PROJECT MANUAL

New Natural Resources Building for

forest preserves of winnebago county

Rockford, Illinois

BA Project No. 2025-09

Date 10-27-2025

BLAKEMORE ARCHITECTS

400 North 1st Street
Rockford, IL. 61107
Phone 815-227-0023
www.blakemore-architects.com

COVER PAGE

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END OF SECTION

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PROJECT TITLE PAGE

PROJECT MANUAL

FOR

NEW NATURAL RESOURCE BUILDING FOR FPWC-FOREST PRESERVE OF WINNEBAGO COUNTY
MERIDIAN ROAD, WINNEBAGO COUNTY, ILLINOIS

DATE: OCTOBER 27, 2025

PREPARED BY:

BLAKEMORE ARCHITECTS, INC
400 N. 1ST STREET
ROCKFORD, ILLINOIS 61107
815-227-0023
WWW.BLAKEMORE-ARCHITECTS.COM

END OF PROJECT TITLE PAGE

SECTION 00 0102

PROJECT INFORMATION

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

A. Project Name: New Natural Resource Building for FPWC, located at: Meridian Road, Winnebago County, Illinois.

B. Blakemore Architects's Project Number: 2025-09.

C. The Owner, hereinafter reffered to as Forest Preserves of Winnebago County (FPWC).

D. Sales Tax Exemption Number: E99923483. Organzational Type: Government.

E. Owner's Project Manager: Mike Brien-Forest Preserves of Winnebago County.
   1. Department: Director of Natural Resources.
   2. Address: 5500 Northrock Drive.
   3. City, State, Zip: Rockford, Illinois 61103.
   4. Phone/Fax: 815-516-2654.
   5. E-mail: Mbrien@winnebagoforest.org.

1.02 NOTICE TO PROSPECTIVE BIDDERS

A. These documents constitute an Invitation to Bid to and request for qualifications from General Contractors for the construction of the project described below.

B. Notice Date: October 27, 2025.

1.03 PROJECT DESCRIPTION

A. Summary Project Description: New Building.

B. Contract Scope: Construction and Site work.

C. Contract Terms: Lump sum (fixed price).

1.04 PROCUREMENT TIMETABLE

A. Pre-Bid Briefing: Forest Preserves of Winnebago County Offices located at 5500 Northrock Dr, Rockford, Illinois 61103 at 2:00 PM Tuesday November 4th, 2025.

B. Last Request for Substitution Due: 7 days prior to due date of bids.

C. Last Request for Information Due: 7 days prior to due date of bids.

D. Bid Due Date: November 20, 2025, before 2 PM local time.

E. Bid Opening: Same day, 2:00 PM local time.

F. Notice to Proceed: Within 30 days after due date.

G. Bids May Not Be Withdrawn Until: 60 days after due date.

H. Desired Final Completion Date: As soon as possible. Provide preliminary schedule along with bid.

I. The Owner reserves the right to change the schedule or terminate the entire procurement process at any time.

1.05 PROCUREMENT DOCUMENTS

A. Documents may be procured from the Architect.

B. Documents may be viewed at The office of the Architect.

C. Documents may be viewed at the Office of the project manager listed above in section 1.01 E.

D. Documents are on display at the offices of the following construction plan rooms:
   1. Northern Illinois Building Contractors Association at 1111 S, Alpine Road in Rockford, Illinois. 815-229-5636 or info@NIBCA.Build
   2. Contractors Association of Will & Grundy Counties at 233 N. Springfield Ave. Joliet, IL 60435-6509. 815-741-1455 or info@CAWGC.org

3. Greater Peoria Contractors & Suppliers Assoc. at 1811 West Altorfer in Peoria, IL 61615. 309-692-5710 or info@GPCSA.org

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 00 1113

ADVERTISEMENT FOR BIDS

FROM:

1.01 THE OWNER (HEREINAFTER REFERRED TO AS OWNER):

A. Forest Preserves of Winnebago County (FPWC)

5500 Northrock Drive

B. Rockford, Illinois, 61103

1.02 AND THE BLAKEMORE ARCHITECTS (HEREINAFTER REFERRED TO AS BLAKEMORE ARCHITECTS):

A. Blakemore Architects, Inc

B. Address:
   1. 400 N. 1st Street
   2. Rockford, Illinois 61107

1.03 DATE: OCTOBER 27, 2025

1.04 TO: POTENTIAL BIDDERS

A. Your firm is invited to submit an offer under seal to Owner for construction of a facility located at Meridian Road, Winnebago County Illinois before 2:00 pm local standard time on the 20th day of November, 2025, for:

B. Project: New Natural Resource Building for FPWC

C. Blakemore Architects's Project Number: Design Professional's Project Number 2025-09.

D. All bidders are required to prequalify to the requirements described in Document 00 2113 - Instructions to Bidders.

E. Project Description: New Office/Vehical Storage Building and associated site work.

F. Bid Documents for a Stipulated Sum contract may be obtained from the office of the [Architect and or plan rooms listed in Specification Section 00 0102 Project Information 1.05 Procurment Documents free of charge .

G. Bidders will be required to provide Bid security in the form of a Bid Bond of a sum no less than 10 percent of the Bid Amount.

H. Refer to other bidding requirements described in Document 00 2113 - Instructions to Bidders and Document 00 3100 - Available Project Information.

I. Submit your offer on the Bid Form provided. Bidders may supplement this form as appropriate.

J. Your offer will be required to be submitted under a condition of irrevocability for a period of 60 days after submission.

K. The Owner reserves the right to accept or reject any or all offers.

1.05 SIGNATURE

A. By: _____

B.
   1. Signed: _____
   2. (Authorized signing officer)

END OF SECTION

SECTION 00 2113

INSTRUCTIONS TO BIDDERS

SUMMARY

1.01 SEE AIA DOCUMENT A701 (1997 EDITION), INSTRUCTIONS TO BIDDERS FOLLOWING THIS DOCUMENT.

1.02 THE INSTRUCTIONS IN THIS DOCUMENT AMEND OR SUPPLEMENT THE INSTRUCTIONS TO BIDDERS AND OTHER PROVISIONS OF THE BIDDING AND CONTRACT DOCUMENTS.

1.03 DOCUMENT INCLUDES

A. Invitation
   1. Bid Submission
   2. Work Identified in Contract Documents
   3. Contract Time

B. Bid Documents and Contract Documents
   1. Definitions
   2. Contract Documents Identification
   3. Availability
   4. Examination
   5. Inquiries/Addenda
   6. Product/Assembly/System Substitutions

C. Site Assessment
   1. Site Examination
   2. Prebid Conference

D. Qualifications
   1. Qualifications
   2. Prequalification
   3. Subcontractors/Suppliers/Others

E. Bid Submission
   1. Submission Procedure

F. Bid Enclosures/Requirements
   1. Performance Assurance
   2. Insurance
   3. Bid Form Requirements
   4. Bid Form Signature
   5. Additional Bid Information
   6. Selection and Award of Alternates

G. Offer Acceptance/Rejection
   1. Duration of Offer
   2. Acceptance of Offer

1.04 RELATED DOCUMENTS

A. Document 01 1000 - Summary.

B. Document 00 1113 - Advertisement for Bids.
   1. Owners Section Two Instruction to Bidders.

C. Document 00 3100 - Available Project Information.

D. Document 00 4100 - Bid Form.

E. Document 00 4322 - Unit Prices Form.

F. Document 00 4323 - Alternates Form.

G. Document 00 4325 - Substitution Request Form - During Procurement

H. Document 00 4327 - Separate Prices Break-Out Form.

I. Document 00 7300 - Supplementary Conditions:
   1. Tax exempt procedures.
   2. Bond types and values.

INVITATION

2.01 BID SUBMISSION

A. Bids signed and under seal, executed, and dated will be received at the office of Forest Preserves of Winnebago County at 10601 N. 2nd Street, Machesney Park, Illinois before 2:00 p.m. local standard time on Thursday November 20, 2025-.

B. Offers submitted after the above time will be returned to the bidder unopened.

C. Submit required Supplements To Bid Forms within 24 hours after closing time for receiving bids.

D. Offers will be opened publicly immediately after the time for receipt of bids.

2.02 INTENT

A. The intent of this Bid request is to obtain an offer to perform work to complete project named New Natural Resource Building for FPWC for a Stipulated Sum contract, in accordance with Contract Documents.

2.03 WORK IDENTIFIED IN THE CONTRACT DOCUMENTS

A. Work of this proposed Contract comprises building construction and site development and , including concrete slab on grade, pre-engineered metal building system, pre-finished metal exterior wall and roof panels, interior office build-outs, plumbing, electrical, and mechanical systems.

B. Project Location:
   1. Meridian Road in Winnebago County, Illinois

2.04 CONTRACT TIME

A. Identify Contract Time in the Bid Form. The completion date in the Agreement shall be the Contract Time added to the commencement date.

BID DOCUMENTS AND CONTRACT DOCUMENTS

3.01 DEFINITIONS

A. Bid Documents: Contract Documents supplemented with Invitation To Bid, Instructions to Bidders, Information Available to Bidders, and General Conditions identified.

B. Contract Documents: Defined in AIA A201 Article 1 including issued Addenda.

C. Bid, Offer, or Bidding: Act of submitting an offer under seal.

D. Bid Amount: Monetary sum identified by the Bidder in the Bid Form.

3.02 CONTRACT DOCUMENTS IDENTIFICATION

A. The Contract Documents are identified as Project Number BA 2025-09, as prepared by Blakemore Architects who is located at 400 1st Street, Rockford, Illinois 61107, and with contents as identified in the Project Manual and Drawings.

3.03 AVAILABILITY

A. Bid Documents can be obtained by Architect via email (pdf).

B. Bid Documents are made available only for the purpose of obtaining offers for this project. Their use does not grant a license for other purposes.

3.04 EXAMINATION

A. Bid Documents may be viewed at the office of Blakemore Architects which is located at 400 N. First Street, Rockford, Illinois 61107.

B. Bid Documents may be viewed at the office of The Forest Preserves of Winnebago County located at 5500 Northrock Dr. Rockford, Illinois 61103.

C. Bid Documents are on display at the offices of the following construction plan rooms:

1. See section 00-0102 Project Information for plan rooms.

D. Upon receipt of Bid Documents verify that documents are complete. Notify Blakemore Architects should the documents be incomplete.

E. Immediately notify Blakemore Architects upon finding discrepancies or omissions in the Bid Documents.

3.05 INQUIRIES/ADDENDA

A. Direct questions to Jhony Molina, telephone 815-227-0023 Ext 14 or via email at: Jhony@Blakemore-Architects.com.

B. Addenda may be issued during the bidding period. All Addenda become part of Contract Documents. Include resultant costs in the Bid Amount.

