete.
   2. Other areas: Use general fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density.

J. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving, footings, slabs-on-grade, footings, footings, similar construction, and footings: 95 percent of maximum dry density.
   2. At other locations: 90 percent of maximum dry density.

K. Reshape and re-compact fills subjected to vehicular traffic.

L. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.04 FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. At Footings:
   1. Use Fill Type S1.
   2. Compact each lift to 95 percent of maximum dry density on both sides of foundation walls and footings.
   3. Do not backfill against unsupported foundation walls.
   4. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

C. Over Subdrainage Piping at Foundation Perimeter and Under Slabs:
   1. Drainage fill and geotextile fabric: Section 334100 - Subdrainage.
   2. Cover drainage fill with Fill Type A3.

D. Over Buried Utility Piping, Conduits, and Duct Bank in Trenches:
   1. Bedding for under 3 Inch diameter: Use Fill Type A7.
   2. Bedding for 3 Inch diameter and over: Use Fill Type A4.

3. Cover with Fill Type S1.

E. At Lawn Areas:
   1. Use Fill Type S1.
   2. See Section 312200 - Grading for topsoil placement.

F. At French Drains:
   1. Use Fill Type A3.

3.05 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

3.06 CLEANING

A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 312500
EROSION AND SEDIMENTATION CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Permanent erosion and sediment control.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete for permanent erosion control structures indicated on drawings.

B. Section 312323 - Fill: Filling and compaction.

C. Section 329223 - Sodding: Permanent turf for erosion control.

D. Section 329300 - Plants: Permanent plantings for erosion control.

1.03 REFERENCE STANDARDS

A. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

B. ASTM D5338 - Standard Test Method for Determining Aerobic Biodegradation of Plastic Materials Under Controlled Composting Conditions, Incorporating Thermophilic Temperatures.

C. ASTM D7322/D7322M - Standard Test Method for Determination of Erosion Control Product (ECP) Ability to Encourage Seed Germination and Plant Growth Under Bench-Scale Conditions.

D. ASTM D7367 - Standard Test Method for Determining Water Holding Capacity of Fiber Mulches for Hydraulic Planting.

E. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit.

F. FHWA FLP-94-005 - Best Management Practices for Erosion and Sediment Control.

G. USDA TR-55 - Urban Hydrology for Small Watersheds; USDA Natural Resources Conservation Service.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Maintenance Instructions: Provide instructions covering inspection and maintenance for preventive measures that must remain after Substantial Completion.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, for Phases I and II, and in compliance with requirements of Construction General Permit (CGP), whether the project is required by law to comply or not.

B. Comply with more stringent requirements of St. Louis County Erosion and Sedimentation Control Manual.

C. Runoff Calculation Standard for Urban Areas: USDA TR-55.

2.02 ACCESSORY MATERIALS

A. Fill Material: See Section 312323.

B. Sod for Permanent Cover: Cultivated grass sod, type as indicated; with strong fibrous root system, free of stones, burned or bare spots.

C. Plants for Permanent Cover: Specie and sizes identified in plant schedule, grown in climatic conditions similar to those in locality of the work.

D. Concrete: See Section 033000.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

B. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish documentation required to obtain applicable permits.
   1. Obtain and pay for permits and provide security required by authority having jurisdiction.

C. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

3.03 FIELD QUALITY CONTROL

A. Provide analysis of topsoil fill; see Section 014000.

3.04 INSTALLATION

A. Hydroseeding: Apply seeded slurry with a hydraulic seeder at a rate of 275 lbs per acre evenly in two intersecting directions.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Immediately following seeding, apply mulch to a thickness of 1/8 inch. Maintain clear of shrubs and trees.

D. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

E. Following germination, immediately reseed areas without germinated seeds that are larger than 4 by 4 inches.

3.05 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.

B. Repair deficiencies immediately.

3.06 CLEAN UP

A. Clean out sediment control structures that are to remain as permanent measures.

END OF SECTION

SECTION 320519
GEOSYNTHETICS FOR EXTERIOR IMPROVEMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Geotextile for separation.

B. Geogrid for stabilization.

1.02 RELATED REQUIREMENTS

A. Section 311000 - Site Clearing.

B. Section 312200 - Grading.

C. Section 312316 - Excavation.

D. Section 312316.13 - Trenching.

E. Section 312323 - Fill.

1.03 REFERENCE STANDARDS

A. AASHTO M 288 - Standard Specification for Geosynthetics for Highway Applications.

B. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

C. ASTM D4833/D4833M - Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.

D. ASTM D5199 - Standard Test Methods for Measuring the Nominal Thickness of Geosynthetics.

E. ASTM D6637/D6637M - Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method.

F. ASTM D7737/D7737M - Standard Test Method for Individual Geogrid Junction Strength.

PART 2 PRODUCTS

2.01 GEOSYNTHETIC

A. Provide geosynthetic in largest size sheets possible to minimize field joining.

B. Uniform thickness in accordance with ASTM D5199.

2.02 GEOTEXTILE

A. General:
   1. Material: Polyethylene consisting of 5 percent maximum regrind and free of contaminants.
   2. Survivability: Class 1, when tested in accordance with AASHTO M 288.

B. Geotextile for Separation: Capable of restricting adjacent material mixing.
   1. Type: Woven.
   2. Seams: Loose laid.
      a. Overlap: According to manufacturer.
         1) 12 inches, minimum.
   3. Grab Strength: 300 lbf, minimum, when tested in accordance with ASTM D4632/D4632M.
   4. Puncture Strength: 450 lbf, minimum, when tested in accordance with ASTM D4833/D4833M.

2.03 GEOGRID

A. General:
   1. Material: Polyethylene consisting of 5 percent maximum regrind and free of contaminants.

B. Geogrid for Stabilization: Capable of reducing deformation of unbound granular materials.
   1. Seams: Loose laid.
      a. Overlap: 12 inches.

2. Ultimate Tensile Strength: 1,300 lbf/ft, minimum, when tested in accordance with ASTM D6637/D6637M.
3. Junction Strength: 25 lbf, minimum, when tested in accordance with ASTM D7737/D7737M.

END OF SECTION

SECTION 321120
SUBBASE AND AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Subbase course.

B. Geosynthetic reinforcement.

C. Aggregate base course.

1.02 RELATED REQUIREMENTS

A. Section 312200 - Grading.

B. Section 312316.13 - Trenching.

C. Section 312323 - Fill.

D. Section 321313 - Concrete Paving.

E. Section 321416 - Brick Unit Paving.

F. Section 321423 - Asphalt Unit Paving.

G. Section 321623 - Sidewalks.

1.03 REFERENCE STANDARDS

PART 2 PRODUCTS

2.01 MATERIALS

A. Subbase Course:
   1. Comply with County of St. Louis Department of Highways and Traffic standard.

B. Aggregate Base Course:
   1. Type 5 : Comply with County of St. Louis Department of Highways and Traffic standard.

PART 3 EXECUTION

3.01 PLACEMENT

A. Under Bituminous Concrete Paving:
   1. Subbase Compacted Thickness: According to design drawings.
   2. Aggregate Base Compacted Thickness: According to design drawings.

B. Under Portland Cement Concrete Paving:
   1. Subbase Compacted Thickness: According to design drawings.
   2. Aggregate Base Compacted Thickness: According to design drawings.

C. Under Unit Pavers:
   1. Subbase Compacted Thickness: According to design drawings.
   2. Aggregate Base Compacted Thickness: According to design drawings.

D. Place course in maximum 4 inch layers and roller compact to specified density.

E. Level and contour surfaces to elevations and gradients indicated.

F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

END OF SECTION

SECTION 321216
ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single course bituminous concrete paving for overlay.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. AI MS-2 - Asphalt Mix Design Methods.

B. AI MS-19 - Basic Asphalt Emulsion Manual.

C. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.

1.04 SUBMITTALS

A. Product Data: Submit product information and mix design to Owner.

B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with County of St. Louis Department of Highways and Traffic standards.

B. Mixing Plant: Complying with State of _____ Highways standard.

C. Obtain materials from same source throughout.

1.06 FIELD CONDITIONS

A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

B. Place bitumen mixture when temperature is not more than 15 F degrees below bitumen supplier's bill of lading and not more than maximum specified temperature.

PART 2 PRODUCTS

2.01 MATERIALS

A. Crack Filler/Sealant: Sealant material shall be in accordance with County of St. Louis Department of Highways and Traffic standard specifications, Section 1057.5, Joint and Crack Sealer, Hot-Poured Elastic Type.

B. Pavement Repair Membrane: See Section 320117.

C. Tack Coat: Emulsified asphalt in accordance with County of St. Louis Department of Highways and Traffic standard specifications, Section 407 - Tack Coat.

2.02 ASPHALT PAVING MIXES

A. Use dry material to avoid foaming. Mix uniformly.

B. Type C Overlay Course: In accordance with County of St. Louis Department of Highways and Traffic standard specifications, Section 405 - Bituminous Pavements and Base.

C. Mix Temperature: Not less than 200 degrees F at time of placement.

PART 3 EXECUTION

3.01 EXAMINATION

A. Contractor shall contact the Owner to arrange an inspection of the crack repair by the Owner and Contractor prior to placing the tack coat and overlay.

3.02 PREPARATION - CRACK REPAIR

A. Cracks 3/8 inch wide or less:

1. Remove and dispose of all loose debris in crack.
2. Place pavement repair membrane in accordance with requirements of Section 320117.
3. Apply tack coat in preparation for single course overlay.

B. Cracks over 3/8 inch wide:
1. Mill existing asphalt pavement along entire length of crack.
a. Width 18 inches.
1) Tolerance: Centered on crack within 6 inches +/-.
b. Depth 2 inches.
1) Tolerance: Within 1/4 inch +/-.
2. Remove and dispose of all loose debris in crack and milled channel.
3. Fill crack and milled channel with crack filler/sealant material to match finished grade of adjacent existing asphalt pavement.
4. Place pavement repair membrane over each joint between the existing asphalt pavement and the milled channel filled with crack filler/sealant material in accordance with the requirements of Section 320117.
5. Apply tack coat in preparation for single course overlay.

3.03 PREPARATION - TACK COAT

A. Apply tack coat in accordance with County of St. Louis Department of Highway and Traffic standard specifications, Section 407 - Tack Coat.

B. Apply tack coat on asphalt surfaces to receive overlay at uniform rate of 0.05 gal/sq yd.

C. Apply tack coat to contact surfaces of existing asphalt cold joints, concrete curbs, and concrete curb and gutters at uniform rate of 0.05 galy/sq yd.

3.04 PLACING ASPHALT PAVEMENT - SINGLE COURSE OVERLAY

A. Install Work in accordance with County of St. Louis Department of Highways and Traffic standards.

B. Place asphalt within 24 hours of applying tack coat.

C. Place to 2 inch compacted thickness.

D. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

E. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.05 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Compacted Thickness: Within 1/4 inch of specified or indicated thickness.

C. Variation from True Elevation: Within 1/2 inch.

3.06 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for quality control.

B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.

3.07 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for 2 days or until surface temperature is less than 140 degrees F.

END OF SECTION

SECTION 321313
CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete sidewalks, stair steps, ramps, vertical curbs, parking areas, and pads.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: retaining walls, light pole foundations, flag pole foundations, box culverts, and drainage channel head walls .

B. Section 312200 - Grading: Preparation of site for paving and base and preparation of subsoil at pavement perimeter for planting.

C. Section 312323 - Fill: Compacted subbase for paving.

D. Section 321123: Aggregate base course.

E. Section 321713 - Parking Bumpers: Precast concrete parking bumpers.

F. Section 321723.13 - Painted Pavement Markings: Pavement markings.

G. Section 321726 - Tactile Warning Surfacing: Plastic tactile and detectable warning tiles for pedestrian walking surfaces.

1.03 REFERENCE STANDARDS

A. ACI 211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide.

B. ACI 301 - Specifications for Concrete Construction.

C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

D. ACI 305R - Guide to Hot Weather Concreting.

E. ACI 306R - Guide to Cold Weather Concreting.

F. ASTM C33/C33M - Standard Specification for Concrete Aggregates.

G. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

H. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.

I. ASTM C150/C150M - Standard Specification for Portland Cement.

J. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

K. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.

L. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

M. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing.

N. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.

O. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types).

1.04 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Submit proposed concrete mix design test reports.

C. Product Data: Provide data on joint filler, admixtures, and curing compound.

PART 2 PRODUCTS

2.01 FORM MATERIALS

A. Form Materials: Conform to ACI 301.

B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).
   1. Thickness: 3/4 inch.

2.02 REINFORCEMENT

A. Steel Welded Wire Reinforcement: Plain type, ASTM A1064/A1064M; in flat sheets; galvanized.

2.03 CONCRETE MATERIALS

A. Obtain cementitious materials from same source throughout.

B. Cement: ASTM C150/C150M, Normal - Type I Portland cement, gray color.

C. Fine and Coarse Mix Aggregates: ASTM C33/C33M, Meramec sand only (lignite free).

D. Fly Ash: ASTM C618, Class C or F.

E. Calcined Pozzolan: ASTM C618, Class N.

F. Silica Fume: ACI 211.1.

G. Water: Clean, and not detrimental to concrete.

H. Air-Entraining Admixtures: ASTM C260/C260M.

2.04 ACCESSORIES

A. Tactile Warning Surfaces: See Section 321726.

B. Joint Sealer: Self-leveling, one part polyurethane in accordance with ASTM C920, Type S, Grade P, Use T.
   1. Acceptable Product: Sonneborn Sonolastic SL1.
   2. Substitutions: See 016000 - Product Requirements.