C. Verbal answers are not binding on any party.

D. All Addendum Questions due by Thursday November 6th 12:00 PM.

E. Addendum Issued Thursday, November 13th at 4:00 PM.

F. Any questions or clarifications shall be submitted via email to Jhony@Blakmeore-Architects.com

3.06 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS

A. General Requirements for Substitution Requests:
   1. Submit requests only for elements for which substitution is specifically allowed in the Project Manual.
   2. Provide sufficient information to determine acceptability of proposed substitutions.

B. Substitution Request Time Restrictions:
   1. Where the Bid Documents stipulate a particular product, substitutions will be considered up to 7 days before receipt of bids.

C. Review and Acceptance of Request:
   1. Blakemore Architects may approve the proposed substitution and will issue an Addendum to known bidders.

D. Where the Bid Documents stipulate a particular product, substitutions will be considered up to November 6th, 12:00 PM

E. In submission of substitutions to products specified, bidders shall include in their bid all changes required in the work and changes to Contract Time and Contract Sum to accommodate such substitutions. A later claim by the bidder for an addition to the Contract Time or Contract Sum because of changes in work necessitated by use of substitutions shall not be considered.

F. The submission shall provide sufficient information to determine acceptability of such products.

G. Provide complete information on required revisions to other work to accommodate each proposed substitution.

H. Provide products as specified unless substitutions are submitted in this manner and accepted.

I. See Section 01 2500 - Substitution Procedures for additional requirements.

SITE ASSESSMENT

4.01 SITE EXAMINATION

A. Examine the project site and read the soil report prior to submitting a bid.

4.02 PREBID CONFERENCE

A. A bidders conference has been scheduled for 2:00 p.m. on the 4th day of November at the location of Forest Preserves of Winnebago County located at 5500 Northrock Drive, Rockford, Illinois 61103.

B. All general contract and subcontract bidders and suppliers are invited.

C. Representatives of Blakemore Architects will be in attendance.

D. Summarized minutes of this meeting will be circulated to attendees. These minutes will form part of Contract Documents.

E. Information relevant to the Bid Documents will be recorded in an Addendum, issued to Bid Document recipients.

QUALIFICATIONS

5.01 EVIDENCE OF QUALIFICATIONS

A. To demonstrate qualification for performing the Work of this Contract, bidders may be requested to submit AIA A305.

5.02 PREQUALIFICATION

A. Bidders shall complete and submit Qualification Form [AIA A305] and include with the bid form submission.

5.03 SUBCONTRACTORS/SUPPLIERS/OTHERS

A. Owner reserves the right to reject a proposed subcontractor for reasonable cause.

B. Refer to General Conditions.

BID SUBMISSION

6.01 SUBMISSION PROCEDURE

A. Bidders shall be solely responsible for the delivery of their bids in the manner and time prescribed in this Project Manual. Paper copies only. No emails.

B. Improperly completed information or irregularities in security deposit may be cause to reject and declare the bid invalid or informal.

C. An abstract summary of submitted bids will be made available to all bidders following bid opening.

6.02 BID INELIGIBILITY

A. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, may at the discretion of the owner, Owner, be declared unacceptable.

BID ENCLOSURES/REQUIREMENTS

7.01 PERFORMANCE ASSURANCE

A. Accepted Bidder: Provide a Performance bond as described in 00 7300 - Supplementary Conditions.

B. Include the cost of Performance Bond in the Bid Amount and identified in the Alternates Form 00 4323 included in this project manual.

7.02 BID FORM REQUIREMENTS

A. Complete all requested information in the Bid Form supplied.

7.03 SALES AND USE TAXES

A. This project is Tax Exempt. Owners Tax Exempt Number is: EE99923483

7.04 FEES FOR CHANGES IN THE WORK

A. Include in the Bid Form, the overhead and profit fees on own Work and Work by subcontractors, applicable for Changes in the Work, whether additions to or deductions from the Work on which the Bid Amount is based.

7.05 BID FORM SIGNATURE

A. The Bid Form shall be signed by the bidder, as follows:

1. Corporation: Signature of a duly authorized signing officer(s) in their normal signatures. Insert the officer's capacity in which the signing officer acts, under each signature. Affix the corporate seal. If the bid is signed by officials other than the president and secretary of the company, or the president/secretary/treasurer of the company, a copy of the by-law

resolution of their board of directors authorizing them to do so, must also be submitted with the Bid Form in the bid envelope.

7.06 ADDITIONAL BID INFORMATION

A. The lowest Three Bidders will be requested to complete the Supplements To Bid Forms within 24 hours after submission of bids.

B. Submit the following Supplements concurrent with bid submission:
   1. Document 00 4336 - Proposed Subcontractors Form: Include the names of all Subcontractors and the portions of the Work they will perform.
   2. Document 00 4322 - Unit Prices Form: Include a listing of unit prices specifically requested by Contract Documents.
   3. Document 00 4323 - Alternates Form: Include the cost variation to the Bid Amount applicable to the Work described in Section 00-4323.
   4. Document 00 4327 - Separate Prices Break-Out Form: Include a listing of separate prices as specifically requested in the Contract Documents.
   5.
   6. See attached following this section the Owners Instruction to Bidders pages.

7.07 SELECTION AND AWARD OF ALTERNATES

A. Bids will be evaluated on the total of the base bid price and all of the Alternates. After determination of the successful bidder, consideration will be given to which Alternates will be included in the Work.

OFFER ACCEPTANCE/REJECTION

8.01 DURATION OF OFFER

A. Bids shall remain open to acceptance and shall be irrevocable for a period of thirty (30) days after the bid closing date.

8.02 ACCEPTANCE OF OFFER

A. Owner reserves the right to accept or reject any or all offers.

B. After acceptance by Owner, Blakemore Architects on behalf of Owner, will issue to the successful bidder, a written Bid Acceptance.

END OF INSTRUCTIONS TO BIDDERS

SECTION TWO: INSTRUCTION TO BIDDERS

1.1 INTRODUCTION/BACKGROUND

The Winnebago County Purchasing Department is seeking bid prices for a new Natural Resources Building for the Forest Preserves of Winnebago County, Illinois.

1.2 COPIES OF IFB DOCUMENTS

- Only complete sets of IFB solicitation documents should be used for preparing bids. The County does not assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets.
- Complete set of IFB documents must be obtained on the County's website at: https://wincoil.gov/departments/purchasing-department
- Submitted Bids MUST include all forms and requirements as called for in the Invitation for Bids. Failure to include all necessary forms and licenses will result in a non-responsive bid.

1.3 EXAMINATION OF IFB DOCUMENTS

- Each Bidder shall carefully examine the IFB and other documents, and inform himself thoroughly regarding any and all conditions and requirements that may in any manner affect cost, progress, or performance of the work to be performed under the bid. Ignorance on the part of the Bidder shall in no way relieve him/her of the obligations and responsibilities assumed under the bid.
- Should a Bidder find discrepancies or ambiguities in, or omissions from, the specifications, or should he/she be in doubt as to their meaning, he/she shall at once notify the County by email at purchasing@purchasing.wincoil.gov by the Schedule of Events deadline.

1.4 INTERPRETATIONS, CLARIFICATIONS, AND ADDENDA

No oral interpretations will be made to any Bidder as to the meaning of the documents. Any inquiries or requests for interpretation must be received in writing by the date specified, in the Schedule of Events, emailed to purchasing@purchasing.wincoil.gov All such changes or interpretation will be made in writing in the form of an addendum and, if issued, shall be posted on the County's website no later than five (5) business days prior to the established Bid due date. It shall be the Bidder's sole responsibility thereafter to find and download the addendum. Each Bidder MUST acknowledge receipt of such addenda on the Bid Signature Form. All addenda are a part of the documents and each Bidder will be bound by such addenda, whether or not received by him/her. It is the responsibility of each Bidder to verify that he/she has received all addenda issued before bids are opened.

1.5 PREPARATION OF BIDS

Signature of the Bidder: The Bidder must sign the bid forms in the space provided for the signature. If the Bidder is an individual, the words "Doing Business As", or "Sole Owner" must appear beneath such signature. In the case of a Partnership, the signature of at least one of the partners must follow the firm name and the words "Member of the Firm" should be written beneath such signature. If the Bidder is a

limited liability company, the title of person signing the Bid on behalf of the limited liability company must be stated and evidence of his authority to sign the Bid must be submitted.

1.6 SUBMISSION OF BIDS

A. Bids shall be submitted to the County of Winnebago at the designated location not later than the time and date for receipt of bids indicated in the IFB solicitation, or any extension thereof made by Addendum. The County's representative authorized to open the bids will decide when the specified time has arrived and no Bids received thereafter will be considered. Bids received after the time and date for receipt of Bids will be returned unopened.

B. Winnebago County Purchasing Department receives bids by paper only. Please DO NOT email or fax bids.

C. Each Bidder shall submit with his Bid the required evidence of his qualifications and experience.

1.7 REQUIRED COUNTY FORMS

Bidder shall complete and execute the forms specified in the IFB (Bid Signature Form and References), failure to provide executed documents may result in Bidder being determined to be not fully responsive to the IFB.

1.8 MODIFICATION OF BIDS

Written modification will be accepted from firms if addressed to the entity and address indicated in the Request for Bids and received prior to Bid due date and time. Prior to the time and date designated for receipt of Bids, any Bid submitted may be modified by delivery to the County Purchasing Department of a complete Bid as modified. All emails shall be marked "Modified Bid" delivery shall comply with requirements for the original bid.

1.9 RESPONSIBILITY FOR BID

The Bidder is solely responsible for all costs of preparing and submitting the bid, regardless of whether a contract award is made by the County. Unless otherwise specified by the Bidder, the County has no less than one hundred twenty (120) day to make a final selection.

1.10 RECEIPT AND OPENING OF BIDS

The properly identified Bids received on time will be opened by the County Purchasing Department. Any Bid not received by the Purchasing Department on or before the deadline for receipt of bids designated in the solicitation or Addendum(s) will not be opened.

1.11 AWARD OF CONTRACT

A. The County reserves the right to waive any informality in any bid, or to re-advertise for all or part of the work contemplated. If bids are found to be acceptable, written notice will be given to the selected Bidder of the award of the contract. The County reserves the right to reject any and all bids.

B. If the award of a contract is annulled, the County may award the contract to another Bidder(s), or the work may be re-advertised or may be performed by other qualified personnel as the County decides.

C. A contract will be awarded to the Bidder(s) deemed to provide the services which are in the best interest of the County. D. The County also reserves the right to reject the bid of a Bidder who has previously failed to perform properly or to complete contracts of a similar nature on time.