C. Reinforcement Accessories:
   1. Chairs, Bolsters, Bar Supports, Sacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   2. Provide stainless steel components for placement within 1-1/2 inches of weathering surfaces.

2.05 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Concrete Strength: Establish required average strength for concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
   1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Admixtures: Reducing and Accelerating admixtures will be allowed at the discretion of the Architect and only after review and approval of product information submittal by Contractor. Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.

D. Concrete Properties:

1. Compressive strength, when tested in accordance with ASTM C39/C39M at 28 days; 4,000 psi.
2. Total Air Content: minimum 5 percent, determined in accordance with ASTM C 173/C 173M.
3. Maximum Slump: 4 inches.
4. Maximum Aggregate Size: 1 inch.

2.06 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify compacted granular base or existing asphalt surface is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

C. Field Survey
1. Include in the scope of work for the concrete overlay a field survey of the existing surface elevations to assure that the final overlay is installed to a minimum thickness of 4 inches and that water will drain away from the building sturctures and towards the existing drainage structures.
2. Include in the scope of work additional concrete material to compensate for the undulations of the existing surfaces to receive the concrete overlay as required to maintain a minimum of 4 inches of thickness.

3.02 SUBBASE

A. See Section 321123 - Aggregate Base Courses for construction of base course for work of this Section.

3.03 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Coat surfaces of manhole, handhole, catch basin, handhole, and handhole frames with oil to prevent bond with concrete pavement.

C. Notify Architect minimum 24 hours prior to commencement of concreting operations.

3.04 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.05 REINFORCEMENT

A. Place reinforcement at midheight of slabs-on-grade. Utilize Chairs, Bolsters, Bar Suppirts, Spacers sized and shaped for adequate support of reinforcement during concrete placement.

B. Interrupt reinforcement at expansion joints.

3.06 COLD AND HOT WEATHER CONCRETING

A. Follow recommendations of ACI 305R when concreting during hot weather.

B. Follow recommendations of ACI 306R when concreting during cold weather.

C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

3.07 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Do not place concrete when base surface is wet.

C. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.

D. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

E. Place concrete to pattern indicated.

3.08 JOINTS

A. Align curb, gutter, and sidewalk joints.

B. Place 3/4 inch wide expansion joints at maximum of 20 foot intervals and to separate paving from vertical surfaces and other components and in pattern indicated.
   1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.
   2. Secure to resist movement by wet concrete.

C. Provide sawn joints.
   1. At maximum 5 feet intervals on sidewalks and in pattern indicated.
   2. At pattern indicated on paved areas other than sidewalks.
   3. Between sidewalks and curbs.
   4. Between curbs and pavement.

D. Provide keyed joints as indicated.

E. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.

3.09 FINISHING

A. Area Paving: Light broom, texture perpendicular to pavement direction.

B. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.

C. Curbs and Gutters: Light broom, texture parallel to pavement direction.

D. Inclined Ramps: Broomed perpendicular to slope.

3.10 JOINT SEALING

A. Place Joint Sealer after a minimum of 28 days or in accordance with manufacturer's instructions over all joints containing Joint Filler.

3.11 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

B. Maximum Variation From True Position: 1/4 inch.

3.12 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.
   1. Provide free access to concrete operations at project site and cooperate with appointed firm.
   2. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.

B. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of each class of concrete placed.

1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
2. Perform one slump test for each set of test cylinders taken.

C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.13 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit pedestrian or vehicular traffic over pavement for 7 days minimum after finishing.

END OF SECTION

SECTION 321623
SIDEWALKS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete sidewalks.

B. Concrete wheelchair ramps.

1.02 RELATED REQUIREMENTS

A. Section 321216 - Asphalt Paving.

B. Section 321313 - Concrete Paving.

C. Section 321726 - Tactile Warning Surfacing.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

C. ASTM C33/C33M - Standard Specification for Concrete Aggregates.

D. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.

E. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Concrete: Provide data on admixtures.

PART 2 PRODUCTS

2.01 CONCRETE SIDEWALKS AND WHEELCHAIR RAMPS

A. Concrete Forms: Wood.

B. Concrete Materials: Comply with ASTM C94/C94M.

C. Aggregate: Pit Run, washed, 3/8 inch (1 cm) stone; free of shale, clay, friable material and debris.

D. Reinforcement:
   1. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, plain type, flat sheets, unfinished.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify gradients and elevations of the subgrade are correct as shown on drawings. Where poor subgrade material is encountered, remove and replace with suitable material.

B. Verify compacted subgrade is acceptable, ready to support imposed loads and paving, and ready to receive work.

3.02 CONCRETE SIDEWALK AND WHEELCHAIR RAMP INSTALLATION

A. Forming:
   1. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
   2. Sidewalk Forms: Place and secure forms to location, dimension, profile, and gradient shown on drawings. Height equal to the full depth of the finished sidewalk.
   3. Wheelchair Ramps: Place and secure forms to location, dimension, profile, and gradient shown on drawings. Comply with ADA Standards.

B. Reinforcement:

1. Place wire-mesh reinforcement mid-height of forms.

C. Placement:
   1. Place concrete in a single lift.
   2. Consolidate concrete by tamping and spading.

D. Joints:
   1. Spacing: Provide scored joints every 5 feet (1.5 m).
   2. Filler height equal to the full depth of the finished concrete.

E. Finishing:
   1. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge, 1/4 inch radius.
   2. Wheelchair Ramps: Broomed perpendicular to slope.

END OF SECTION

SECTION 321710
PARKING BUMPERS AND MANUFACTURED TRAFFIC-CALMING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Parking bumpers.

1.02 RELATED REQUIREMENTS

A. Section 321216 - Asphalt Paving.

B. Section 321313 - Concrete Paving.

C. Section 321723 - Pavement Markings.

1.03 REFERENCE STANDARDS

A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

B. ASTM C33/C33M - Standard Specification for Concrete Aggregates.

C. ASTM C150/C150M - Standard Specification for Portland Cement.

PART 2 PRODUCTS

2.01 PARKING BUMPERS

A. Nominal Size: 5 inches high, 7 inches wide, 7 feet long.

B. Profile: Manufacturer's standard.

C. Anchoring Holes: Two, spaced equally.

D. Precast Concrete:
   1. Cement: Portland Type I - Normal in accordance with ASTM C150/C150M.
   2. Aggregate: Lightweight in accordance with ASTM C33/C33M.
   3. Reinforcement: Deformed, unfinished steel bars in accordance with ASTM A615/A615M.
   4. Color: Natural.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install units without damage to shape or finish. Replace or repair damaged units.

B. Install units in alignment with adjacent work, as indicated on drawings.

END OF SECTION

SECTION 321723
PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Painted pavement markings.

1.02 RELATED REQUIREMENTS

A. Section 321216 - Asphalt Paving.

1.03 REFERENCE STANDARDS

A. AASHTO MP 24 - Standard Specification for Waterborne White and Yellow Traffic Paints.

PART 2 PRODUCTS

2.01 PAINTED PAVEMENT MARKINGS

A. Painted Pavement Markings: As indicated on drawings.
   1. Marking Paint: In accordance with AASHTO MP 24.
      a. Parking Lots: White.
      b. Symbols and Text: White.

PART 3 EXECUTION

3.01 INSTALLATION

A. General:
   1. Position pavement markings as indicated on drawings.
   2. Field location adjustments require approval of Architect.

B. Painted Pavement Markings:
   1. Apply in accordance with manufacturer's instructions.
   2. Marking Paint: Apply uniformly, with sharp edges.
      a. Applications: One coat.
      b. Wet Film Thickness: 0.015 inch, minimum.
      c. Stencils: Lay flat against pavement, align with striping, remove after application.

END OF SECTION

SECTION 321726
TACTILE WARNING SURFACING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Plastic tactile and detectable warning tiles for pedestrian walking surfaces.

1.02 RELATED REQUIREMENTS

A. Section 321313 - Concrete Paving: Concrete sidewalks.

B. Section 321723.13 - Painted Pavement Markings: Crosswalk and curb markings.

1.03 REFERENCE STANDARDS

A. 49 CFR 37 - Transportation Services for Individuals with Disabilities (ADA).

B. AASHTO LRFD - Bridge Design Specifications.

C. ADA Standards - 2010 ADA Standards for Accessible Design.

D. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

E. ASTM C501 - Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser.

F. ASTM C903 - Standard Practice for Preparing Refractory Specimens by Cold Gunning.

G. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.

H. ASTM D570 - Standard Test Method for Water Absorption of Plastics.

I. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

J. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems.

K. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.

L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

M. ASTM G155 - Standard Practice for Operating Xenon Arc Lamp Apparatus for Exposure of Materials.

N. ATBCB PROWAG - Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way.

O. FED-STD-595C - Colors Used in Government Procurement (Fan Deck)..

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's product data, standard details, details specific to this project; written installation and maintenance instructions.

C. Shop Drawings: Submit plan and detail drawings. Indicate:
   1. Locations on project site. Demonstrate compliance with referenced accessibility standards.
   2. Sizes and layout.
   3. Pattern spacing and orientation.
   4. Attachment and fastener details, if applicable

D. Warranty: Submit manufacturer warranty; complete forms in Owner's name and register with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver to project site in manufacturer's protective wrapping and in manufacturer's unopened packaging.

B. Store covered and elevated above grade and in manufacturer's unopened packaging until ready for installation. Maintain at ambient temperature between 40 and 90 degrees F.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Plastic Tiles: Provide manufacturer's standard five year warranty against manufacturing defects, breakage or deformation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Plastic Tactile and Detectable Warning Surface Tiles:
   1. Armor-Tile, a brand of Engineered Plastics, Inc: www.armortiletransit.com.
   2. Vanguard ADA Systems: www.vanguardonline.com.
   3. Substitutions: See Section 016000 - Product Requirements.

2.02 TACTILE AND DETECTABLE WARNING DEVICES

A. Plastic Tactile and Detectable Warning Tiles: ADA compliant, epoxy polymer composition with an ultra-violet coating employing aluminum oxide particles in the truncated domes, exterior grade, matte finish polyester sheet with truncated dome pattern, solid color throughout, internal reinforcing of sheet and of truncated domes, integral radius cut lines on back face of tile; with factory applied removable protective sheeting.
   1. Material Properties:
      a. Water Absorption: 0.20 percent, maximum, when tested in accordance with ASTM D570.
      b. Slip Resistance: 0.50 minimum dry static coefficient of friction, when tested in accordance with ASTM D2047.
      c. Flexural Strength: 25,000 pounds per square inch minimum, when tested in accordance with ASTM D790.
      d. Chemical Stain Resistance: No reaction to 1 percent hydrochloric acid, motor oil, calcium chloride, gum, soap solution, bleach, or antifreeze, when tested in accordance with ASTM D543.
      e. Chemical Stain Resistance: No reaction to 1 percent hydrochloric acid, motor oil, calcium chloride, gum, soap solution, bleach, or antifreeze, when tested in accordance with ASTM D1308.
      f. Abrasion Resistance: 300, minimum, when tested in accordance with ASTM C501.
      g. Flame Spread Index: 25, maximum, when tested in accordance with ASTM E84.
      h. Accelerated Weathering: Delta-E of less than 5.0 at 2,000 hours exposure, when tested in accordance with ASTM G155.
      i. Adhesion: No delamination of tile prior to board failure in a temperature range of 20 to 180 degrees F, when tested in accordance with ASTM C903.
      j. Loading: No damage when tested according to AASHTO LRFD test method HS20.
      k. Salt and Spray Performance: No deterioration or other defect after 200 hours of exposure, when tested in accordance with ASTM B117.
   2. Installation Method: cast in place and surface applied where indicated on drawings.
   3. Shape: As indicated on drawings.
   4. Dimensions: As required to meet the shapes indicated to produce the least amount of joints possible.

5. Pattern: Staggered pattern of truncated domes complying with ADA Standards.
6. Edge: Square.
7. Joint: Butt.
8. Color: FED-STD 595C, Table IV, Colonial Red No. 20109.

2.03 ACCESSORIES

A. Fasteners: Nylon sleeve, nylon pin expansion anchors ¼ inch diameter by 1-9/16 inch long provided by manufacturer.

B. Adhesive: Type recommended and approved by surfacing tile manufacturer.

C. Sealant: Elastomeric sealant of color to match adjacent surfaces; approved by surfacing tile manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. When installation location is near site boundary or property line, verify required location using property survey.

B. Verify that work area is ready to receive work:
   1. If existing conditions are not as required to properly complete the work of this section, notify Architect.
   2. Do not proceed with installation until deficiencies in existing conditions have been corrected.

C. Verify that dimensions, tolerances, and attachment methods for work in this section are properly coordinated with other work on site.

3.02 INSTALLATION, GENERAL

A. Install in accordance with manufacturer's written instructions.
   1. Do not install damaged, warped, bowed, dented, abraded, or otherwise defective units.
   2. Do not install when ambient or substrate temperature has been below 40 degrees F during the preceding 8 daylight hours.

B. Field Adjustment:
   1. Cut units to size and configuration shown on drawings.
   2. Do not cut tiles to less than 9 inches wide in any direction.
   3. Locate relative to curb line in compliance with ATBCB PROWAG, Sections 304 and 305.
   4. Orient so dome pattern is aligned with the direction of ramp.
   5. Align truncated dome pattern between adjacent units.

C. Install units fully seated to substrate, square to straight edges and flat to required slope.

D. Align units so that tops of adjacent units are flush and joints between units are uniform in width.

3.03 INSTALLATION, CAST IN PLACE PLASTIC TILES

A. Tamp and vibrate units as recommended by manufacturer.

B. Ensure no voids or air pockets exist between top surface of concrete and underside of units.

C. Place and position weights on units while concrete cures as recommended by manufacturer.

3.04 INSTALLATION, SURFACE APPLIED PLASTIC TILES

A. Verify substrate is clean and dry; free of voids, projections and loose material; remove dust, oil, grease, curing compounds, sealers and other substances that may interfere with adhesive bond or sealant adhesion.

B. Mechanically roughen surface as required to remove contaminants and prepare surface for adhesive and sealant application.

C. Drill fastener holes straight, true and to depth recommended by manufacturer.

D. Apply adhesive to back of unit as recommended by manufacturer.

E. Mechanically fasten to substrate in accordance with manufacturer's written instructions; avoid striking or damaging the unit itself during installation.

F. Apply sealant to edges in cove profile.

3.05 CLEANING PLASTIC UNITS

A. Remove protective plastic sheeting no sooner than 48 hours after installation.

B. Remove excess sealant or adhesive from joints and edges.

C. Clean four days prior to date of scheduled inspection.

3.06 PROTECTION

A. Protect installed units from traffic, subsequent construction operations or other imposed loads until concrete is fully cured.

B. Touch-up, repair or replace damaged products prior to Date of Substantial Completion.

END OF SECTION

SECTION 321731
STEEL GUARDRAIL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Steel guardrail and steel posts.

1.02 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

PART 2 PRODUCTS

2.01 MATERIALS

A. Guardrail Beam: ASTM A36/A36M rolled steel sections, "W" profile, _____ inch thick, _____ inch high, die punched bolt holes for site assembly and attachment to posts, formed steel curved and flared termination sections.

B. Steel Posts: ASTM A36/A36M rolled steel shapes.
   1. ___ inch by ___ inch size.
   2. _____ inch wall thickness.

2.02 ACCESSORIES

A. Hardware: Steel, bolts, nuts and washers to suit rail profile.

2.03 FINISHES

A. Components: Galvanized in accordance with ASTM A123/A123M.

B. Hardware: Hot-dip galvanized to weight required by ASTM A153/A153M.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install rails and posts and accessories in accordance with manufacturer's instructions.

B. Set top of rail at height indicated on drawings.

C. Space posts at intervals not exceeding 10 feet.

D. Space posts as indicated on drawings.

E. Attach rails securely to posts with anchoring hardware.

3.02 TOLERANCES

A. Posts - Maximum Variation From Plumb: 1/2 inch.

B. Rail - Maximum Offset From True Position: 1 inch.

C. Rail - Maximum Variation From True Height: 1/2 inch.

D. Components shall not infringe adjacent property lines.

END OF SECTION

SECTION 321816.13
PLAYGROUND PROTECTIVE SURFACING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of existing protective surfacing and correction of grades as necessary.

B. Protective surfacing for playground area.

C. Subbase under resilient surfacing.

D. Containment curbs.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 116813 - Playground Equipment: Playground layout (staking).

C. Section 321123 - Aggregate Base Courses: Subbase for resilient surfacing.

1.03 REFERENCE STANDARDS

A. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.

B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

C. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).

D. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.

E. ASTM F1292 - Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment.

F. ASTM F1487 - Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.

G. CPSC Pub. No. 325 - Public Playground Safety Handbook.

1.04 DEFINITIONS

A. Use Zone: The area beneath and immediately adjacent to a play structure or equipment (play event) that is designated for unrestricted circulation around equipment, and on whose surface it is predicted that a user would land when falling from or exiting the equipment.

B. Critical Fall Height: The maximum fall height at which the protective surfacing meets the requirements of ASTM F1292.

C. Fall Height: The vertical distance between the finished elevation of the designated play surface and the finished elevation of the protective surfacing beneath it as defined by ASTM F1487.

D. Protective Surfacing: Resilient ground surfacing. The characteristics of the protective surfacing are based on the fall height of the playground equipment. Changes in either the surfacing or the fall height, particularly reducing the resilience of the protective surfacing or increasing the fall height, will reduce safety-related performance.

E. Subbase: A layer under the resilient layer of the protective surfacing but over the subgrade; may be rigid, as in concrete or bituminous, or aggregate.

F. Subgrade: The surface of the ground on which the protective surfacing is installed.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements - Administrative Requirements, for submittal procedures.

B. Product Data: For all manufactured surfacing products, provide manufacturer's product data showing materials of construction, compliance with specified standards, installation procedures, and safety limitations.
   1. Include IPEMA certifications where required.

C. Product Data: For natural surfacing materials, provide supplier's certification or mill certificate showing compliance with specified requirements.

D. Shop Drawings: Detailed scale drawings showing locations of existing playground equipment and exposed footings, bases, and anchorage points.
   1. Clearly identify footing and base elevations in relation to a fixed survey point on site and to subgrade elevation and depth of protective surfacing, surveyed by land surveyor licensed in the State in which the Project is located.
   2. Show locations of underground utilities, storm-drainage system and irrigation system.
   3. Show locations of related construction such as walkways and roadways, fences, site furnishings, and plantings.
   4. Show measured fall height for each playground equipment item, determined in accordance with ASTM F1487.
   5. Show Use Zone perimeters, determined in accordance with ASTM F1487.

E. Samples: For each product for which color must be selected provide color chart showing full range of colors.

F. Percolation Test Report: Describing test method used and results.

G. Maintenance Data:
   1. For manufactured surfacing products, provide manufacturer's recommended maintenance instructions and list of repair products, with address and phone number of source of supply.

H. Manufacturer's Field Report: Obtain the services of the equipment manufacturer's field representative to review the finished installation for compliance with specified requirements and with design criteria to the extent known to the Contractor. Submit field report to the School District.

I. Head Injury Criterion (HIC) Test Report: Test fall impact attenuation of each playground site-installed surface system at each piece of play equipment for compliance with ASTM F1292-99/04 and ASTM F1951-99. Submit testing results to the School District.

1.06 QUALITY ASSURANCE

A. Maintain one copy of the latest edition of ASTM F1487 and CPSC Pub. No. 325 at project site.

B. Manufacturer Qualifications: Company regularly engaged in manufacturing products specified in this section, with not less than three years of documented experience.
   1. Surfacing installed in minimum 10 sites and been in successful service minimum 5 years.
   2. Provide certificate of Insurance AA rated for minimum 1,000,000 dollars covering both product and general liability.
   3. Manufacturer's Representative: Provide name, company name and address, and qualifications.

C. Installer Qualifications: Company certified by manufacturer for training and experience installing the protective surfacing; provide installer's company name and address, and training and experience certificate.

1.07 PRE-INSTALLATION MEETING

A. Coordinate with Section 116813.

B. Convene a meeting one week before starting earthwork for playground to discuss coordination between various installers.
   1. Require attendance by personnel responsible for grading and installers of playground equipment, protective surfacing, footings, and adjacent work.
   2. Include representatives of Contractor.

3. Notify Architect at least 2 weeks prior to meeting.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store protective surfacing to project site in accordance with manufacturer's recommendations.

B. Store materials in a dry, covered area, elevated above grade.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals - Closeout Submittals, for additional warranty requirements.

B. Provide minimum 5 year warranty for playground surfacing.

PART 2 PRODUCTS

2.01 PERFORMANCE CRITERIA

A. Because the safety of the playground depends on strict compliance with the performance criteria, this information is provided for Contractor's information.
   1. The protective surfacing constitutes a resilient layer installed over a non-resilient layer, which is installed over the subgrade, with the top of playground equipment footings and anchorage devices covered by full depth of the resilient portion of the protective surfacing.
   2. The protective surfacing must be installed with good workmanship, free of patching, consistent in firmness, consolidation, texture, color and visual appearance and have minimal visible seams, soft spots or visual inconsistencies. Protective surfacing that is installed without good workmanship, or with voids, sunken soft spots or numerous visual consistencies is unacceptable and must have its rubberized base repaired and consolidated and its topping layer fully removed and replaced at no additional cost to Owner.
   3. The safety characteristics of the protective surfacing are based on the fall height of the playground equipment and firmness of installed material. The protective surfacing must be installed at the depths required by manufacturer to achieve critical fall height protection for all play equipment. The protective surfacing must be consistently firm without soft spots that depress over 1-inch in depth which, in the opinion or experience of the Owner or Owner's representative, may contribute to tripping and falling or rolled ankles and may be a safety hazard. Inconsistent, hazardous or unsafe surfacing installation is unacceptable and must be removed and replaced at no additional cost to Owner. The Owner or Owner's representative will determine if the surface is inconsistent, if soft spots are a safety hazard and therefore unacceptable and replacement is required.
   4. The top elevation of the protective surfacing is intended to be flush with adjacent grades.
   5. The top of the consolidated drainage stone subbase and top elevations of the protective surfacing must be sloped at 2% or less in all directions except where indicated on design grading plans. Excessive slopes, uncompacted soil subgrade or unconsolidated drainage stone subbase will translate into excessive slopes and soft spots that will create unacceptable protective surfacing and subbase that must be completely removed, epaired and replaced at no additional cost to Owner.
   6. Use Zone: The protective surfacing has been designed to provide acceptable impact attenuation as defined in ASTM F1292 for Critical Height of 6 feet.

B. If deviation from specified depth is required, it is the Contractor's responsibility to make all changes required to maintain specified top elevation and required impact attenuation at no extra cost to Owner; obtain approval prior to proceeding; follow approval request procedure as specified for substitutions.

2.02 MATERIALS

A. Poured-In-Place Membrane Surfacing: Weather-resistant wear layer over impact attenuating substrate over aggregate subbase.
   1. Wear Layer: Ethylene propylene diene monomer (EPDM) particles adhered with a ultraviolet-stabilized polyurethane binder to produce an even, uniformly colored surface.

2. Wear Layer Thickness: 3/8 inch, minimum.
3. Coefficient of Friction, when wet: 0.8, minimum, when tested in accordance with ASTM D2047.
4. Wear Layer Color(s): As selected from manufacturer's full range of bright colors.
5. Impact Attenuating Substrate: 100 percent recycled shredded styrene butadiene rubber (SBR) shreds or granules with 100 percent solids polyurethane binder to form a resilient material; do not use foam rubber.
6. Resilient Depth: As required to achieve specified Critical Fall Height as defined in ASTM F1292 but not more than depth indicated; maintain top elevation flush with adjacent grades.
7. Certification: Provide IPEMA certification of ASTM F1292 Critical Fall Height at thickness specified.

B. Geotextile: Nonwoven polypropylene sheet.

C. Containment Curbs: Cast-in-place concrete; free of sharp vertical edges, protruding elements, and trip hazards.
1. Size(s): As indicated on drawings.
2. Minimum Edge Radius: 1/4 inch.
3. Expansion Joints: Sealed as indicated on drawings.

D. Aggregate Subbase: See Section 321123.

PART 3 EXECUTION

3.01 PREPARATION FOR REPLACEMENT OF EXISTING LOOSE FILL SURFACING

A. Remove existing loose fill down to subgrade soil within playground project limits.

B. Grade subgrade to design elevations and required slopes. Slope subgrade to drains. Fully compact subrade to 95% maximum dry density per Standard Proctor test.

C. Measure stakethe location of all playground elements, including perimeter of existing protective surfacing, access and egress points, hard surfaces, walls, fences, and structures, and planting locations.

D. Stake the layout of the entire Use Zone perimeter before starting any work, based on Contract Documents.
1. Verify that Use Zone perimeters do not overlap hard surfaces, whether currently installed or not.
2. Do not proceed until revised drawings have been provided, showing corrected layout.

E. Install underdrain system and protect inlet and outlet openings to keep soil, stones and concrete debris out of drain system.

F. Excavate for post footings and construct play equipment. Set equipment heights and locations and confirm with surface elevations and use zone requirements. Adjust as necessary before staking posts plumb, drilling platform holes in posts and pouring foundations.

G. Excavate, form and install reinforced concrete Perimeter Curbs, segmental block walls, sidewalks and ramps as indicated. Keep excavated soil on site to backfill perimeter curbs and raise perimeter grade as required. Supplement excavated soil with additional topsoil to backfill and raise grade against proposed walls and pavements as indicated.

H. Notify Owner and Owner's representative that Perimeter Curbs are complete and require review and approval prior to backfilling. Honeycombed concrete Perimeter Curbs is not acceptable. Owner or Owner's representative may allow patching for minor honeycombing or may require removal and replacement of perimter curb sections with deep or large areas or large amounts of honeycombing voids or cracks.

I. Prepare, clean and Seal expansion joints of approved perimeter curbs.

J. Backfill and compact excavated soil against approved and Perimeter Curbs. Fill low areas and raise and even grade around perimeter of curbs. Compact all subgrade and backfill to 95% maximum dry density per Standard Proctor Test.

K. Unless otherwise indicated, backfill and cover exposed soil areas outside of perimeter curbs with minimum of 3-inches of wood mulch to bring mulch up flush with tops of curb.

L. Inside Use Zones remove all obstructions that would extend into the resilient protective surfacing.

M. Make surface of subgrade compacted, smooth and evenly sloped
   1. Fill holes and depressions with borrow from same area or soil of similar type.
   2. Make changes to grades and suppment low areas with topsoil as indicated on drawings. Compact all to 95% maximum dry density per Standard Proctor Test.

N. Install geotextile separation fabric over compacted subgrade and inlets. Install completely flat with no wrinkles or creases. Overlap fabric roll seams.