1.12 SUBCONTRACTORS

If applicable all subcontractors shall be identified on the form contained herein. Contractor shall require that the subcontractor comply with all Prevailing Wage Act requirements. The County of Winnebago reserves the right to reject any or all subcontractors.

1.13 ACCURACY DISCLAIMER

The Contractor shall thoroughly acquaint himself with the services required for the bid to fully understand the facilities, difficulties and restrictions attending to the execution of the bid. The Contractor will be allowed no additional compensation for his failure to be so informed.

1.14 CERTIFICATE OF INSURANCE AND INSURANCE REQUIREMENTS

The Bidder shall be responsible for all necessary insurance coverage as indicated below. Certificates of Insurance must be provided to the County of Winnebago within fifteen (15) days after award of contract or acceptance of the bid, with the County of Winnebago listed as additional insured as indicated. If the proper insurance forms are not received within the fifteen (15) day period, the contract may be awarded to the next selected Bidder/Bidder. Policies shall be written by companies licensed to do business in the State of Illinois and having an agent for service of process in the State of Illinois. Companies shall have an A.M. Best rating of VI or better.

INSURANCE	MINIMUM ACCEPTABLE LIMITS OF LIABILITY
1. Workers' Compensation	Statutory
2. Employers Liability	
A. Each Accident	$2,000,000
B. Each Employee-disease	$2,000,000
C. Policy Aggregate-disease	$2,000,000
3. Commercial Liability	
A. Per Occurrence	$5,000,000
B. General Aggregate	$5,000,000
1. General Aggregate - Per Project	$5,000,000
2. General Aggregate - Products/Completed	$5,000,000
4. Business Auto Liability	$2,000,000
5. General Umbrella Excess Liability	$5,000,000
6. Professional Errors and Omissions	
7. Environmental Impairment Liability	

The County of Winnebago shall be named as an Additional Insured on the General Liability and Vehicle Liability policies.

1.15 CHANGES IN INSURANCE COVERAGE

The Bidder will immediately notify the Winnebago County Purchasing Department if any insurance has been cancelled, materially changed, or renewal has been refused and the Bidder shall immediately suspend all work in progress and take the necessary steps to purchase, maintain and provide the required insurance coverage(s) and limits. If suspension of work should occur due to insurance requirements, upon verification by the County of required insurance, the County will notify Bidder when they can proceed with work. Failure to provide and maintain required insurance coverage(s) and limits could result in immediate cancellation of the Contract and the Bidder shall accept and bear all costs that may result due to the Bidder's failure to provide and maintain the required insurance.

END OF SECTION TWO: INSTRUCTION TO BIDDERS

1997 EDITION

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Instructions to Bidders

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

TABLE OF ARTICLES

1. DEFINITIONS

2. BIDDER'S REPRESENTATIONS

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7. PERFORMANCE BOND AND PAYMENT BOND

8. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

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INSTRUCTIONS TO BIDDERS

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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 other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.

1.2 Definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, or in other Contract Documents are applicable to the Bidding Documents.

1.3 Addenda are written or graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

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 as the base, to which Work may be added or from which Work may be deleted for 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 the amount of 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 The Bidder by making a Bid represents that:

2.1.1 The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.

2.1.2 The Bid is made in compliance with the Bidding Documents.

2.1.3 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 personal observations with the requirements of the proposed Contract Documents.

2.1.4 The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.

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ARTICLE 3 BIDDING DOCUMENTS

3.1 COPIES

3.1.1 Bidders may obtain complete sets of the Bidding Documents from the issuing office designated in the Advertisement or Invitation to Bid in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Bidders who submit a bona fide Bid and return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the Bidding Documents and the Bidder's deposit will be refunded.

3.1.2 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.

3.1.3 Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

3.1.4 The Owner and Architect may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.

3.2.2 Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect at least seven days prior to the date for receipt of Bids.

3.2.3 Interpretations, corrections and changes of the Bidding Documents will be made by Addendum. Interpretations, corrections and changes of the Bidding Documents made in any other manner will 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 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. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work, including changes in the work of other contracts that incorporation of the proposed substitution would require, shall be included. 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.

3.3.3 If the Architect approves a 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.

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3.3.4 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 all who are known by the issuing office to have received a complete set of Bidding Documents.

3.4.2 Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

3.4.3 Addenda will be issued no later than four 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 Each Bidder shall ascertain prior to submitting a Bid 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 the Bidding Documents.

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

4.1.3 Sums shall be expressed in both words and figures. In case of discrepancy, the amount written in words shall govern.

4.1.4 Interlineations, alterations and erasures 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."

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 make no 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 of the Bidder and the nature of legal form of the Bidder. The Bidder shall provide evidence of legal authority to perform within the jurisdiction of the Work. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give 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.

4.2 BID SECURITY

4.2.1 Each Bid shall be accompanied by a bid security in the form and amount required if so stipulated in the Instructions to Bidders. The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and will, 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. The amount of the bid security shall not be forfeited to the Owner in the event the Owner fails to comply with Paragraph 6.2.

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4.2.2 If a surety bond is required, it shall be written on AIA Document A310, Bid Bond, unless otherwise provided in the Bidding Documents, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

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

4.3 SUBMISSION OF BIDS

4.3.1 All copies of the Bid, the bid security, if any, 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.

4.3.2 Bids shall be deposited at the designated location prior to the time and date for receipt of Bids. Bids received after the time and date for receipt of Bids will be returned unopened.

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

4.3.4 Oral, telephonic, telegraphic, facsimile or other electronically transmitted bids will not be considered.

4.4 MODIFICATION OR WITHDRAWAL OF BID

4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid.

4.4.2 Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder. Written confirmation over the signature of the Bidder shall be received, and date- and time-stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

4.4.3 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

4.4.4 Bid security, if required, shall be in an amount sufficient for the Bid as resubmitted.

ARTICLE 5 CONSIDERATION OF BIDS

5.1 OPENING OF BIDS

At the discretion of the Owner, if stipulated in the Advertisement or Invitation to Bid, the properly identified Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids may be made available to Bidders.

5.2 REJECTION OF BIDS

The Owner shall have the right to reject any or all Bids. A Bid not accompanied by a required bid security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.

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5.3 ACCEPTANCE OF BID (AWARD)

5.3.1 It is the intent of the Owner to award a Contract to the lowest qualified Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. 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 own best interests.

5.3.2 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 low 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, a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted as a prerequisite to the issuance of Bidding Documents.

6.2 OWNER'S FINANCIAL CAPABILITY

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

6.3 SUBMITTALS

6.3.1 The Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, after notification of selection for the award of a Contract, furnish to the Owner through the Architect in writing:

.1 a designation of the Work to be performed with the Bidder's own forces;

.2 names of the manufacturers, products, and the suppliers of principal items or systems of materials and equipment proposed for the Work; 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 in writing 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, (1) withdraw the Bid or (2) submit an acceptable substitute person or entity with an adjustment in the Base Bid or Alternate Bid to cover 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.

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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. Bonds may be secured through the Bidder's usual sources.

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 If the Owner requires that bonds be secured from other than the Bidder's usual sources, changes in cost will be adjusted as provided in the Contract Documents.

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 be commenced prior thereto in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Subparagraph 7.2.1.

7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Both bonds shall be written in the amount of the Contract Sum.

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 thereto a certified and current copy of the power of attorney.

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum.



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SECTION 00 3100

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. Geotechnical Report: Construction & Geotechnical Material Testing, Inc Project Number 25G0505, dated September 12, 2025.

C. Septic Soil Boring Report dated 9-30-2025.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

3.01 OBTAINMENT OF PERMITS

A. General Contractor to obtain the following required permits, at no cost to Owner:
   1. Building Permit for all trades.

B. Building Permit Procedures: When required to obtain this permit:
   1. Complete and file permit application(s) with appropriate agency.
      a. Submit application within five days of the Notice to Proceed.
   2. Pay required fees.
   3. Advise Blakemore Architects if submission of modified documents is necessary to have the authorities having jurisdiction complete the plan review and approval process. Submit modified documents expeditiously.
   4. Do not commence execution of any item of work for which a permit has not been obtained.

EXISTING REPORTS AND SURVEYS

4.01 SUBSURFACE INVESTIGATION REPORT

A. A copy of a geotechnical report prepared by Construction & Geotectnical Material Testing, Inc, (project number 25G0505, dated September 12, 2025) with respect to the building site is included with this document:

B. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Sum accruing to the Owner.

C. Septic Soil Boring Report dtaed 9-30-2025.

END OF SECTION

Construction & Geotechnical Material Testing, Inc.

60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

September 12, 2025

Mr. Mike Brien
Forest Preserves of Winnebago County
5500 Northrock Drive
Rockford, Illinois 61103

CGMT Project No. 25G0505

Reference: ***Report of Subsurface Exploration and Geotechnical Engineering Services, Proposed New Office and Storage Garage Building, 3927 S. Meridian Road, Rockford, Illinois 61102***

Dear Mr. Brien:

CGMT, Inc. has completed the subsurface exploration and geotechnical engineering analyses for the proposed New Office and Storage Garage Building to be located at 3927 S. Meridian Road, in Rockford, Illinois. This report describes the subsurface exploration procedures, laboratory testing, and geotechnical recommendations for project construction. A Boring Location Plan is included in the Appendix of this report along with the Boring Logs performed for the exploration.

We appreciate this opportunity to be of service to the Forest Preserves of Winnebago County during the design phase of this project. If you have any questions with regard to the information and recommendations presented in this report, or if we can be of further assistance to you in any way during the planning or construction of this project, please do not hesitate to contact us.

Respectfully,

CONSTRUCTION AND GEOTECHNICAL MATERIAL TESTING, INC.

Pratik K. Patel, PE
Vice President | Principal

3pc: Encl.

REPORT OF

SUBSURFACE EXPLORATION AND
GEOTECHNICAL ENGINEERING SERVICES



NEW OFFICE AND STORAGE GARAGE BUILDING
3927 S. MERIDIAN ROAD
ROCKFORD, ILLINOIS 61102

CGMT PROJECT NO. 25G0505

FOR

FOREST PRESERVES OF WINNEBAGO COUNTY
ROCKFORD, ILLINOIS

SEPTEMBER 12, 2025

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APPENDIX

EXECUTIVE SUMMARY

Construction & Geotechnical Material Testing, Inc. (CGMT) has completed your subsurface exploration and geotechnical engineering project. The subsurface conditions encountered during our exploration and CGMT's conclusions and recommendations are summarized below. This summary should not be considered apart from the entire text of the report with all the qualifications and considerations mentioned herein. Details of our conclusions and recommendations are discussed in the following sections and in the Appendix of this report.