O. Install drainage stone over geotextile fabric, consolidating and compacting with passes from excavator used to spread the stone. Use plate compactors to fully consolidate the drainage stone at required subbase elevations and at slopes that are 2% or less in every direction except as indicated otherwise.

P. After subbase drainage stone is placed and consolidated to required subbase elevations, pull finish grade elevations strings, set finish grade stakes, mark intended depth of surfacing on the base supports of each item of playground equipment using temporary tape in a manner that will be easily verifiable during installation of surfacing.

Q. Perform percolation test at the lowest elevation of the subgrade in the areas to be covered by protective surfacing.
   1. Report results to Architect.
   2. If percolation is less than 1 inch in a 3 hour period, do not proceed.

3.02 EXAMINATION

A. Playground equipment installer will perform playground layout prior to installation of footings; verify correctness of layout before starting this work.

B. Verify that playground equipment and site furnishings and underdrain system located within playground area are complete.

C. Verify location of underground utilities and facilities in the playground area. Damage to underground utilities and facilities will be repaired at Contractor's expense.

D. Verify that subgrades are at proper elevations and that smooth grading is complete.

E. Verify that proper depth of surfacing is marked on base supports of playground equipment.

3.03 PREPARATION

A. Remove all organic materials and mulch to bare soil depth. Grade subgrade to design elevations and smooth consistent slopes to drain inlets. Correct subgrade irregularities to ensure that required depth of protective surfacing can be installed, the subgrade will drain to underdrain grated inlets, and subgrade elevations are in accordance with manufacturer's requirements. Compact soil subgrade to 95% standard proctor test.

B. Inside Use Zones remove all obstructions that would extend into the resilient protective surfacing.

C. Remove rocks, debris, and other similar items.

D. Install containment curbs with top surface flush with intended elevation of top surface of protective surfacing.

3.04 SUBBASE

A. Install geotextile separation fabric over entire playground soil subgrade and up sides of curb as indicated. Removal all wrinkles and creases so fabric is completely smooth and flat. Overlap fabric edges a minimum of 12-inches. Correct and smooth wrinkles prior to backfilling. Backfill aggregate subbase by hand to weigh down geotextile fabric edges and to keep flat during bulk stone backfilling.

B. Install aggregate subbase as indicated on drawings and in Section321123. Using vibrating plate compactors, consolidate aggregate to a smooth, firm subbase surface where stone is locked together and not easily displaced.

C. Install with top surface of subbase no higher than grades and levels indicated and not more than 1/4 inch lower than grades and levels indicated.

D. Install in true, even plane, sloped to match design slopes of rubberized surface.

E. Flatness Tolerance: 1/4 inch in 10 feet, maximum.

3.05 RESILIENT SURFACING LAYER

A. Install in accordance with CPSC Pub. No. 325, ASTM F1487, manufacturer's instructions, and requirements of authorities having jurisdiction (AHJ).

B. Install proper thickness throughout Use Zone(s).

C. Clean and dry surface of subbase.

D. Cover aggregate subbase with geotextile:
   1. Verify that aggregate is free of ruts or protruding objects.
   2. Lap minimum 4 inches width at seams. Adhere seams in accordance with manufacturer's recommendations.
   3. Install smooth, and free of tensile stresses, folds, or wrinkles.
   4. Protect from clogging, tears, or other damage during surfacing installation.
   5. Repair or replace damaged geotextile in accordance with manufacturer's recommendations.

E. Poured In Place Surfacing:
   1. Mix components mechanically on-site in accordance with manufacturer's directions; do not mix by hand.
   2. Install seamlessly; ensure complete bond to subbase.
   3. Cover footings and foundations and adhere tightly around penetrating elements.
   4. Maintain full thickness of resilient layers within Use Zone; cover or abut containment curbs as indicated on drawings; completely cover tapered transition edges.
   5. Hand trowel exposed surface to smooth, even finish.
   6. Impact Attenuation Layer: Install entire layer in one continuous pour on the same day.
   7. Wear Surface: Bond wear surface to substrate with adhesive. Apply adhesive in small quantities so that wear surface can be applied before adhesive dries.
      a. Install surfacing seamlessly. When wear surface is composed of different color patterns, pour surface continuously and seamlessly.
      b. When seams are required due to color change or field conditions, place adjacent wear surface as soon as possible, before initial pour has cured. Coat edge of initial pour with adhesive and apply wear surface mixture immediately.
      c. Add a minimum of 1/8 inch depth to specified surfacing depth to ensure required impact attenuation performance is met.
      d. Install wear surface to cover foundations and adhere tightly around elements penetrating the surface.

3.06 FIELD QUALITY CONTROL

A. Obtain the services of the equipment manufacturer's field representative to review the finished installation for compliance with specified requirements and with design criteria to the extent known to the Contractor; submit report of field review. Test fall impact attenuation of each playground site-installed surface system for compliance with ASTM F1292-99/04 and ASTM F1951-99. Submit labratory testing results to the School District. Remove and replace non-compliant resilient surface areas and adjacent areas as directed by the School District.

B. Owner or Owner's representative will inspect playground surfacing after installation to verify that surfacing is of proper type and depth and that playground meets specified design safety and accessibility requirements.

C. Repair or replace rejected work until compliance is achieved.

3.07 CLEANING AND PROTECTION

A. Restore adjacent existing areas that have been damaged from the construction.

B. Clean playground equipment of construction materials, dirt, stains, filings, and blemishes due to shipment or installation. Clean in accordance with manufacturer's instructions, using cleaning agents as recommended by manufacturer.

C. Clean playground area of excess construction materials, debris, and waste.

D. Remove excess and waste material and dispose of off-site in accordance with requirements of authorities having jurisdiction.

E. Protect installed products until Date of Substantial Completion.

F. Replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 323113
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Posts, rails, and frames.

B. Excavation for post bases; concrete foundation for posts.

C. Manual gates with related hardware.

D. Accessories.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

C. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.

D. ASTM F567 - Standard Practice for Installation of Chain-Link Fence.

E. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework.

F. CLFMI CLF-FIG0111 - Field Inspection Guide.

G. FS RR-F-191/1D - Fencing, Wire and Post Metal (Chain-Link Fence Fabric).

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Chain Link Fences and Gates:
   1. Tymetal Corp; The Fortress Heavy Duty Cantilever Slide Gate; www.tymetal.com/#sle..
   2. The Chamberlain Group, LLC; LiftMaster Elite Series; www.liftmaster.com
   3. Collins & Hermann Infrastructure Solutions; Motorized Cantilevered Slide Gate; www.collinsandhermann.com
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 COMPONENTS

A. Line Posts: 1.9 inch diameter.

B. Corner and Terminal Posts: 2.38 inch diameter.

C. Gate Posts: 3-1/2 inch diameter.

D. Top and Brace Rail: 1.66 inch diameter, plain end, sleeve coupled.

E. Bottom Rail: 1.66 inch diameter, plain end, sleeve coupled.

F. Gate Frame: 1.66 inch diameter for welded fabrication.

G. Fabric: 2 inch diamond mesh interwoven wire, 9 gauge, 0.1483 inch thick, top selvage knuckle end closed, bottom selvage enclosed diamond.

H. Tension Wire: 6 gauge, 0.1920 inch thick steel, single strand.

I. Tie Wire: Aluminum alloy steel wire.

2.03 MATERIALS

A. Posts, Rails, and Frames: ASTM F1083 Schedule 40 hot-dipped galvanized steel pipe, welded construction, minimum yield strength of 50 ksi for sizes NPS 5 and larger

B. Line Posts: Type I round in accordance with FS RR-F-191/1D.

C. Terminal, Corner, Rail, Brace, and Gate Posts: Type I round in accordance with FS RR-F-191/1D.

D. Wire Fabric: ASTM F 668 polymer-coated, class 2B fused and bonded steel chain link fabric.

E. Concrete: Ready-mixed, complying with ASTM C94/C94M; normal Portland cement; 3,000 psi strength at 28 days, 3 inch slump; 1 inch nominal size aggregate.

2.04 MANUAL GATES AND RELATED HARDWARE

A. Hardware for Single Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; fork latch with gravity drop and padlock hasp; keeper to hold gate in fully open position.

B. Hinges: Finished to match fence components.
   1. Brackets: Round.
   2. Mounting: Center.
   3. Closing: Manual.

C. Latches: Finished to match fence components.
   1. Brackets: Round.
   2. Locking: Mechanical.

2.05 ACCESSORIES

A. Caps: Molded rigid vinyl; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.

2.06 FINISHES

A. Components (Other than Fabric): Galvanized in accordance with ASTM A123/A123M, at 1.7 ounces per square foot.

B. Components and Fabric: Vinyl coated over coating of 1.8 ounces per square foot galvanizing.

C. Hardware: Hot-dip galvanized to weight required by ASTM A153/A153M.

D. Accessories: Same finish as framing, powder coat accessories which cannot receive vinyl coating.

E. Color(s): To be selected by Owner from manufacturer's full range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that areas are clear of obstructions or debris.

3.02 PREPARATION

A. Removal: Obstructions or debris.

3.03 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Place fabric on outside of posts and rails.

C. Set intermediate, terminal, and gate posts plumb , in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.

D. Line Post Footing Depth Below Finish Grade: ASTM F567.

E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567.

F. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.

G. Provide top rail through line post tops and splice with 6 inch long rail sleeves.

H. Install center and bottom brace rail on corner gate leaves.

I. Do not stretch fabric until concrete foundation has cured 7 days.

J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

K. Position bottom of fabric 2 inches above finished grade.

L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

N. Install bottom tension wire stretched taut between terminal posts.

O. Do not attach the hinged side of gate to building wall; provide gate posts.

P. Install hardware and gate with fabric to match fence.

Q. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Position: 1 inch.

C. Do not infringe on adjacent property lines.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.

C. Post Settings: Randomly inspect three locations against design for:
   1. Hole diameter.
   2. Hole depth.
   3. Hole spacing.

D. Fence Height: Randomly measure fence height at three locations or at areas that appear out of compliance with design.

E. Gates: Inspect for level, plumb, and alignment.

F. Workmanship: Verify neat installation free of defects. See CLFMI CLF-FIG0111 for field inspection guidance.

3.06 CLEANING

A. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

B. Clean fence with mild household detergent and clean water rinse well.

3.07 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstrate proper operation of equipment to Owner's designated representative.

D. Training: Train Owner's personnel on operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of two hours of training.

END OF SECTION

SECTION 323119
DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Decorative aluminum fences.

B. Automatic gate operators.

C. Excavation for post bases; concrete foundation for posts.

1.02 RELATED REQUIREMENTS

A. Section 312316 - Excavation.

1.03 REFERENCE STANDARDS

A. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes.

B. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

D. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.

E. ASTM D523 - Standard Test Method for Specular Gloss.

F. ASTM D714 - Standard Test Method for Evaluating Degree of Blistering of Paints.

G. ASTM D822/D822M - Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

H. ASTM D1654 - Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.

I. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.

J. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

K. ASTM D3359 - Standard Test Methods for Rating Adhesion by Tape Test.

L. ASTM F2200 - Standard Specification for Automated Vehicular Gate Construction.

M. ASTM F2408 - Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets.

N. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

O. NFPA 70 - National Electrical Code.

P. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.

Q. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.

R. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Manufacturer's Extended Warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Finish: Lifetime.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Decorative Metal Fences and Gates:
   1. Ameristar Fence Products, Inc: www.ameristarfence.com; Model Echelon Plus.
   2. Elite Fence Products, Inc.: www.elitefence.com; Model EFF-20 industrial.
   3. Collins & Hermann Infrastructure Solutions; Fencing and Cantilevered Slide Gate; www.collinsandhermann.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Automatic Gate Operators:
   1. Tymetal Corp; The Fortress Heavy Duty Cantilever Slide Gate:: www.tymetal.com/#sle.
   2. The Chamberlain Group, LLC; LiftMaster Elite Series CSL24UL; www.liftmaster.com..
   3. Collins & Hermann Infrastructure Solutions; Motorized Cantilevered Slide Gate; www.collinsandhermann.com.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 FENCES

A. Fences: Complete factory-fabricated system of posts and panels, accessories, fittings, and fasteners; finished with electrodeposition coating, and having the following performance characteristics:

B. Thermal Coating: Six-stage pretreatment/wash and an electrostatic spray application of a polyester finish. The topcoat shall be a "no-mar" TGIC polyester powder coat finish.
   1. Topcoat Thickness: 2 mils, minimum.
   2. Coating Performance: Comply with general requirements of ASTM F2408.
      a. Adhesion: ASTM D3359 (Method B); Class 3B with 90 percent or more of coating remaining in tested area.
      b. Corrosion Resistance: ASTM B117, ASTM D714 and ASTM D1654; 1/8 inch coating loss or medium No.8 blisters after 1,500 hours.
      c. Impact Resistance: ASTM D2794; 60 inch pounds.
      d. Weathering Resistance: ASTM D523, ASTM D822/D822M and ASTM D2244; less than 60 percent loss of gloss.

C. Aluminum: ASTM B221.
   1. Tubular Pickets, Rails and Posts: 6005-T5 alloy.
   2. Extrusions for Posts and Rails (Outer Channel): 6005-T5 alloy.
   3. Extrusions for Pickets and Rail (Inner Slide Channels): 6063-T5 alloy.

D. Fasteners: ASTM A276/A276M, Type 302 stainless steel; finished to match fence components.
   1. Tamper-proof security bolts.
   2. Self-drilling hex-head screws.