The project site is located at 3927 S. Meridian Road in Rockford, Illinois. A total of four (4) exploratory borings, B-1 through B-4, were performed for this project. The soil conditions encountered at the borings performed at the site are summarized as follows:

Approximately 6 to 10 inches of topsoil were encountered at the ground surface at the boring locations. The topsoil was underlain by black, brown, and gray, stiff silty clay fill soils that extended to depths of approximately 3½ to 6 feet below the existing grade, where, natural, brown, loose to very dense sand and gravel soils were encountered and extended to the boring termination depths of approximately 20 feet below the existing grade.

If available, records of compaction obtained during the mass earthwork phase of the project should be provided to CGMT for our review. However, if records are not available, the existing fill soils appear to have been placed with some measure of control of moisture content and density and it should be feasible to support floor slabs, pavements, and new fill. Support of foundations on existing fill soils is discussed later in this report.

If the Forest Preserves of Winnebago County willing to accept some risk of total and differential settlement and associated long term maintenance, the existing fill material similar to those encountered in the borings extending to depths of approximately 3½ to 6 feet below the existing grade may remain in place below floor slabs and pavements but the subgrade must pass a proofroll under the observation of a CGMT geotechnical engineer or soils technician. However, if the Forest Preserves of Winnebago County is unwilling to accept the risk, then the existing fill soils should be completely removed and replaced with new engineered fill.

Based on the anticipated structural loading and subsurface conditions, conventional shallow foundation systems consisting of spread and/or continuous footings, extended through existing fill soils (encountered in the boring to depths of approximately 3½ to 6 feet below the existing grade) bearing on the natural, medium dense to very dense sand and gravel, or new, properly compacted engineered fill is considered feasible and appropriate to support the proposed office building and storage building. For footings, extended through existing fill soils, bearing at depths of approximately 3½ feet below grade on natural, medium dense to very dense sand and gravel, or new, properly compacted engineered fill, we recommend a maximum net allowable soil bearing pressure of 3,000 psf be used to proportion the footings.

Alternatively, if the owner is willing to accept additional risk of total and differential movement of foundations and the associated long term maintenance, the existing fill material, similar to those encountered in the borings extending to depths of approximately 3½ to 6 feet below the existing grade, may remain in place below footings but the foundation bearing soils must be thoroughly evaluated with shallow probe holes, in-place moisture-density tests, and calibrated hand penetrometer tests. If possible, proofrolling would also helpful in evaluating the soils. It is our opinion that the risk of larger than normal building movements can be reduced to a reasonable degree through appropriate site preparation and thorough evaluation of fill characteristics. For footings, bearing at depths of at least 3½ feet below grade on thoroughly tested supported on fill soils consisting of stiff silty clay or medium dense to very dense granular fill soils, or new, properly compacted engineered fill, we recommend a maximum net allowable soil bearing pressure of 2,000 psf be used to proportion the footings. However, if the Forest Preserves of Winnebago County is unwilling to accept the risk of total and differential settlement of footings, the existing fill soils should be completely removed and backfilled with engineered fill back to the design footing grade.

Existing fill soils were encountered in the borings at depths of approximately 3½ to 6 feet below the existing grade. Complete removal and replacement discussed above may not be economical due to high construction cost. As an alternative, for ground improvement techniques and construction of conventional shallow foundations, the use of compacted/rammed aggregate piers, similar to Geopier® rammed aggregate piers and Vibro Piers can be considered for support of foundations for the new office building and storage garage. It is our opinion that foundations supported on compacted/rammed aggregate piers or Vibro Piers as discussed above will likely permit proportioning foundations for a net allowable soil bearing capacity of 3,000 psf, though this must be verified by the rammed aggregate piers or Vibro Piers installer.

The compacted/rammed aggregate piers can be used to reinforce the existing soils beneath spread and wall footings, load bearing walls and floor slabs. The compacted/rammed aggregate piers are constructed by drilling approximately 2½ feet in diameter boreholes extending through the layers of unsuitable soils and compacted/ramming thin lifts of new aggregate fill materials within the boreholes to create dense aggregate piers. The compacted/rammed aggregate piers should be constructed through layers of existing fill soils and anticipated to extend to natural, medium dense to very dense at depths of about 3½ to 6 feet below the existing grade. Temporary casing will likely be needed during construction of the aggregate piers through the existing fill soils. Aggregate piers should be constructed on a grid pattern using well-graded granular soils tamped in thin lifts. We anticipate spacing of compacted/rammed aggregate piers should be in the range of 5 to 10 feet on center. Our experience suggests that aggregate pier manufacturers will interpret the available subsurface information and can provide appropriate foundation design including allowable bearing pressure and anticipated settlement.

We recommend that the excavation of building foundations be monitored full-time by a CGMT geotechnical engineer or his representative to verify that the exposed subgrade materials and the soil bearing pressure will be suitable for the proposed structure.

Report Prepared By:

Nicholas Wolff

Nicholas P. Wolff, P.E.
Geotechnical Engineer

Report Reviewed By:

Pratik Patel

Pratik K. Patel, PE
Vice President | Principal

1
PROJECT OVERVIEW

Introduction

This report presents the results of our subsurface exploration and engineering services for the proposed new office and storage garage building in Rockford, Illinois. A General Location Plan included in the Appendix of this report, shows the approximate location of this project.

Project Description

ITEM	DESCRIPTION
Site Layout	See Boring Location Diagram in the Appendix
Proposed Construction	We understand the project will be a new single story, slab-on-grade office and storage garage pre-engineered building that will not include basements or below grade spaces.
Structural Loads	Max. column loads: 200 kips (Anticipated); Max. wall loads: 3 kips per lineal foot (Anticipated)
Grading and Existing Site Considerations	Less than 2 to 3 feet of cuts and fills will be necessary to establish final site grades.
Ancillary Improvements	New parking and drive areas are also planned.

Scope of Work

The conclusions and recommendations contained in this report are based on the soil borings performed in the vicinity of the proposed construction areas, and associated laboratory testing of selected soil samples. The scope of the subsurface exploration included the following:

Number of Borings	Depth (feet)
4	20

The results of the soil borings, along with a Boring Location Plan showing the approximate locations where the borings were performed, are included in the Appendix of this report. Once the samples were returned to our laboratory we laboratory tests on selected representative soil samples from the borings to evaluate pertinent engineering properties, and, we analyzed the field and laboratory data to develop appropriate engineering recommendations.

The purpose of this report is to provide information and geotechnical engineering recommendations with regard to:

- Subsurface Soil and Groundwater Conditions
- Seismic Considerations
- Site Preparation and Earthwork
- Foundation Design and Construction
- Floor Slab Design and Construction
- Pavement Design and Construction

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EXPLORATION RESULTS

Site Description

ITEM	DESCRIPTION
Project Location	The project site is located at 3927 S. Meridian Road, in Rockford, Illinois.
Existing Site Improvements	At the ground surface, the site was vacant land covered with grass.
Existing Topography	There was an overall grade down from the northern portion of the site to the southeastern potion of the site. Site grades ranged from approximately 828 feet down to 820 feet (Per Google Earth).

Soil Conditions

A total of four (4) borings, B-1 through B-4 were performed for this project. The subsurface conditions encountered at the borings performed at the site can be summarized as follows.

Approximately 6 to 10 inches of topsoil were encountered at the ground surface at the boring locations. The topsoil was underlain by black, brown, and gray, stiff silty clay fill soils that extended to depths of approximately 3½ to 6 feet below the existing grade, where, natural, brown, loose to very dense sand and gravel soils were encountered and extended to the boring termination depths of approximately 20 feet below the existing grade.

SOILS	SOIL CHARACTERISTICS
Silty Clay (Existing Fill)	Unconfined Compressive Strengths: 1.0 to 1.5 tsf Dry Density Determinations: 106.0 to 106.5 pcf Moisture Contents: 15.7 to 20.8 percent
Sand and Gravel (Natural)	Loose to very dense; 6 to 100+ blows per foot

The specific soil types observed at the borings are noted on the boring logs, enclosed in the Appendix.

Groundwater Observations

Observations for groundwater were made during sampling and upon completion of the drilling operations at the boring locations. In auger drilling operations, water is not introduced into the boreholes, and the groundwater position can often be obtained by observing water flowing into or out of the boreholes. Furthermore, visual observation of the soil samples retrieved during the auger drilling exploration can often be used in evaluating the groundwater conditions. Groundwater levels were observed during drilling and immediately the completion of drilling. Groundwater measurements are summarized in the table below:

Location	GROUNDWATER LEVELS		
	DURING DRILLING	IMMEDIATELY AFTER COMPLETION	ESTIMATED SEASONAL HIGH WATER TABLE
Soil Boring B-1	None	None	N/A[1]
Soil Boring B-2	None	None	N/A[1]
Soil Boring B-3	None	None	N/A[1]
Soil Boring B-4	None	None	N/A[1]

[1] The seasonal high water table may be located at depths greater than those explored, but perched groundwater may be present.

In general, estimates of prevailing ground water conditions on sites are based upon ground water levels at the time of the exploration. Ground water levels in borings are indicative of short-term groundwater levels. Soil color of samples is also considered during visual classification of the soil samples, as color is an indicator of the seasonal high-water table. Soils generally oxidize from a gray color to browns and tans when they are not in a saturated state. The seasonal high-water table is often interpreted to be near this zone of color change. Based on the results of this exploration, the seasonal high-water table may be located at depths greater than those explored, but perched groundwater may be present.

More definitive evidence of prevailing groundwater levels could be obtained through the use of groundwater monitoring wells, which CGMT could install and monitor if requested.

It should be noted that the groundwater level can vary based on precipitation, evaporation, surface run off and other factors not immediately apparent at the time of this exploration. Surface water runoff will be a factor during general construction, and steps should be taken during construction to control surface water runoff and to remove any water that may accumulate in the proposed excavations as well as floor slab and pavement areas. Precipitation generally varies seasonally. To assist in anticipating groundwater fluctuations changes throughout the year, average monthly precipitation is provided in the table below:

Seasonal Precipitation

Month	January	February	March	April	May	June	July	August	September	October	November	December	Total
Normal Precipitation (inches)	1.73	1.79	2.50	3.38	3.68	3.45	3.70	4.90	3.21	3.15	3.15	2.25	36.89

Average precipitation levels were obtained from wunderground.com.

Seismic Zone

Per the 2021 International Building Code, the Soil Site Class is determined from ASCE 7.16, Table 20.3-1 Site Classification. Based upon the site conditions, the site soils can be characterized as Site Class D. Site Class D is described as Stiff Soil Profile for the top 100 ft of the site soil profile. Since we drilled to a maximum depth of 20 feet for this exploration, based on our experience with the soils in this area, the available geologic maps and following the direction of IBC 2021 when there are no borings to 100 feet deep, it is our opinion the site would be defined as Site Class D.

CGMT also calculated the spectral response factors based on the site class as well as the latitude and longitude of the project location using United States Geological Survey (USGS) seismic calculator software. The calculated values are presented in the table below:

Seismic Design Criteria

New Office and Storage Garage Building					
3927 S. Meridian Road, Rockford, Illinois 61102					
Latitude	42.22377°	**Longitude**	-89.17399°	**Site Class**	"D"
S_s	0.140g	**S_{MS}**	0.180g	**S_{DS}**	0.120g
S_1	0.066g	**S_{M1}**	0.140g	**S_{D1}**	0.094g

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ANALYSIS AND RECOMMENDATIONS

Overview

The following recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions encountered. If there are any changes to the project characteristics or if different subsurface conditions are encountered during construction, CGMT should be consulted so that the recommendations of this report can be reviewed.

A summary of the results of the exploration is provided in the table below:

Preliminary Bearing Table

Location	Boring Depth (feet)	Depth to Groundwater (feet)		Approximate Depth to Soils Suitable for a Net Allowable Bearing Pressure of 2,000 psf[1] "Elevated Risk"	Approximate Depth to Soils Suitable for a Net Allowable Bearing Pressure of 3,000 psf[1] "Reduced Risk"
		During Drilling	After Completion		
Soil Boring B-1	20	None	None	1 Foot	3½ Feet
Soil Boring B-2	20	None	None	1 Foot	6 Feet
Soil Boring B-3	20	None	None	1 Foot	3½ Feet
Soil Boring B-4	20	None	None	1 Foot	3½ Feet

[1] To be used a minimum of 3½ feet below adjacent outside grade.

Subgrade Preparation and Engineered Fill

Subgrade Preparation

Initial subgrade preparation should consist of complete stripping/removal of any topsoil, vegetation, and any other soft or unsuitable/deleterious materials from the proposed construction areas. Unsuitable materials, such as topsoil/buried topsoil or organic soils, should either be stockpiled for later use in landscaping fills or placed in approved disposal areas either on-site or off-site. Root systems of existing trees shall be satisfactorily grubbed.

We recommend that the project geotechnical engineer or his representative should be on site to monitor stripping and site preparation operations and observe that unsuitable soils have been satisfactorily removed and to observe proofrolling.

Due to the widely spaced distribution of borings combined with the potential for soil disturbance, the accuracy of topsoil thicknesses based upon measurements at the boring locations is limited. In addition, the density of the surface soils also may impact the measured topsoil thickness. As such, the thicknesses reported on the boring logs should be considered approximate. To provide improved estimates for stripping volumes, CGMT recommends a supplemental topsoil survey be performed.

The sides of the excavations should be sloped or braced for stability. Excavations should comply with the requirements of OSHA 29CFR, Part 1926, Subpart P, "Excavations" and its appendices, as well as other applicable codes. This document states that the excavation safety is the responsibility of the contractor. Reference to this OSHA requirement should be included in the job specifications.

Any existing utilities should be abandoned and relocated, and associated structures and backfill materials should be removed from the proposed construction areas unless they are planned to remain in service. Prior to construction, we recommend all utilities in the proposed construction areas be positively identified and marked. Those utilities that can be relocated should be relocated to the extent practical and backfilled with compacted/densified engineered fill. Abandoned utilities should be removed or grouted full with lean concrete. Excavations resulting from removal/demolition of existing utilities and other structures should be completely filled with engineered fill. Active utilities to remain in the construction areas should be exposed and protected during construction to reduce the potential for damage or interruption of service. Where existing utilities will remain under any structure, we recommend that the utility backfill be removed and replaced with controlled fill.

Any existing floor slabs and/or below grade foundation elements from previous structure should be completely removed from the proposed construction areas. The tops of foundation walls should be removed to depths of at least 2 feet below the base of new pavements, but existing wall backfill materials, if encountered, should be completely removed and replaced with controlled compacted fill. Soils exposed in the excavations created by the demolition should be observed and evaluated by an experienced geotechnical technician or engineer. The completed excavations should be backfilled with properly placed and compacted fill as recommended in this report. Improper placement and compaction of fill materials during demolition/removal of existing foundations and other structures could lead to inconsistent subgrade performance resulting in foundation, floor slab and pavement distress and settlement.

The presence of field tiles should be considered when developing plans and specifications. Where field tiles are encountered, we recommend that they be rerouted to a storm sewer system or properly abandoned upgradient from the site. Field tiles in new building and pavement areas should be removed or grouted.

After removal of unsuitable/deleterious materials and stripping to the desired grade, and prior to fill placement, we recommend the stripped/exposed subgrades be observed by an experienced geotechnical engineer or his authorized representative at the time of construction in order to aid in identifying localized soft/loose or unsuitable materials which should be removed. Proofrolling using a fully loaded, tandem-axle truck, or loaded truck/equipment similar to those anticipated during construction, should be used at this time to aid in identifying localized soft or unsuitable material which should be removed. Any soft or unsuitable materials encountered during proofrolling should be compacted in place or removed and replaced with an approved backfill compacted to the criteria given below. Prior to proofrolling, the driveway and floor slab areas that will receive less than 1 foot of new fill, should be scarified to a depth of about 9 inches, moisture conditioned, and recompacted as recommended below.

If available, records of compaction obtained during the mass earthwork phase of the project should be provided to CGMT for our review. However, if records are not available, the existing fill soils appear to have been placed with some measure of control of moisture content and density and it should be feasible to support floor slabs, pavements, and new fill. Support of foundations on existing fill soils is discussed later in this report.

If the Forest Preserves of Winnebago County willing to accept some risk of total and differential settlement and associated long term maintenance, the existing fill material similar to those encountered in the borings extending to depths of approximately 3½ to 6 feet below the existing grade may remain in place below floor slabs and pavements but the subgrade must pass a proofroll under the observation of a CGMT geotechnical engineer or soils technician. However, if the Forest Preserves of Winnebago County is unwilling to accept the risk, then the existing fill soils should be completely removed and replaced with new engineered fill.

During final preparation of subgrades, a smooth drum roller is often used to provide a flat surface and provide for better drainage to reduce the negative impact of rain events. Due to the relative sensitivity of the silty clay soils, we recommend that these materials be static rolled (no vibrations) to reduce the potential for subgrade soil disturbance. We also recommend crowning the subgrade to provide positive drainage off the building pad and parking lot subgrades.

Engineered Fill

Where new fill material is required for backfill or to otherwise reach the design subgrade elevation beneath slabs-on-grade and pavements, we recommend that engineered fill be used. Any soil placed as engineered fill should be an approved material, free of organic matter or debris, be a non-frost susceptible soil, and have a liquid limit and plasticity index less than 40 and 15, respectively. The project geotechnical engineer should be consulted to determine the suitability of off-site/on-site materials for use as engineered fill, prior to use or placement. We do not recommend the use of 3-inch stone as engineered fill to backfill undercuts, particularly under floor slabs and foundations. Fill materials containing large voids are more susceptible to future movement that may become unstable resulting in excessive and variable settlement.

Fill should be placed in lifts not exceeding 8 inches in loose thickness, moisture conditioned to within 2 percent of the optimum moisture content, and compacted to at least 95 percent of the maximum dry density obtained in accordance with ASTM Specification D 1557, Modified Proctor Method. Fill placed below footing base elevations should be compacted to at least 95 percent of the material's modified Proctor maximum dry density (ASTM D 1557). Engineered fill placed to support foundations should extend 1 foot beyond the outside edges of the footings and from that point outward laterally 1 foot for every 2 feet of fill thickness below the footings. Laboratory proctor tests should be performed on fill materials to determine the maximum dry density and optimum moisture content. A shrinkage factor of 15 percent can be assumed for estimating earthwork quantities for bidding purposes.

We recommend suitable silty clays used to raise the grade or backfill undercuts should be compacted with a sheepsfoot roller. Granular engineered fill should be compacted with a smooth drum roller or adequate heavy vibratory plate. Moisture control during earthwork operations, including the use of disking or appropriate drying equipment and techniques, should be expected.

In-place density tests should be performed with a minimum of 1 test per 2,000 square feet of fill area for each lift of fill placed. We recommend that the placement of engineered fill be monitored full-time by CGMT representative and in-place density tests should be performed to verify the adequacy of the compaction for each lift of fill placed.

Footing Foundations

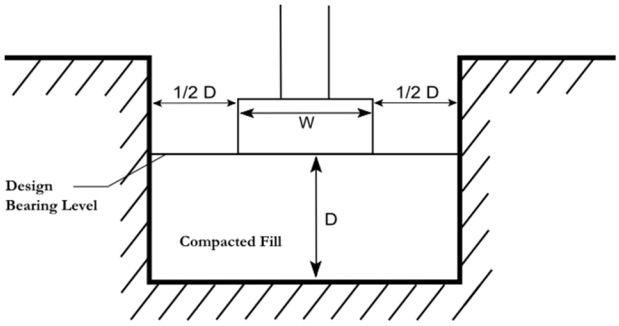
Based on the anticipated structural loading and subsurface conditions, conventional shallow foundation systems consisting of spread and/or continuous footings, extended through existing fill soils (encountered in the boring to depths of approximately 3½ to 6 feet below the existing grade) bearing on the natural, medium dense to very dense sand and gravel, or new, properly compacted engineered fill is considered feasible and appropriate to support the proposed office building and storage building. For footings, extended through existing fill soils, bearing at depths of approximately 3½ feet below grade on natural, medium dense to very dense sand and gravel, or new, properly compacted engineered fill, we recommend a maximum net allowable soil bearing pressure of 3,000 psf be used to proportion the footings.

Alternatively, if the owner is willing to accept additional risk of total and differential movement of foundations and the associated long term maintenance, the existing fill material, similar to those encountered in the borings extending to depths of approximately 3½ to 6 feet below the existing grade, may remain in place below footings but the foundation bearing soils must be thoroughly evaluated with shallow probe holes, in-place moisture-density tests, and calibrated hand penetrometer tests. If possible, proofrolling would also helpful in evaluating the soils. It is our opinion that the risk of larger than normal building movements can be reduced to a reasonable degree through appropriate site preparation and thorough evaluation of fill characteristics. For footings, bearing at depths of at least 3½ feet below grade on thoroughly tested supported on fill soils consisting of stiff silty clay or medium dense to very dense granular fill soils, or new, properly compacted engineered fill, we recommend a maximum net allowable soil bearing pressure of 2,000 psf be used to proportion the footings. However, if the Forest Preserves of Winnebago County is unwilling to accept the risk of total and differential settlement of footings, the existing fill soils should be completely removed and backfilled with engineered fill back to the design footing grade.