E. Concrete: Ready-mixed, complying with ASTM C94/C94M; normal Portland cement; 3,000 psi strength at 28 days, 3 inch slump; 1 inch nominal size aggregate.

2.03 ALUMINUM FENCE

A. Decorative Aluminum Fence System: Provide fence meeting the Test Load and Coating Performance requirements of ASTM F2408 for Industrial class.

B. Fence Panels: 4 feet high by 4 feet long.
   1. Panel Style: three rail without extended pickets.
      a. Use three rail without extended pickets for fencing less than 6 ft. in height.
   2. Panel Strength: Capable of supporting 270 pounds minimum load applied at midspan without deflection.
   3. Attach panels to posts with manufacturer's standard panel brackets and recommended fasteners.

C. Posts: Aluminum extrusions; 2-1/2 inches square, 0.080 inch wall thickness, with internal reinforcing.

D. Rails: Extruded aluminum channels.
   1. "ForeRunner" design; outside cross-section dimensions of 1-3/4 inch square; interior guide channel forms lower limit of raceway for retaining rod.
   2. Effective Wall Thickness:
      a. Top Wall of Outer Channel: 0.100 inch thick.
      b. Side Wall: 0.120 inch thick.
      c. Inner Slide Channel: 0.080 inch thick.
   3. Enclosed Retaining Rod: 1/8 inch diameter galvanized steel with variable pitch connection system for high angle racking and elimination of external fasteners.
   4. Picket-to-Rail Intersection Seals: PVC grommets.
   5. Picket Spacing, Standard: 4 inch on center.

E. Pickets: Extruded aluminum tubes.
   1. Size: 3/4 inch square.
   2. Style: Square top pickets extend above top rail.

F. Fasteners: Manufacturer's standard stainless steel bolts, screws, and washers; factory finish fasteners to match fence.

G. Gates:
   1. Posts: 3 inch square by 0.120 inch thick extruded aluminum tubing.
   2. Rails: "ForeRunner" style, 1-3/4 inch square, reinforced.
   3. Ends: 1-34 inch square by 0.250 inch thick extruded aluminum tubing.
   4. Pickets: 1 inch square by 0.125 inch thick extruded aluminum tubing.
   5. All picket and rail intersections shall be joined by welding.

H. Accessories: Aluminum castings, extrusions, and cold-formed strips; factory finished to match fence.
   1. Flat post cap with set screw.

I. Flexibility: Capable of following variable slope of up to 1:4.

J. Color: Manufacturer's standard, factory applied Black.

2.04 AUTOMATIC GATE OPERATORS

A. Swinging Gates: Pre-wired, pedestal mounted gate operator for horizontal swinging gates, per ASTM F2200 and UL 325.
   1. Control Functions: Open, pause, and close.
   2. Maximum Open/Close Time: 10 seconds.
   3. Access: Card.
   4. Maximum gate weight: 500 pounds (187 kilograms).
   5. Horsepower Rating: Suitable for connected load.

6. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
7. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
    a. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Set fence posts in accordance with the manufacturer recommended spacing.
    1. To achieve plumbness, use aluminum shims only.

C. When cutting rails immediately seal the exposed surfaces by:
    1. Removing metal shavings from cut area.
    2. Apply zinc-rich primer to thoroughly cover cut edge and drilled hole; allow to dry.
    3. Apply two coats of custom finish spray paint matching fence color.
    4. Failure to seal exposed surfaces in accordance with manufacturer's instructions will negate manufacturer's warranty.

D. Space gate posts according to the manufacturers' drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected.
    1. Base type and quantity of gate hinges on the application, weight, height, and number of gate cycles.
    2. Identify the necessary hardware required for the application on the manufacturer's gate drawings.
    3. Provide gate hardware by the manufacturer of the gate and install in compliance with manufacturer's recommendations.

E. Install operator in accordance with manufacturer's instructions and in accordance with NFPA 70.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From Indicated Position: 1 inch.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.

C. Post Settings: Randomly inspect three locations against design for:
    1. Hole diameter.
    2. Hole depth.
    3. Hole spacing.

D. Fence Height: Randomly measure fence height at three locations or at areas that appear out of compliance with design.

E. Gates: Inspect for level, plumb, and alignment.

3.06 CLEANING

A. Leave immediate work area neat at end of work day.

B. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

C. Clean fence with mild household detergent and clean water rinse well.

D. Remove mortar from exposed posts and other fencing material using a 10 percent solution of muriatic acid followed immediately by several rinses with clean water.

E. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

F. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

3.07 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstrate proper operation of equipment to Owner's designated representative.

3.08 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 323223
SEGMENTAL RETAINING WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Segmental retaining walls made of modular concrete units with or without soil reinforcement.

B. Subdrainage pipe behind retaining wall.

C. Shop drawings.

D. Retaining wall units.

E. Drainage filter.

1.02 PRICE AND PAYMENT PROCEDURES

A. Excavation of unsuitable soil and replacement with acceptable fill will be paid for at unit prices specified in Section 312316 - Excavation.

1.03 RELATED REQUIREMENTS

A. Section 311000 - Site Clearing: Removal of unwanted trees, bushes, and debris.

B. Section 312200 - Grading: Rough and finish grading.

C. Section 312316 - Excavation.

D. Section 312323 - Fill.

1.04 REFERENCE STANDARDS

A. AASHTO M 288 - Standard Specification for Geosynthetics for Highway Applications.

B. AASHTO NTPEP - National Transportation Product Evaluation Program.

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

D. ASTM C1262 - Standard Test Method for Evaluating the Freeze-Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units.

E. ASTM C1372 - Standard Specification for Dry-Cast Segmental Retaining Wall Units.

F. ASTM D448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction.

G. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

H. ASTM D1241 - Standard Specification for Materials for Soil-Aggregate Subbase, Base, and Surface Courses.

I. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).

J. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

K. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

L. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

M. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity..

N. ASTM D4491/D4491M - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

O. ASTM D4595 - Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.

P. ASTM D4595 - Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.

Q. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

R. ASTM D4751 - Standard Test Methods for Determining Apparent Opening Size of a Geotextile.

S. ASTM D5262 - Standard Test Method for Determining the Unconfined Tension Creep and Creep Rupture Behavior of Planar Geosynthetics Used for Reinforcement Purposes.

T. ASTM D5262 - Standard Test Method for Determining the Unconfined Tension Creep and Creep Rupture Behavior of Planar Geosynthetics Used for Reinforcement Purposes.

U. ASTM D5321/D5321M - Standard Test Method for Determining the Shear Strength of Soil-Geosynthetic and Geosynthetic-Geosynthetic Interfaces by Direct Shear.

V. ASTM D5818 - Standard Practice for Exposure and Retrieval of Samples to Evaluate Installation Damage of Geosynthetics.

W. ASTM D5818 - Standard Practice for Exposure and Retrieval of Samples to Evaluate Installation Damage of Geosynthetics.

X. ASTM D6638 - Standard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks).

Y. ASTM D6638 - Standard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks).

Z. ASTM D6706 - Standard Test Method for Measuring Geosynthetic Pullout Resistance in Soil.

AA. ASTM D6916 - Standard Test Method for Determining the Shear Strength Between Segmental Concrete Units (Modular Concrete Blocks).

BB. ASTM D7928 - Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis.

CC. ASTM F667/F667M - Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings.

DD. NCMA TR-127 - Design Manual for Segmental Retaining Walls 3rd Edition.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Segmental Retaining Wall Units:
   1. Manufacturer's product data.

C. Retaining Wall Design Engineer Qualifications and Statement of Experience.

D. Shop Drawings: Engineering drawings for installation, including elevations, large-scale details of elevations, typical sections, details, and connections, soil reinforcement, and drainage provisions.
   1. Include marked up contract drawings showing exact dimensions for blocks, required coping, and other minor revisions.
   2. Design Data: Submit detailed design calculations showing compliance with specified design criteria and material evaluations performed in accordance with specified design standard, signed and sealed by Design Engineer.
   3. Submit no less than 2 weeks prior to start of work.
   4. Obtain approval of Architect prior to start of work.

E. Permit: Obtain permit from authorities having jurisdiction prior to start of work and submit copy of permit.

1.06 QUALITY ASSURANCE

A. Retaining Wall Design Engineer Qualifications: Provide design by or under direct supervision of Professional Engineer experienced in the work of this section and licensed in the State in which the Project is located and:

1. Having minimum of five years documented experience in design of reinforced soil structures.

B. Manufacturer Qualifications -- Concrete Units: Firm specializing in manufacturing products specified in this section and:
   1. With not less than 3 years experience.

C. Installer Qualifications: Firm specializing in design and installation of segmental retaining walls and:
   1. With not less than 3 years documented experience.
   2. Approved by retaining wall system manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products above ground on wood pallets or blocking, in manufacturer's unopened packaging, until ready for installation.

B. Prevent excessive soil and mud from coming in contact with face of concrete units.

C. Polymeric Materials: Store at temperatures above minus 20 degrees F; rolled materials may be laid flat or stood on end.

D. Protect material from damage, do not use damaged material.

E. Remove damaged material from the site.

F. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Segmental Retaining Walls:
   1. Anchor Wall Systems, Inc.: www.anchorwall.com.
   2. Keystone Retaining Wall Systems, Inc.: www.keystonewalls.com.
   3. Versa-Lok Retaining Wall Systems: www.versa-lok.com.
   4. _____.
   5. Substitutions: See Section 016000 - Product Requirements.
   6. Reinforcement shall have AASHTO NTPEP approval.

2.02 RETAINING WALLS

A. Contractor is responsible for design of the retaining walls.
   1. Design to required horizontal and vertical alignment as indicated on drawings.

B. Design Standard: Design retaining walls to be capable of withstanding the effects of gravity loads due to soil pressures resulting from grades indicated, determined in accordance with:
   1. NCMA TR-127.
   2. Include effects of sloped backfill as indicated on drawings.
   3. Include effects of superimposed loads (surcharge) as indicated on drawings.
   4. In addition, comply with applicable local, state, and federal codes and regulations.
   5. This design method considers potential failure modes categorized by external, internal, local, compound, and global stability.
   6. Architect has considered global stability and has indicated minimum design requirements in Contract Documents.
   7. Seismic Stability: Perform analysis in accordance with ASCE 7.
   8. Factor of Safety:
      a. External Stability:
         1) Base Sliding = 1.5
         2) Overturning = 1.5
         3) Bearing Capacity = 2.0
         4) Global Stability = 1.3

b. Internal Stability:
    1) Shear Capacity = 1.5
9. Surcharges:
    a. Dead Load:
        1) No Traffic or Pedestrian Traffic Above Wall = 0 lb/sf minimum
        2) Light Vehicular Traffic Above Wall (automobiles and lightweight trucks) = 100 lb/sf minimum
        3) Heavy Vehicular Traffic Above Wall (buses and tractor/trailer trucks) = 250 lb/sf minimum
10. Maximum Allowable Bearing Pressure: 1.5 ksf unless soils report indicates allowable bearing pressure is greater.
11. Provide engineering services as required for analysis for all modes of stability.
12. Use of design software for calculations is permitted.
13. Submit complete shop drawings showing all features of the design.

C. Setback: 3/4 inch back from face per course.

D. Mass (Weight) Per Wall Face Area: 35 pounds per square foot, minimum, including filled voids.

E. Shear Resistance: Design the wall not to exceed the capacity of materials and soils to resist shear:
1. Shear Resistance Between Units: Determine in accordance with ASTM D6916.
2. Connection Between Units and Soil Reinforcement: Determine in accordance with ASTM D6638. Strength shall exceed the maximum tensile force with a Factor of Safety of 1.5.
3. Coefficient for Direct Shear of Reinforcement on Soil: Determine in accordance with ASTM D5321/D5321M using soil similar in gradation and texture to that to be used for fill in the reinforced zone.

F. Soil Reinforcement:
1. Test reinforcement to be used in accordance with ASTM D6706 using soil taken from project site.
2. Do not use more than one type of reinforcement attached to units within the same wall; do not use products made by different manufacturers in the same wall; minimize the number of different reinforcement and filter products to avoid confusion in placement.
3. Walls Less Than 12 feet High: Use only one type of reinforcement of one grade and strength.
4. NCMA Method: Determine in accordance with NCMA TR-127:
5. Length Back from Wall: Not less than dimensions shown on drawings.
6. Long Term Design Strength of Reinforcement: LTDS = Tult / (RFd x RFid x RFcr), where:
    a. Tult = Ultimate (tensile) strength per ASTM D4595.
    b. RFd = Reduction Factor for chemical and biological durability; minimum 2.0 if durability testing has not been conducted, otherwise 1.1 for High-density polyethylene. (HDPE), and 1.1 for polyethylene terephthalate (PET).
    c. RFid = Reduction Factor for Installation Damage; minimum 1.1 and 3.0 if testing per ASTM D5818 has not been conducted.
    d. RFcr = Reduction Factor for Creep; consistent with test procedure used for determining the ultimate strength per ASTM D5262.
    e. The product RFd x RFid x RFcr shall be greater than 2.0.

G. Drainage: Design to prevent water accumulation in retained soil; use drainage fill and drainage pipe as specified in Section 334100; provide outlets at 50 foot intervals along length of wall, minimum.

H. Minimum Factor of Safety: Design with the following stability requirements:
1. Sliding = 1.5.
2. Pullout = 1.5.
3. Tensile Overstress = 1.5.
4. Overturning = 2.0.