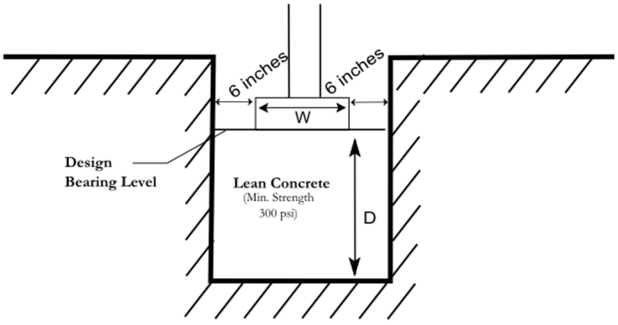
To reduce the potential for foundation bearing failure and excessive settlement due to local shear or "punching" action, we recommend that continuous footings have a minimum width of 18 inches and that isolated column footings have a minimum lateral dimension of 30 inches. In addition, footings should be placed at a depth to provide adequate frost cover protection. We recommend the footings be placed at a minimum depth of 3½ feet below finished grade. Interior footings in heated areas can be placed at a minimum of 2 feet below grade provided that suitable soils are encountered and that the foundations will not be subjected to freezing weather either during or after construction.

We recommend that the excavation of building foundations be monitored on a full-time basis by a CGMT geotechnical engineer or his representative to verify that the exposed subgrade materials and the soil bearing capacity will be suitable for the proposed building and is consistent with the boring log information obtained during the geotechnical exploration.

The contractor should be prepared to undercut/overexcavate and extend the footings to soils of adequate bearing capacity. As an alternative, after overexcavation and removal of weaker/low bearing capacity soils or unsuitable soils, the foundation subgrade can be raised using compacted engineered fill or lean concrete to a minimum frost depth of 3½ feet below final exterior grade. Engineered fill should be compacted to a minimum of 95 percent of the maximum dry density as discussed in the **Subgrade Preparation and Engineered Fill** section. The zone of the engineered fill placed below the foundations should extend 1 foot beyond the outside edges of the footings and from that point, outward laterally 1 foot for every 2 feet of fill thickness below the footing. The overexcavation and backfill procedure is depicted in the figure below. If lean concrete is used to replace weaker/low bearing soils or unsuitable soils, no lateral overexcavation will be necessary, but the excavation should be 1 foot wider than the footing (6 inches on each side).



Overexcavation and Backfill Procedure
(Recommended for Relatively Shallow Deepening)



Overexcavation and Lean Concrete Backfill Procedure
(Recommended for Greater Deepening)

Settlement of the conventional shallow foundations, designed in accordance with our recommendations presented in this report, is expected to be within tolerable limits for the proposed building. For footings, extended through existing fill soils, placed on natural, medium dense to very dense sand and gravel, or properly compacted engineered fill and designed as discussed above, maximum total settlement is expected to be in the range of 1 inch or less. These settlement values are based on our engineering experience with the soil and the anticipated structural loading, and are to guide the structural engineer with his design.

The settlement values provided above are for foundations bearing on suitable natural soils, or on compacted engineered fills. If foundations will bear on existing fill soils that have passed a proofroll test, total and differential settlement may be greater than the estimates provided above.

Rammed or Vibro-Compacted Aggregate Piers

Existing fill soils were encountered in the borings at depths of approximately 3½ to 6 feet below the existing grade. Complete removal and replacement discussed above may not be economical due to high construction cost. As an alternative, for ground improvement techniques and construction of conventional shallow foundations, the use of compacted/rammed aggregate piers, similar to Geopier® rammed aggregate piers and Vibro Piers can be considered for support of foundations for the new office building and storage garage. It is our opinion that foundations supported on compacted/rammed aggregate piers or Vibro Piers as discussed above will likely permit proportioning foundations for a net allowable soil bearing capacity of 3,000 psf, though this must be verified by the rammed aggregate piers or Vibro Piers installer.

The compacted/rammed aggregate piers can be used to reinforce the existing soils beneath spread and wall footings, load bearing walls and floor slabs. The compacted/rammed aggregate piers are constructed by drilling approximately 2½ feet in diameter boreholes extending through the layers of unsuitable soils and compacted/ramming thin lifts of new aggregate fill materials within the boreholes to create dense aggregate piers. The compacted/rammed aggregate piers should be constructed through layers of existing fill soils and anticipated to extend to natural, medium dense to very dense at depths of about 3½ to 6 feet below the existing grade. Temporary casing will likely be needed during construction of the aggregate piers through the existing fill soils. Aggregate piers should be constructed on a grid pattern using well-graded granular soils tamped in thin lifts. We anticipate spacing of compacted/rammed aggregate piers should be in the range of 5 to 10 feet on center. Our experience suggests that aggregate pier manufacturers will interpret the available subsurface information and can provide appropriate foundation design including allowable bearing pressure and anticipated settlement.

The compacted/rammed aggregate piers can also be used to support floor slabs. For buildings with compacted/rammed aggregate piers, similar to Geopier® rammed aggregate piers and Vibro Piers, floor slabs and the required granular base course can be constructed on top of aggregate piers. Prior to the construction of floor slabs, the subgrade preparation should consist of densifying the exposed design subgrade surface to the extent practical prior to placement of granular base course and concrete.

We recommend that the excavation of building foundations be monitored on a full-time basis by a CGMT geotechnical engineer or his representative to verify the exposed soils and the soil bearing capacity will be suitable for the proposed building and is consistent with the boring log information obtained during the geotechnical exploration.

For footings bearing above soil improved using rammed aggregate piers properly designed and installed, maximum total settlement is expected to be in the range of 1 inch or less based on consolidation of the soils under structural loading. These settlement values are based on our engineering experience with the soil and the anticipated structural loading, and are to guide the structural engineer with his design.

Floor Slab Design

For the design and construction of slabs-on-grade, we recommend that all existing vegetation, topsoil or organic soils, and any unsuitable/deleterious materials should be removed and replaced with new, properly compacted engineered fill as discussed in the **Site Preparation and Engineered Fill** section. If the removal is performed in accordance with these recommendations, we anticipate floor slabs for the structures will be supported on stable and approved subgrades consisting of the existing soils or on new, properly compacted engineered fill.

It is assumed that the existing floor slab subgrade has performed satisfactorily during the proofroll discussed in the **Subgrade Preparation** subsection, even though the existing fill soils were encountered to depths of approximately 3½ to 6 feet below the existing grade. Provided that the floor slab subgrade passes a proofroll, the risk of excessive settlement is low. However, if the floor slab subgrade does not pass the proofroll, some undercutting and placement of controlled backfill will be required.

We recommend that floor slabs be underlain by a minimum of 6 inches of granular material having a maximum aggregate size of 1½ inches and no more than 2 percent of fines. Prior to placing the granular material, the floor subgrade soil should be properly compacted, proofrolled, and free of standing water, mud, and frozen soil. For design of Portland cement concrete slabs-on-grade, a modulus of subgrade reaction (k) of 100 pounds per cubic inch (pci) can be used for slabs constructed on subgrade prepared as discussed herein.

A properly designed and constructed capillary break layer can often mitigate the need for a moisture retarder and can assist in more uniform curing of concrete. If a vapor retarder is considered to provide additional moisture protection, special attention should be given to the surface curing of the slabs to reduce uneven drying of the slabs and associated cracking and/or slab curling. The use of a blotter or cushion layer above the vapor retarder can also be considered for project specific reasons. Please refer to ACI 302.1R96 *Guide for Concrete Floor and Slab Construction* and ASTM E 1643 *Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs* for additional guidance on this issue.

We recommend that the floor slab be isolated from the foundation footings so differential settlement of the structure will not induce shear stresses on the floor slab. Also, in order to reduce the crack width of any shrinkage cracks that may develop near the surface of the slab, we recommend mesh reinforcement as a minimum be included in the design of the floor slab. Temperature and shrinkage reinforcements in slabs on ground should be positioned in the upper third of the slab thickness. The Wire Reinforcement Institute recommends the mesh reinforcement be placed 2 inches below the slab surface or upper one-third of slab thickness, whichever is closer to the surface. Adequate construction joints, contraction joints and isolation joints should also be provided in the slab to reduce the impacts of cracking and shrinkage. Please refer to ACI 302.1R96 *Guide for Concrete Floor and Slab Construction* for additional information regarding concrete slab joint design.

Pavements

For the design and construction of the pavements, we recommend that of any topsoil, vegetation, and any other soft or unsuitable/deleterious materials be removed from the proposed construction areas before construction of new pavements and the new pavements be supported by stable and approved subgrades consisting of the existing soils or new, properly compacted engineered fill.

It is assumed that the existing pavement subgrade has performed satisfactorily during the proofroll discussed in the **Subgrade Preparation** subsection, even though existing fill soils were encountered to depths of approximately 3½ to 6 feet below the existing grade. Provided that the pavement subgrade passes a proofroll, the risk of excessive settlement is low. However, if the pavement subgrade does not pass the proofroll, some undercutting and placement of controlled backfill will be required.

We anticipate the new pavement will be constructed of asphaltic concrete or Portland cement concrete. We expect that the proposed parking lot will generally be utilized for light duty traffic, and the driveways and loading and unloading areas be utilized for light to medium duty traffic. Heavy traffic loads would be anticipated for areas near any dumpsters where garbage trucks would often cross. We recommend the pavement subjected to light traffic be underlain by a minimum of 8 inches of base course granular material, similar to Illinois Department of Transportation gradation CA-6.

Assuming the pavement subgrade will consist predominantly of the cohesive soils and new fill prepared in accordance with the recommendations given in this report, a SSR of Fair, an estimated IBR value of 2 and a drainage class of Very poor should be used for pavement design purposes. Similarly, an estimated modulus of subgrade reaction value equal to 100 pounds per cubic inch should be used for concrete pavement design purposes. Concrete pavements should be air-entrained Portland cement concrete with a minimum compressive strength of 4,000 psi and a minimum flexural strength of 650 psi. Concrete strength requirements are outlined in Article 1020.04 in the IDOT Standard Specifications (Adopted April 1, 2016).

Some typical pavement sections used in this region of the country are given below which could be considered for preliminary estimating purposes. Other sections can also be considered. These sections assume a low volume of light vehicle loads (automobiles, vans, pickups, etc.). They should also be considered minimum thicknesses, and, as such, periodic maintenance should be anticipated. Final design sections should consider details such as final grades, traffic loadings, traffic volumes, the desired design life and any local, county or city codes. If you wish, we would be pleased to perform a detailed pavement section design using AASHTO or Asphalt Institute procedures when this information is available. It should also be noted that these sections do not consider if the binder course will be subject to construction vehicle traffic for an extended period of time. Some distress to the binder course and aggregate base could occur, if this is the case.