5. Bearing Capacity = 2.0.

2.03 MATERIALS

A. Retaining Wall Units: Machine-formed concrete blocks of shapes and sizes suitable for the retaining wall configuration required and complying with ASTM C1372 and the following:
   1. Face Color: Natural cement gray; all units from same production run.
   2. Texture: Split face, on exposed surfaces.
   3. Face Shape: Straight (flat).
   4. Curved Walls: Provide unit shapes that accommodate the required curves without cutting and with gaps between faces of adjacent units of not more than 1/8 inch and a minimum radius of 3 1/2 feet.
   5. Acute Corners: Miter-cut corner units are acceptable; exposed faces finished to match.
   6. Batter Dimensional Control: Provide integral positive control to maintain consistent batter dimension.
   7. Shear Resistance Mechanism: Manufacturer's standard.
   8. Moisture Absorption: 8 percent, maximum.
   9. Dimensional Tolerances: Plus/minus 1/16 inch from specified dimension.
   10. Appearance: No visible chips, cracks, or other imperfections when viewed from 10 feet under diffuse lighting.

B. Drainage Filter: Geosynthetic textile.
   1. Apparent Opening Size: 70 to 100 U.S. Sieve size, when tested in accordance with ASTM D4751.
   2. Permittivity: 0.5 per second, minimum, when tested in accordance with ASTM D4491/D4491M.
   3. Durability: Comply with minimum requirements of AASHTO M 288 Class 1; minimum mass of 8 ounces per square yard.

C. Aggregate for Leveling Pad: Compacted sand, gravel, or crushed rock complying with the following:
   1. Type A1 as specified in Section 312323 - Fill.
   2. Do not use pea gravel.

D. Drainage Fill: Clean, freely draining aggregate placed within, between, or immediately behind segmental units; do not use pea gravel; use the following:
   1. Type A3 as specified in Section 312323 - Fill.

E. Reinforced Backfill: Compacted soil placed behind drainage fill within reinforced soil mass; do not use heavy clay or organic soils; comply with the following:
   1. As specified in Section 312323 - Fill.

F. Drainage Pipe: Perforated PVC, complying with ASTM D3034; or corrugated HDPE complying with ASTM ASTM F667/F667M; with geotextile filter wrap; 4 inch diameter.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify location of existing structures and utilities prior to excavation.

B. Protect adjacent structures from the effects of excavation.

C. Verify that layout dimensions are correct and substrate is in proper condition for installation.

D. Notify Architect of unsatisfactory conditions.

E. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Sitework:

B. Excavation:
   1. Excavate to lines and grades indicated on drawings.

2. Do not disturb embankment or foundation beyond lines. Minimize over-excavation; fill over-excavated areas with compacted reinforced backfill or leveling pad material at Contractor's expense.
3. Excavation support, if required, shall be the responsibility of the Contractor.
4. After excavation, and prior to placement of leveling materials, Geotechnical Engineer will examine bearing soil surface to verify strength meets or exceeds design requirements and assumptions.
5. Replace unsuitable bearing soil as directed by Geotechnical Engineer in accordance with requirements of Section 312316 - Excavation.
6. Embankment excavations shall be bench cut as directed by the project Geotechnical Engineer.

C. Leveling Pad:
1. Depth: As indicated on drawings.
2. Width: 6 inches minimum extension beyond front and back faces of units.
3. Location: Top of pad at 1 inch below grade for each 8 inches that wall extends above grade.
4. Compact aggregate to lines and grades on drawings, in lifts 6 inches thick, maximum.
5. Compact aggregate to a minimum of 95 percent standard Proctor density, when determined in accordance with ASTM D698 at moisture content within 2 percent of optimum.
6. Use only hand-operated compaction equipment within 36 inches of back of wall.

D. Verify level grade before proceeding.

E. Install drainage collection pipe with a continuous fall in the direction of flow; cap open ends as necessary to prevent soil and debris from entering.

3.03 INSTALLATION

A. Install in accordance with drawings, manufacturer instructions, and applicable codes and regulations.

B. Segmental Retaining Wall Units:
1. Place first course of units on leveling pad; check alignment and level. Check for full contact with base and for stability.
2. Place units side by side for full length of wall, aligning back face of straight walls using string line or offset from base line and back face of curved walls using flexible pipe or other method recommended by manufacturer.
3. Do not leave gaps between units.
4. Lay out corners and curves in accordance with manufacturer's instructions. Do not leave gaps to produce wall batter or curvature.
5. Cut blocks with saw; do not split units.
6. Sweep excess material from tops of units before laying succeeding courses.
7. Place a maximum of 2 succeeding courses above level backfill. Check for proper alignment and batter.
8. Where top of wall changes elevation, step units to match grade or turn top course into embankment.
9. Where bottom of wall changes elevation, step base leveling pad and extend lowest course a minimum of two units into slope.
10. Install shear connectors per manufacturer recommendations.

C. Soil Reinforcement: Install each layer on fully compacted fill.
1. Orient soil reinforcement material with highest strength axis perpendicular to wall alignment.
2. Attach to top of wall units and extend horizontally, full length, over compacted backfill slightly sloping downward away from wall.

3. Install in one piece lengths with 100 percent coverage in each layer at each level. Do not splice or leave gaps between panels or ends of pieces.
4. Pull taut and remove slack prior to backfill placement.

D. Drainage Fill: Place drainage fill in, between, and behind units.
1. Compact to lines and grades on drawings, in lifts 6 inches thick, maximum; decrease lift thickness where necessary to achieve required density.
2. Extend drainage fill 12 inches beyond back face of units.
3. Base of drainage fill elevation shall not exceed two courses or 16 inches from base of wall units.

E. Drainage Pipe:
1. Install and join pipe and pipe fittings in accordance with pipe manufacturer's instructions.
2. Place drainage pipe on drainage fill at elevations detailed.
3. Lay pipe to slope gradients noted on Drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
4. Place pipe with perforations facing down.
5. Install pipe couplings.
6. Install filter aggregate at sides, over joint covers and top of pipe.

F. Backfill: Place, spread, and compact backfill from behind drainage fill to undisturbed soil while minimizing the development of slack in the soil reinforcement.
1. Use only lightweight hand-operated compaction equipment within 3 feet from back wall face, or one half of wall height, whichever is greater.
2. Place backfill in lifts of maximum 6 inches to 8 inches loose thickness where hand compaction is used and 8 inches to 10 inches where heavy equipment compaction is used.
3. Compact backfill to 95 percent maximum density and upper 2 feet of backfill to 98 percent maximum density, standard Proctor, as determined in accordance with ASTM D698, or as recommended by Geotechnical Engineer.
4. Moisture content of backfill prior to and during compaction to be within plus or minus 2 percentage points dry of optimum and uniform throughout each layer.
5. Do not operate tracked construction equipment directly upon soil reinforcement. Maintain a minimum fill thickness of 6 inches for operation of tracked vehicles over soil reinforcement. Minimize turning of tracked vehicles while over soil reinforcement.
6. Operate wheeled equipment at speeds less than 10 miles per hour over soil reinforcement.
7. Prevent contamination of the filter fabric, unit fill, blanket drains, chimney drains, and/or drainage composite from poor drainage materials such as fine grained silt and clay.
8. At end of each day, slope top of backfill away from wall to direct runoff away from wall face. Prevent runoff from adjacent areas from entering wall site.
9. At completion, if other work adjacent to wall is not to be done immediately (paving, landscaping, etc), grade top of backfill and provide temporary drainage to prevent water runoff toward the wall.

G. Cap Units: Install with masonry adhesive.
1. Clear cap units and top course of segmental retaining wall units of debris and standing water before applying adhesive.
2. Apply masonry adhesive to top surface of top unit and place cap into position over projecting pins. Protect wall face from masonry adhesive.

H. Site Drainage:
1. At end of each day:
   a. Grade backfill a minimum of 2 percent away from wall to prevent runoff from adjacent areas from entering wall site and to prevent ponding at the wall.
   b. Construct a berm at the crest of the wall to prevent surface water from overtopping.

2. At completion, if other work adjacent to wall is not to be done immediately (paving, landscaping, etc), grade top of backfill and provide temporary drainage to prevent water runoff toward the wall.
3. Surface water control and groundwater seepage shall be the responsibility of the project Architect.

3.04 TOLERANCES

A. Top of Wall:
1. Plan Location: Maximum of plus/minus 1 inch from plan location.
2. Elevation: Maximum of plus/minus 1 inch from elevations shown on drawings.

B. Face of Wall Flatness: Measured as deviation from a straight edge.
1. In the Vertical Dimension: Plus/minus 1-1/4 inch per 10 foot section.
2. In the Horizontal Dimension of Straight Walls: Plus/minus 1-1/2 inch per 10 foot section.

C. Overall Wall Batter: Within 2 degrees of design, measured from the vertical.

D. Gap Between Adjacent Units: 1/8 inch, maximum.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Provide manufacturer's field representative to observe and inspect concrete units.

C. Observe and inspect:
1. Concrete units: For correct type, for quality installation with courses that are level and follow the designed batter ratio.
2. Soil backfill: For correct type, for specified compaction with level grading prior to reinforcement installation.
3. Soil reinforcement: For correct type, for solid connection to concrete units, and for smooth and taut installation.
4. Field location in plan and elevation.

D. Soil Tests: For every new soil type and/or for every 2,000 cubic yard per running foot perform Atterberg Limit, Sieve Analysis, and Proctor Compaction tests. Perform additional testing per project Architect.

E. Owner will engage inspection and testing services, including independent laboratories, to provide quality assurance and testing services during construction. Contractor will secure necessary construction control testing during construction.

F. Frequency of Compaction Testing: 1 for each lift for each 100 ft of wall length.

G. Notify the Contractor of any deficiencies in the retaining wall construction and provide the Contractor a reasonable opportunity to correct the deficiency.
1. Notify the Contractor, Owner and Retaining Wall Design Engineer of any construction deficiencies that have not been corrected timely.

H. Contractor shall correct work found deficient and not in accordance with drawings and specifications.

3.06 CLEANING

A. Clean wall face to remove debris and stains.

B. Leave adjacent paved areas broom clean.

3.07 PROTECTION

A. Prevent damage to wall and earthwork by subsequent construction and uncontrolled runoff until substantial completion; repair damage due to failure to protect wall or earthwork.

B. Do not operate heavy paving or grading equipment within 36 inches from the back of the wall face.

C. Do not operate equipment with wheel loads in excess of 150 pounds per square foot live load within 10 feet from the wall face.

D. Do not place temporary soil or fill stockpiles adjacent to wall.

E. Replace damaged units prior to Date of Substantial Completion.

END OF SECTION

SECTION 323700
VEHICULAR SECURITY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Impact attenuating devices.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 312316 - Excavation.

C. Section 321216 - Asphalt Paving.

1.03 REFERENCE STANDARDS

A. ASTM F2656/F2656M - Standard Test Method for Crash Testing of Vehicle Security Barriers.

PART 2 PRODUCTS

2.01 IMPACT ATTENUATING DEVICES

A. Fixed Bollards: Permanently installed bollard capable of preventing vehicular passage.
   1. Crash Test Rating: M30, based on ASTM F2656/F2656M.
   2. Post: Round, recessed in foundation.
      a. Diameter: 8 inches.
      b. Concrete Fill: 3,000 psi.
      c. Reinforcement: No.6 reinforcing bar 3/4 inch.
      d. Exposed Height: 30 inches, minimum.
      e. Recessed Depth: 30 inches, minimum.
      f. Finish: Painted Yellow.
   3. Foundation:
      a. Concrete: 3,000 psi.
      b. Depth: 36 inches.
      c. Width, Perpendicular to Travel: 30 inches.
      d. Length, Parallel to Travel: 60 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
   1. Verify location of utilities.
   2. Verify integration requirements with other site security equipment.

3.02 PREPARATION

A. Protection of In-Place Conditions: Protect existing built conditions from damage.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.04 PROTECTION

A. Protect installed units from subsequent construction operations.

END OF SECTION

SECTION 329223
SODDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil.

B. Placing topsoil.

C. Fertilizing.

D. Sod installation.

E. Maintenance.

1.02 RELATED REQUIREMENTS

A. Section 312200 - Grading: Topsoil material.

B. Section 312200 - Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.

1.03 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.

1.04 REFERENCE STANDARDS

A. TPI (SPEC) - Guideline Specifications to Turfgrass Sodding.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Certificate: Certify grass species and location of sod source.

1.06 QUALITY ASSURANCE

A. Sod Producer: Company specializing in sod production and harvesting with minimum five years experience in hardiness zone 5 through 7.

1.07 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver sod in rolls. Protect exposed roots from dehydration.

B. Do not deliver more sod than can be laid within 24 hours.

PART 2 PRODUCTS

2.01 MATERIALS

A. Sod: TPI (SPEC), Certified Turfgrass Sod quality; cultivated grass sod; type indicated below; with strong fibrous root system, free of stones, burned or bare spots; containing no more than 5 weeds per 1000 sq ft. Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.
   1. Tall Fescue Grass Type: 100 percent.
   2. Thickness: "Thin" sod, minimum 1/2 inch and maximum 1 inch topsoil base.
   3. Cut sod in area not exceeding 1 sq yd.
   4. Machine cut sod and load on pallets in accordance with TPI (SPEC) Guidelines.

B. Topsoil: Type S2 as specified in Section 312200 - Grading.

C. Fertilizer: 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:
   1. Nitrogen: 12 percent.
   2. Phosphoric Acid: 12 percent.
   3. Soluble Potash: 12 percent.

D. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

2.02 ACCESSORIES

A. Wood Pegs: Softwood, sufficient size and length to ensure anchorage of sod on slope.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this section.

3.02 PREPARATION

A. Prepare subgrade in accordance with Section 312200 - Grading.

B. Place topsoil in accordance with Section 312200 - Grading.

3.03 FERTILIZING

A. Apply fertilizer at a rate of 2.5 lbs per 1 000 sf.

B. Apply after smooth raking of topsoil and prior to installation of sod.

C. Apply fertilizer no more than 48 hours before laying sod.

D. Lightly water to aid the dissipation of fertilizer.

3.04 LAYING SOD

A. Planting Season: March 15 through October 15.
   1. Sodding must be completed within planting season.

B. Moisten prepared surface immediately prior to laying sod.

C. Lay sod within 24 hours after harvesting to prevent deterioration.

D. Lay sod smooth and tight with no open joints visible, and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces.

E. Where new sod adjoins existing grass areas, align top surfaces.

F. Where sod is placed adjacent to hard surfaces, such as curbs, pavements, etc., place top elevation of sod 1/2 inch below top of hard surface.

G. On slopes 4 inches per foot and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet on center. Drive pegs flush with soil portion of sod.

H. Water sodded areas immediately after installation. Saturate sod to 4 inches of soil.

I. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities.

3.05 MAINTENANCE

A. Provide maintenance at no extra cost to Owner; Owner will pay for water used from existing water system on site.

B. Provide maintenance of sodded areas for two months from date of sod installation or until sod has taken root. Notify Owner one-week prior to end of watering period.

C. 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.

D. Neatly trim edges and hand clip where necessary.

E. Immediately remove clippings after mowing and trimming.

F. Water to prevent grass and soil from drying out.

G. Roll surface to remove irregularities.

H. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

I. Immediately replace sod to areas that show deterioration or bare spots.

J. If Contractor chooses to delay planting due to weather conditions, Contractor assumes responsibility for erosion control and repair to landscape grading per requirements of Section 312200 - Grading.

END OF SECTION

SECTION 329300
PLANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil and topsoil.

B. Topsoil bedding.

C. New trees, plants, and ground cover.

D. Relocated trees, plants, and ground cover.

E. Mulch and Fertilizer.

F. Maintenance.

1.02 RELATED REQUIREMENTS

A. Section 312200 - Grading: Topsoil material.

1.03 DEFINITIONS

A. Weeds: Any plant life not specified or scheduled.

B. Plants: Living trees, plants, and ground cover specified in this Section .

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Submit list of plant life sources.

1.05 QUALITY ASSURANCE

A. Nursery Qualifications: Company specializing in growing and cultivating the plants with five years documented experience.

B. Installer Qualifications: Company specializing in installing and planting the plants with five years documented experience.

C. Tree Pruner Qualifications: Company specializing in pruning trees with proof of Arborist Certification.

D. Maintenance Services: Performed by installer.

1.06 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

B. Plant Materials: Described by ASTM Z60.1; free of disease or hazardous insects.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

B. Deliver individual plants or bundles of plants with identification label.
   1. Do not remove labels until Owner has inspected plant labels.

C. Protect and maintain plant life until planted.

D. Deliver plant life materials immediately prior to placement. Keep plants moist.

1.08 FIELD CONDITIONS

A. Do not install plant life when ambient temperatures may drop below 35 degrees F or rise above 90 degrees F.

B. Do not install plant life when wind velocity exceeds 30 mph.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Warranty: Include coverage for one continuous growing season; replace dead or unhealthy plants.

C. Replacements: Plants of same size and species as specified, planted in the next growing season, with a new warranty commencing on date of replacement.

1.10 MAINTENANCE (SEE END OF SECTION)

PART 2 PRODUCTS

2.01 PLANTS

A. Plants: Species and size identified in plant schedule, grown in climatic conditions similar to those in locality of the work.

B. Trees, Plants, and Ground Cover: Species and size identifiable in plant schedule, grown in climatic conditions similar to those in locality of the Work.
   1. Species: In accordance with Standardized Plant Names, official code of American Joint Committee on Horticulture Nomenclature.
   2. Plants: No. 1 Grade conforming to "American Standard for Nursery Stock" of American Association of Nurserymen (AAN); well-branched, vigorous and balanced root and top growth; free from disease, injurious insects, mechanical wounds, broken branches, decay and other defects.
   3. Trees: Furnish with reasonably straight trunks, well balanced tops, and single leader.

2.02 SOIL MATERIALS

A. Topsoil: Type S2 as specified in Section 312200 - Grading.

2.03 SOIL AMENDMENT MATERIALS

A. Fertilizer: Containing fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated in analysis.
   1. Nitrogen: 12 percent.
   2. Phosphoric Acid: 12 percent.
   3. Soluble Potash: 12 percent.

B. Water: Clean, fresh, and free of substances or matter that could inhibit vigorous growth of plants.

2.04 MULCH MATERIALS

A. Mulching Material: hardwood species wood ground bark, free of growth or germination inhibiting ingredients.

2.05 ACCESSORIES

A. Wrapping Materials: Burlap.

B. Stakes: Softwood lumber, pointed end.

C. Cable, Wire, Eye Bolts and Turnbuckles: Non-corrosive, of sufficient strength to withstand wind pressure and resulting movement of plant life.

D. Plant Protectors: Rubber sleeves over cable to protect plant stems, trunks, and branches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared subsoil and planters are ready to receive work.

B. Saturate soil with water to test drainage.

C. Verify that required underground utilities are available, in proper location, and ready for use.

3.02 PREPARATION OF SUBSOIL

A. Prepare subsoil to eliminate uneven areas. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.

C. Scarify subsoil to a depth of 3 inches where plants are to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

D. Dig pits and beds 6 inches larger than plant root system.

3.03 PLACING TOPSOIL

A. Spread topsoil to a minimum depth of 6 inches over area to be planted. Rake smooth.

B. Place topsoil during dry weather and on dry unfrozen subgrade.

C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.

D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

E. Install topsoil into pits and beds intended for plant root balls, to a minimum thickness of 6 inches.

3.04 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after initial raking of topsoil.

C. Mix thoroughly into upper 2 inches of topsoil.

D. Lightly water to aid the dissipation of fertilizer.

3.05 PLANTING

A. Planting Season:
   1. Do not plant any plants prior to March 1.
   2. Do not plant non-dormant plants after October 15.
   3. Do not plant dormant plants after December 1.

B. Place plants as indicated.

C. Set plants vertical.

D. Remove non-biodegradable root containers.

E. Set plants in pits or beds, partly filled with prepared plant mix, at a minimum depth of 6 inches under each plant. Remove burlap, ropes, and wires, from the root ball.

F. Place bare root plant materials so roots lie in a natural position. Backfill soil mixture in 6 inch layers. Maintain plant life in vertical position.

G. Saturate soil with water when the pit or bed is half full of topsoil and again when full.

3.06 PLANT SUPPORT

A. Brace plants vertically with plant protector wrapped guy wires and stakes to the following:
   1. Tree Caliper: 1 inch; Tree Support Method: 1 stake with one tie
   2. Tree Caliper: 1 to 2 inches; Tree Support Method: 2 stakes with two ties
   3. Tree Caliper: 2 to 4 inches; Tree Support Method: 3 guy wires with eye bolts and turn buckles
   4. Tree Caliper: Over 4 inches; Tree Support Method: 4 guy wires with eye bolts and turn buckles

3.07 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 014000 - Quality Requirements.

B. Plants will be rejected if a ball of earth surrounding roots has been disturbed or damaged prior to or during planting.

3.08 MAINTENANCE

A. Provide maintenance at no extra cost to Owner; Owner will pay for water.

B. Maintain plant life for two months after Date of Substantial Completion.

C. Irrigate sufficiently to saturate root system and prevent soil from drying out.

D. Cultivate and weed plant beds and tree pits.

E. Remove dead or broken branches and treat pruned areas or other wounds.

F. Neatly trim plants where necessary.

G. Immediately remove clippings after trimming.

H. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions.

I. Control insect damage and disease. Apply pesticides in accordance with manufacturers instructions.

J. Remedy damage from use of herbicides and pesticides.

K. Replace mulch when deteriorated.

L. Maintain wrappings, guys, turnbuckles, and stakes. Adjust turnbuckles to keep guy wires tight. Repair or replace accessories when required.

END OF SECTION

SECTION 330561
CONCRETE MANHOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Section does not include sanitary and stormwater manholes and structures, which shall meet the requirements of the Metropolitan St. Louis Sewer District (MSD).

1.02 REFERENCE STANDARDS

A. AASHTO HB - Standard Specifications for Highway Bridges.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manhole covers, component construction, features, configuration, and dimensions.

C. Shop Drawings: Indicate manhole or structure locations, elevations, piping sizes and elevations of penetrations.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 CONCRETE MANHOLES

A. Weight Rating: H 10 according to AASHTO HB.

2.02 ACCESSORIES

A. Steps: Formed galvanized steel rungs; 3/4 inch diameter. Formed integral with manhole sections.

B. Strap Anchors: Bent steel shape, __ by __ inch size by ____ inch thick, galvanized to ASTM A123/A123M Grade specified for applicable material category.

2.03 CONFIGURATION

A. Shaft Construction: Concentric with concentric cone top section; lipped male/female dry joints; sleeved to receive pipe sections.

B. Shape: Cylindrical.

C. Clear Inside Dimensions: As indicated on drawings.

D. Design Depth: As indicated on drawings.

E. Clear Lid Opening: As indicated on drawings.

F. Pipe Entry: Provide openings as indicated on drawings.

G. Steps: As indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify items provided by other sections of work are properly sized and located.

B. Verify that built-in items are in proper location, and ready for roughing into Work.

C. Verify excavation for manholes is correct.

3.02 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

3.03 INSTALLATION

A. Establish elevations and pipe inverts for inlets and outlets as indicated in drawings.

END OF SECTION

SECTION 331416
SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water pipe for site conveyance lines.

B. Pipe valves.

C. Pipe and fittings for site water lines including domestic water lines.

1.02 RELATED REQUIREMENTS

A. Section 099113 - Exterior Painting.

B. Section 211100 - Facility Fire-Suppression Water-Service Piping.

C. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.

D. Section 330110.58 - Disinfection of Water Utility Piping Systems: Disinfection of site service utility water piping.

1.03 REFERENCE STANDARDS

A. ANSI/ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent

B. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

C. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

D. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.

E. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

F. AWWA C502 - Dry-Barrel Fire Hydrants.

G. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances.

H. AWWA C606 - Grooved and Shouldered Joints.

I. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. through 60 In. (100 mm through 1500 mm).

J. UL 246 - Hydrants for Fire-Protection Service.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

C. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with Missouri American Water Company requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.01 WATER PIPE

A. PVC Pipe: AWWA C900 Class 100:
   1. Fittings: AWWA C111/A21.11, Schedule 40 per ASTM D2466 or schedule 80 per ASTM D2467.
   2. Joints: ASTM D3139 compression gasket ring.

B. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Water Service" in large letters.

2.02 VALVES

A. Manufacturers:
   1. Mueller Company: www.muellercompany.com
   2. Clow Valve Company: www.clowvalve.com
   3. American Flow Control: www.acipco.com
   4. Substitutions: See Section 016000 - Product Requirements.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

2.03 BACKFLOW PREVENTERS

A. Manufacturers:
   1. Zurn Plumbing Products: www.zurn.com
   2. Febco: www.febcoonline.com
   3. Watts: www.watts.com
   4. Substitutions: See Section 016000 - Product Requirements.

B. Double Check Valve Assemblies: Comply with ANSI/ASSE 1012; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

2.04 FIRE HYDRANTS

A. Manufacturers:
   1. Mueller Company: www.muellercompany.com
   2. Clow Valve Company: www.clowvalve.com
   3. American Flow Control: www.acipco.com
   4. Substitutions: See Section 016000 - Product Requirements.

B. Hydrants: AWWA C502, UL 246, dry barrel type.
   1. Inside dimension: 7 inches minimum, with minimum 5 inches diameter valve seat opening.
   2. Minimum net water area of barrel not less than 190 percent of valve opening.
   3. 6 inch bell or mechanical joint inlet connection with accessories, gland bolts, and gaskets.

C. Hydrant Extensions: Fabricate in multiples of 6 inches with rod and coupling to increase barrel length.

D. Hose and Streamer Connection: Match sizes with utility company, two hose nozzles , one pumper nozzle.

E. Finish: Primer and two coats of enamel in color required by utility company.

2.05 DOMESTIC WATER HYDRANTS

2.06 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 312316.13 - Trenching.

B. Cover: As specified in Section 312316.13 - Trenching.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing water main size, location, and invert are as indicated.

B. Verify that building service connection size, location, and invert are as indicated.

3.02 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.03 TRENCHING

A. See the sections on excavation and fill for additional requirements.

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Place bedding and compact.

3.04 INSTALLATION - PIPE

A. Maintain separation of water main from sewer piping in accordance with GLUMRB Ten States Standards (10statesstandards.com).

B. Group piping with other site piping work whenever practical.

C. Establish elevations of buried piping to ensure not less than 3.5 feet of cover.

D. Install pipe to indicated elevation to within tolerance of 5/8 inches.

E. Install ductile iron piping and fittings to AWWA C600.

F. Install grooved and shouldered pipe joints to AWWA C606.

G. Route pipe in straight line.

H. Install pipe to allow for expansion and contraction without stressing pipe or joints.

I. Install access fittings to permit disinfection of water system performed under Section 330110.58.

J. Slope water pipe and position drains at low points.

K. Install trace wire 6 inches below finish grade, above pipe line; coordinate with Section 312316.13.

3.05 INSTALLATION - VALVES AND HYDRANTS

A. Set valves on solid bearing.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway in accordance with Section 211100.