Typical Pavement Sections[1]

	Light Duty (Parking Lots)	Heavy Duty[2] (Drives)	Frequent Truck Traffic
Portland Cement Concrete:	5 inches	6 inches	7 inches
Full Depth Asphalt:	5.5 inches	7 inches	10 inches
Combined Section Asphalt / Crushed Stone Base Course:	3/8 inches	4/10 inches	4.5/16 inches

[1]All materials should meet the current Illinois Department of Transportation Standard Specifications for Road and Bridge Construction requirements.

[2]In areas of anticipated heavy traffic, delivery trucks, or concentrated loads, a minimum concrete thickness of 7 inches is recommended but should be evaluated further when loading conditions are known.

Final design sections should consider details such as final grades, traffic loadings, traffic volumes, the desired design life and any local, county or city codes. If you wish, we would be pleased to perform a detailed pavement section design using AASHTO or Asphalt Institute procedures when this information is available. Minimum design requirements for hot-mix asphalt (HMA) shall follow Article 1030.05 in the IDOT Standard Specifications (Adopted April 1, 2016) During asphalt pavement construction, the wearing and leveling course should be compacted to a minimum of 93 percent of the theoretical density value. Prior to placing the granular material, the pavement subgrade soil should be properly compacted, proofrolled, and free of standing water, mud, and frozen soil.

Consideration should also be given to placing a geotechnical fabric at the base of the new pavement section as a separation layer and to reduce the potential for premature degradation of the new pavements.

An important consideration with the design and construction of pavements is surface and subsurface drainage. Where standing water develops, either on the pavement surface or within the base course layer, softening of the subgrade and other problems related to the deterioration of the pavement can be expected. Furthermore, good drainage should reduce the possibility of the subgrade materials becoming saturated over a long period of time. We would be pleased to be of further assistance to you in the design of the project pavements by providing additional recommendations during construction of the project.

Periodic maintenance of pavements should be anticipated. The subgrade parameters provided in this report consider that significant changes in the subgrade moisture content do not occur. To reduce the potential for changes in subgrade moisture, all paved areas should be sloped to provide rapid drainage of surface water and to drain water away from the pavement edges. Water that is allowed to pond on or adjacent to the pavement can saturate and soften the subgrade soils and subsequently accelerate pavement deterioration.

Granular base or subbase materials directly below pavement sections can also collect infiltrated surface water and soften the subgrade as well as increase the effects of frost action, both of which can be detrimental to pavements. For these reasons, where granular materials are used over a cohesive soil subgrade or where the groundwater level is within 3.5 feet of finished pavement subgrade, we recommend the installation of four-inch diameter transverse underdrains to improve the pavement performance and extend its service life. The underdrains should be installed at 300-foot intervals and at low points in the pavement. Pipe underdrains shall be installed per Article 601 in the IDOT Standard Specifications (Adopted April 1, 2016) and consist of Type 2 underdrains.

General Construction Considerations

We recommend that the subgrade preparation, installation of the foundations, and construction of slabs-on-grade be monitored by a CGMT geotechnical engineer or his representative. Methods of verification and identification such as proofrolling, DCP testing and hand auger probe holes will be necessary to further evaluate the subgrade soils and identify unsuitable soils. The contractor should be prepared to overexcavate footing excavations at isolated locations. We recommend that excavations of new foundations be monitored on a full-time basis by a CGMT geotechnical engineer or his representative to verify that the soil bearing pressure and the exposed subgrade materials will be suitable for the proposed office building and storage garage building and are consistent with the boring log information obtained during this geotechnical exploration. We would be pleased to provide these services.

Since localized areas of soft/unsuitable soils may be present below the bearing elevation of foundations, we recommend that hand-auger borings be performed to at least half the footing width, or a minimum of 3 feet below each isolated column footing and to at least 2 feet below continuous footings. Hand auger borings should be performed at each column footing and at approximately 20-foot intervals along continuous footings to verify the suitability of the soils to support the recommended maximum net allowable bearing pressure. If soft/unsuitable soils are encountered, the footings should be extended until suitable bearing soils are encountered or the unsuitable soils should be removed beneath the base of the footing and replaced with compacted engineered fill or lean concrete. The foundation contractor should expect undercutting/overexcavation or removal of unsuitable material without delay and replacement with engineered fill at the time of foundation excavation/construction.

All loose or soft soils in the subgrade or foundation excavation areas should be densified or removed before placing any concrete or fill. Accumulated water or runoff water at the base of the foundation excavations should also be promptly removed. Groundwater seepage is anticipated not to be a major factor during foundation excavations or undercutting. If encountered, we believe sump and pump system should be adequate to remove accumulated seepage from the bottom of excavations prior to placement of concrete or crushed stone. Concrete should not be placed in water. To reduce the potential for frost heave related problems; forms should be used prior to the placement of foundation concrete.

Exposure to the environment may weaken the soils at the foundations bearing level if the excavations remain open for too long a time. Therefore, foundation concrete should be placed the same day that excavations are opened, when possible. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the immediately prior to placement of concrete.

We recommend adequate surface and subsurface drainage be considered in the design and construction of floor slabs and pavements. Where standing water develops, either on slab or pavement surfaces or within the base course layer, softening of the subgrade and other problems related to the deterioration of the floor slabs and pavements can be expected. Adequate drainage should reduce the possibility of the subgrade materials becoming saturated over a long period of time. To reduce water infiltration to the pavement section and within the base course layer resulting in softening of the subgrade and deterioration of the slabs and pavements, we recommend the timely repair or sealing of joints and cracks in slabs and pavement.

All unsuitable materials should be removed and replaced with environmentally clean, inorganic fill and free of debris or harmful matter. Unsuitable materials removed from the project site should be disposed of in accordance with all applicable federal, state, and local regulations.

The contractor should avoid stockpiling excavated materials immediately adjacent to the excavation walls. We recommend that stockpile materials be kept back from the excavation a minimum distance equal to the excavation depth to avoid surcharging the excavation walls. If this is impractical due to space constraints, the excavation walls should be retained with bracing designed for the anticipated surcharge loading.

Excavations should comply with the requirements of OSHA 29CFR, Part 1926, Subpart P, "Excavations" and its appendices, as well as other applicable codes. This document states that the contractor is solely responsible for the design and construction of stable, temporary excavations. The excavations should not only be in accordance with current OSHA excavation and trench safety standards but also with applicable local, state, and federal regulations. The contractor should shore, slope or bench the excavation sides when appropriate. In no case should excavations extend below the level of adjacent structures, utilities or pavements, unless underpinning or other adequate support is provided. Site safety is the sole responsibility of the contractor, who shall also be responsible for the means, methods and sequencing of construction operations.

14
EXPLORATION PROCEDURES

Subsurface Exploration Procedures

The soil borings were located in the field by a CGMT Field Engineer based on the proposed boring site plan provided to us. As required by the State of Illinois, the driller notified Illinois One-Call System, JULIE, to verify underground utilities in the vicinity of the project site prior to drilling operations.

The soil borings were performed with a truck-mounted rotary-type auger drill rig, which utilized continuous hollow stem augers to advance the boreholes. Representative soil samples were obtained at 2½ foot intervals for the first 10 feet and 5-foot intervals thereafter by means of conventional split-barrel sampling procedures. In this procedure, a 2-inch O.D., split-barrel sampler is driven into the soil a distance of 18 inches by a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler through a 12-inch interval, after initial setting of 6 inches, is termed the Standard Penetration Test (SPT) or N-value and is indicated for each sample on the boring logs. The SPT value can be used as a qualitative indication of the in-place relative density of cohesionless soils. In a less reliable way, it also indicates the consistency of cohesive soils. This indication is qualitative, since many factors can significantly affect the standard penetration resistance value and prevent a direct correlation between drill crews, drill rigs, drilling procedures, and hammer-rod-sampler assemblies. The drill rig utilized an automatic trip hammer to drive the sampler. Consideration of the effect of the automatic hammer's efficiency was included in the interpretation of subsurface information for the analyses prepared for this report.

The drill crew maintained a field log of the soils encountered in the borings. After recovery, each geotechnical soil sample was removed from the sampler and visually classified. Representative portions of each soil sample were then sealed in jars and brought to our laboratory in Elk Grove Village, Illinois for further visual examination and laboratory testing. After completion of the drilling operations, the boreholes were backfilled with auger cuttings to the existing ground surface.

Laboratory Testing Program

Representative soil samples were selected and tested in our laboratory to check field classifications and to determine pertinent engineering properties. The laboratory testing program included visual classifications and unconfined compressive strength and moisture content determinations. Dry density determinations were performed on selected samples of existing cohesive fill soils.

An experienced geotechnical engineer classified each soil sample on the basis of texture and plasticity in accordance with the Unified Soil Classification System. The group symbols for each soil type are indicated in parentheses following the soil descriptions on the boring logs. A brief explanation of the Unified System is included with this report. The geotechnical engineer grouped the various soil types into the major zones noted on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs and profiles are approximate; in situ, the transitions may be gradual.

Unconfined compressive strength tests were performed on cohesive soil samples with the use of a calibrated hand penetrometer. In the hand penetrometer test, the unconfined compressive strength of a soil sample is estimated, to a maximum of 4½ tons per square foot (tsf) by measuring the resistance of a soil sample to penetration of a small, calibrated spring-loaded cylinder.

The soil samples will be retained in our laboratory for a period of 60 days, after which, they will be discarded unless other instructions are received as to their disposal.

15
CLOSING

We recommend that the construction activities be monitored by CGMT to provide the necessary overview and to check the suitability of the subgrade soils for supporting the foundations. Once final loads become available, CGMT must be contacted to review the recommendations presented herein.

This report has been prepared in order to aid in the evaluation of this property and to assist the architect and/or engineer in the design of this project. The scope is limited to the specific project and locations described herein and our description of the project represents our understanding of the significant aspects relative to soil and foundation characteristics. In the event that any change in the nature or location of the proposed construction outlined in this report are planned, we should be informed so that the changes can be reviewed and the conclusions of this report modified or approved in writing by the geotechnical engineer. It is recommended that all construction operations dealing with earthwork and foundations be reviewed by an experienced geotechnical engineer to provide information on which to base a decision as to whether the design requirements are fulfilled in the actual construction. If you wish, we would welcome the opportunity to provide field construction services for you during construction.