D. Set hydrants to grade, with nozzles at least 20 inches above ground in accordance with Section 211100.

E. Locate isolation valve minimum of 36 inches away from hydrant and maximum 72 inches away from hydrant.

F. Provide a drainage pit 36 inches square by 24 inches deep filled with 2 inches washed gravel. Encase elbow of hydrant in gravel to 6 inches above drain opening. Do not connect drain opening to sewer.

G. Paint hydrants in accordance with Section 099113.

3.06 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Perform field inspection and testing in accordance with Section 014000.

C. Pressure and leak test water piping:

1. After completion of pipeline installation, including backfill, but prior to final connection to existing system, conduct, in presence of Owner and Architect, concurrent hydrostatic pressure and leakage tests in accordance with AWWA C600.
2. Provide equipment required to perform hydrostatic pressure and leakage tests.
3. Test Pressure: Not less than 200 psi or 50 psi in excess of maximum static pressure, whichever is greater.
4. Test Duration: Not less than two-hour duration.
5. Test Failure Limits:
    a. No pipeline installation will be approved when pressure varies by more than 5 psi at completion of hydrostatic pressure test.
    b. No pipeline installation will be approved when leakage is greater than that determined by the following formula:
        1) L = (SDsqrt P)/133,200
        2) L = allowable, in gallons per hour
        3) S = length of pipe tested, in inches
        4) D = nominal diameter of pipe, in inches
        5) sqrt P = square root of the average test pressure during leakage test, in pounds per square inch (gauge)
6. Test Process:
    a. Before applying test pressure, completely expel air from section of piping under test.
        1) Provide corporation cocks so air can be expelled as pipeline is filled with water.
        2) After air has been expelled, close corporation cocks and apply test pressure.
        3) At conclusion of tests, remove corporation cocks removed and plug resulting piping openings.
    b. Slowly bring piping to test pressure and allow system to stabilize prior to conducting leakage test.
    c. Do not open or close valves at differential pressures above rated pressure.
    d. Examine exposed piping, fittings, valves, hydrants, and joints carefully during hydrostatic pressure test.
    e. Repair or replace damage or defective pipe, fittings, valves, hydrants, or joints discovered, following a failed pressure or leak test.

D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

END OF SECTION

SECTION 333113
SITE SANITARY SEWERAGE GRAVITY PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary sewerage drainage piping, fittings, and accessories.

B. Connection of building sanitary drainage system to Metropolitan St. Louis Sewer District (MSD) system.

C. Cleanout access.

1.02 RELATED REQUIREMENTS

A. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.

1.03 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.04 REFERENCE STANDARDS

A. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

B. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating pipe, pipe accessories.

C. Field Quality Control Submittals: Document results of field quality control testing.

D. Project Record Documents:
   1. Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.07 REGULATORY REQUIREMENTS

A. Conform to Metropolitan St. Louis Sewer District standards for materials and installation of the Work of this section.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Provide products that comply with Metropolitan St. Louis Sewer District standards.

B. Plastic Pipe: ASTM D 3034, Type PSM, Poly(Vinyl Chloride) (PVC) material; inside nominal diameter as indicated on drawings, bell and spigot style solvent sealed joint end.

C. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.02 PIPE ACCESSORIES

A. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Sewer Service" in large letters.

2.03 CLEANOUT

A. Manufacturers:

1. Jay R. Smith Mfg. Co.; Product 4261L: www.jrsmith.com
2. Substitutions: Section 01600 Product Requirements.

B. Cleanout Box: Cast iron construction, round, dual flanged, secured lid:
1. Nominal Lid and Frame Size: 8-3/4 inches diameter.

C. Cleanout Cover: Gasketed with ABS plug.
1. Cleanout cover comes with cleanout box.

2.04 BEDDING AND COVER MATERIALS

A. Pipe Bedding Material: As specified in Section 312316.13 - Trenching.

B. Pipe Cover Material: As specified in Section 312316.13 - Trenching.

PART 3 EXECUTION

3.01 GENERAL

A. Perform work in accordance with Metropolitan St. Louis Sewer District standards.

3.02 TRENCHING

A. See Section 312316.13 - Trenching for additional requirements.

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Backfill around sides and to top of pipe with bedding Fill Type A5, tamp in place and compact, then complete backfilling.

3.03 INSTALLATION - PIPE

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
1. Plastic Pipe: Also comply with ASTM D2321.

C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

D. Connect to building sanitary sewer outlet and municipal sewer system .

E. Install trace wire 6 inches below finish grade above pipe line; coordinate with Section 312316.13.

F. Coordinate the Work with connection to Metropolitan St. Louis Sewer District system and trenching through public rights-of-way or easements.

3.04 INSTALLATION - CLEANOUTS

A. Verify and adjust pipe elevation as necessary prior to installing cleanout frame and cover.

B. Install frame and cover onto pipe.

C. Set forms for concrete collar.

D. Pour concrete for concrete collar:
1. Compressive strength: Minimum 3,000 psi at 28 days.
2. Air entrainment: Minimum 5%.
3. Slump: Maximum 4 inches.
4. Finish: Broom finish.

E. Remove concrete forms and place backfill or pavement around concrete collar as indicated on drawings.

3.05 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 014000 - Quality Requirements.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

C. Infiltration Test: Test in accordance with Metropolitan St. Louis Sewer District standards.

D. Deflection Test: Test in accordance with Metropolitan St. Louis Sewer District standards.

3.06 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 334100
SUBDRAINAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete Retaining Wall and Under Playground Fall Areas Drainage Systems.

B. Filter aggregate and bedding.

1.02 RELATED REQUIREMENTS

A. Section 312316 - Excavation: Excavating for building perimeter subdrainage and concrete retaining wall subdrainage subdrainage systems.

B. Section 312316.13 - Trenching: Excavating and backfilling for under-slab subdrainage, site subdrainage, and under playground fall areas subdrainage systems.

C. Section 312323 - Fill: Placing filter aggregate and backfilling over filter aggregate, up to subgrade elevation for building perimeter subdrainage and concrete retaining wall subdrainage systems.

1.03 REFERENCE STANDARDS

A. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe drainage products, pipe accessories, and _____.

C. Project Record Documents: Record location of pipe runs, connections, cleanouts and principal invert elevations.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the work of this section.

PART 2 PRODUCTS

2.01 PIPE MATERIALS

A. Polyvinyl Chloride Pipe: ASTM D2729; plain end, 4 inch inside diameter; with required fittings.

B. Use perforated pipe at subdrainage system; unperforated through sleeved walls.

2.02 AGGREGATE AND BEDDING

A. Filter Aggregate and Bedding Material: Fill Type A3 as specified in Section 312316.13 - Trenching.

B. Filter Aggregate and Bedding Material: Fill Type A3 as specified in Section 312323 - Fill.

2.03 CLEANOUT

A. Manufacturers:
   1. Jay R. Smith Mfg. Co.; Product 4261L: www.jrsmith.com
   2. Substitutions: Section 01600 Product Requirements.

B. Cleanout Box: Cast iron construction, round, dual flanged, secured lid:
   1. Lid Design: Scoriated with lifting device and "C.O." cast into lid.
   2. Nominal Lid and Frame Size: 8-3/4 inches diameter.

C. Cleanout Cover: Gasketed with ABS plug.
   1. Cleanout cover comes with cleanout box.

2.04 ACCESSORIES

A. Pipe Couplings: Solid plastic.

B. Geotextile Drainage Fabric: Non-biodegradable, non-woven; Mirafi-140N manufactured by TenCate. www.tencate.com

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over-excavation with compacted aggregate.

B. Remove large stones or other hard matter that could damage drainage piping or impede consistent backfilling or compaction.

3.03 INSTALLATION

A. Install and join pipe and pipe fittings in accordance with pipe manufacturer's instructions.

B. Place drainage pipe on clean cut subsoil.

C. Lay pipe to slope gradients noted on Drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

D. Place pipe with perforations facing down.

E. Install pipe couplings.

F. Install filter aggregate at sides, over joint covers and top of pipe. Provide top cover compacted thickness of 12 inches.

G. Place filter fabric over levelled top surface of aggregate cover prior to subsequent backfilling operations.

H. Place aggregate in maximum 6 inch lifts, consolidating each lift.

I. Refer to Section 312323 - Fill for compaction requirements. Do not displace or damage pipe when compacting.

J. Place impervious fill over drainage pipe aggregate cover and compact.

K. Connect to storm sewer system with unperforated pipe .

L. Coordinate the Work with connection to Metropolitan St. Louis Sewer District system and trenching through public rights-of-way or easements.

3.04 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspection and testing.

B. Request inspection prior to and immediately after placing aggregate cover over pipe.

3.05 PROTECTION

A. Protect pipe and aggregate cover from damage or displacement until backfilling operation begins.

END OF SECTION

SECTION 334211
STORMWATER GRAVITY PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stormwater drainage piping.

B. Stormwater pipe accessories.

1.02 RELATED REQUIREMENTS

A. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.

B. Section 334230 - Stormwater Drains.

1.03 REFERENCE STANDARDS

A. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

B. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of stormwater gravity piping with size, location and installation of stormwater drains according to Section 334230.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating pipe, pipe accessories.

C. Field Quality Control Submittals: Document results of field quality control testing.

D. Project Record Documents:
   1. Record location of pipe runs, connections, and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 REGULATORY REQUIREMENTS

PART 2 PRODUCTS

2.01 STORMWATER PIPE MATERIALS

A. Provide products that comply with Metropolitan St. Louis Sewer District standards.

B. Plastic Pipe: ASTM D3034, SDR 35, Type PSM, Poly Vinyl Chloride (PVC) material; inside nominal diameter as indicated on drawings, bell and spigot style solvent sealed joint end.

2.02 PIPE ACCESSORIES

A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

B. Substitutions: See Section 01 6000 - Product requirements.

2.03 CONCRETE:

A. Compressive strength: Minimum 3,000 psi at 28 days.

B. Air entrainment: Minimum 5%.

C. Slump: Maximum 4 inches.

D. Finish: Broom finish.

2.04 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 312316.13 - Trenching.

B. Cover: As specified in Section 312316.13 - Trenching.

PART 3 EXECUTION

3.01 TRENCHING

A. See Section 312316.13 - Trenching for additional requirements.

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Backfill around sides and to top of pipe with bedding Fill Type A5 or A6 as appropriate for pipe size, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
   1. Plastic Pipe: Also comply with ASTM D2321.

C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

D. Coordinate the Work with connection to Metropolitan St. Louis Sewer District system and trenching through public rights-of-way or easements.

E. Install continuous trace wire 6 inches below finish grade, above pipe line; coordinate with Section 312316.13 - Trenching.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 014000 - Quality Requirements.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
   1. Infiltration Test: Test in accordance with Metropolitan St. Louis Sewer District standards.
   2. Deflection Test: Test in accordance with Metropolitan St. Louis Sewer District standards.

3.04 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 334230
STORMWATER DRAINS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Precast concrete catch basins.

B. Frames and grates.

1.02 RELATED REQUIREMENTS

A. Section 312316 - Excavation.

B. Section 312323 - Fill.

C. Section 334211 - Stormwater Gravity Piping.

1.03 REFERENCE STANDARDS

A. AASHTO HB - Standard Specifications for Highway Bridges.

B. ASTM C55 - Standard Specification for Dry-Cast Concrete Building Brick.

C. ASTM C478/C478M - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections.

D. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.

E. ASTM C1634 - Standard Specification for Dry-Cast Concrete Facing Brick and Other Concrete Masonry Facing Units.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate stack assembly, invert elevations, opening sizes, and pipe angles.

C. Manufacturer's Installation Instructions: Indicate special procedures for assembly.

D. Project Record Documents:
   1. Record invert elevations of catch basins, drop inlets, and trench drains.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 PRODUCTS

2.01 CATCH BASINS

A. Weight Rating: H 10 according to AASHTO HB.

B. Precast Concrete Catch Basins: Comply with ASTM C478/C478M, reinforced.
   1. Wall Thickness: 8 inches (203 mm).
   2. Base Thickness: 12 inches (305 mm).
   3. Reinforcement: Formed steel wire, galvanized finish, wire diameter as indicated on drawings.
   4. Joint Sealant: Comply with ASTM C990.

C. Grade Adjustments:
   1. Concrete Bricks: ASTM C1634 or ASTM C55 Grade N, cored, normal weight; 4 by 8 by 3 inches.

D. Frames and Grates: Steel, checkerboard pattern, 33 1/4 by 33 1/4 inch.

2.02 ACCESSORIES

A. Steps: Formed galvanized steel rungs; 3/4 inch diameter. Formed integral with manhole sections.

PART 3 EXECUTION

3.01 EXCAVATION AND FILL

A. Hand trim excavation for accurate placement to indicated elevations.

B. Backfill with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION

A. Establish elevations and pipe inverts for inlets and outlets as indicated in drawings.

B. Precast Concrete Catch Basins:
   1. Place base section plumb and level.
   2. Install joint sealant uniformly around section lip.

C. Grade Adjustments:
   1. Lay brick or masonry units uniformly on mortar bed with full head joints, running bond. Top with mortar, plumb and level.
   2. Place adjacent materials tight and smooth following design grades.

D. Frames and Grates:
   1. Place frame plumb and level.
   2. Place grate in frame securely.

END OF SECTION