The analysis and recommendations submitted in this report are based upon the data obtained from the soil borings and tests performed at the locations as indicated on the Boring Location Plan and other information referenced in this report. This report does not reflect any variations, which may occur between the borings. In the performance of the subsurface exploration, specific information is obtained at specific locations at specific times. However, it is a well-known fact that variations in soil conditions exist on most sites between boring locations and also such situations as groundwater levels vary from time to time. The nature and extent of variations may not become evident until the course of construction. If variations then appear evident, after performing on-site observations during the construction period and noting characteristics and variations, a reevaluation of the recommendations for this report will be necessary.

APPENDIX

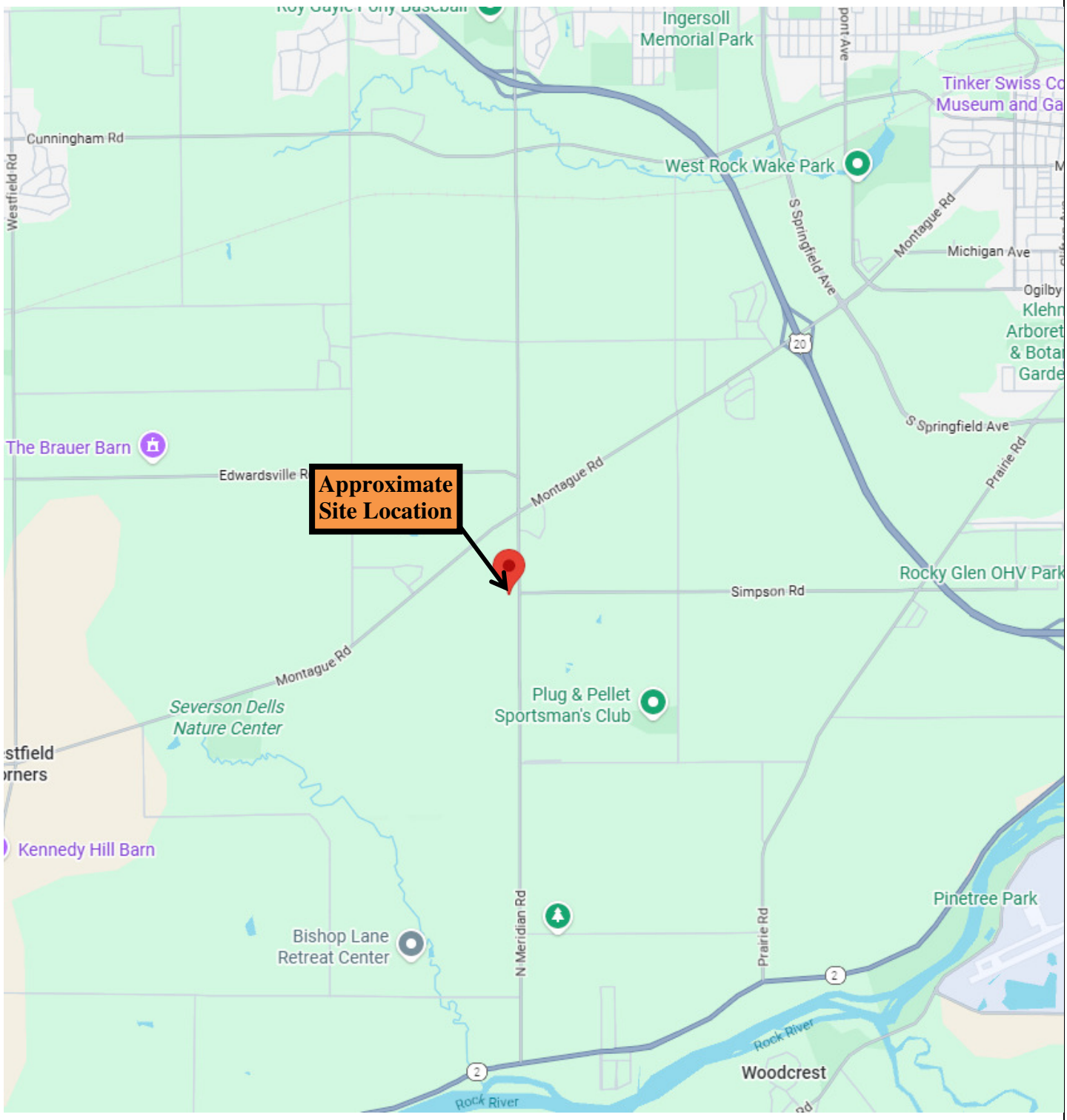
Vicinity Map

Boring Location Plan

Boring Logs

Unified Soil Classification System

Reference Notes For Boring Logs



	VICINITY MAP	N	**CGMT Project No. 25G0505** **New Office and Storage Garage Building** **3927 S. Meridian Road** **Rockford, Winnebago County, Illinois 61102**



Drawing Not To Scale

LEGEND

- Approximate Soil Boring Location

N

Soil Boring Location Diagram

New Office and Storage Garage Building

3927 S. Meridian Road
Rockford, Illinois 61102

Project Manager	Project Number
P. Patel	25G0505
Date	Sheet Number
9/12/2025	Fig. 1



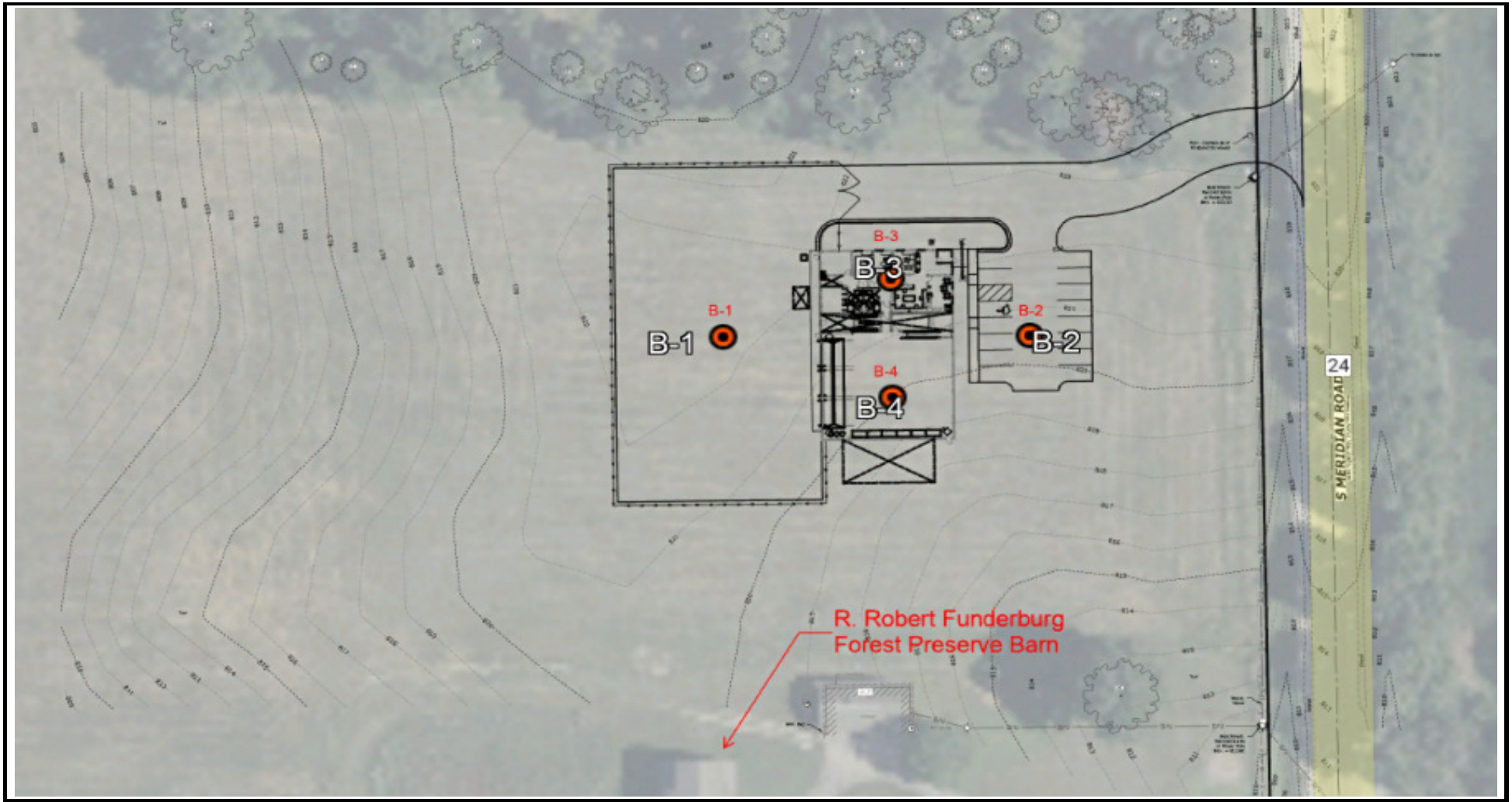
Drawing Not To Scale

LEGEND

- Approximate Soil Boring Location

N

Soil Boring Location Diagram	
New Office and Storage Garage Building	
3927 S. Meridian Road Rockford, Illinois 61102	
Project Manager	Project Number
P. Patel	25G0505
Date	Sheet Number
9/12/2025	Fig. 2



Drawing Not To Scale

LEGEND

- Approximate Soil Boring Location

N

Soil Boring Location Diagram

New Office and Storage Garage Building

3927 S. Meridian Road
Rockford, Illinois 61102

Project Manager	Project Number
P. Patel	25G0505
Date	Sheet Number
9/12/2025	Fig. 3

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: **B-01**
Date: Thursday, September 4, 2025
Project: New Office and Storage Garage Building
3927 S. Meridian Road
Rockford, Illinois 61102
Project No.: 25G0505
Boring Location: See Boring Location Diagram
Logged By: B.A.S.
Ground Elevation: 822.49

Soil Boring Prepared for:
Mr. Mike Brien
Forest Preserves of Winnebago County
5500 Northrock Drive
Rockford, Illinois 61103

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
822.49	0.0		Approximately 7" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
821.49	1.0		Silty Clay, Trace Sand and Gravel, black, brown and gray, stiff (CL FILL)	SS-1 1.0' - 2.5' 10" Recovery	3 4 5	15.7	1.0	**Dry Density:** 1.0' - 2.5' = 106.5 lbs./ft³
820.49	2.0							
819.49	3.0							
818.49	4.0		Sand and Gravel, brown, medium dense to very dense (SP-GP)	SS-2 3.5' - 5.0' 6" Recovery	7 11 10	12.4	-	
817.49	5.0							
816.49	6.0			SS-3 6.0' - 7.5' 7" Recovery	3 7 8	12.4	-	
815.49	7.0							
814.49	8.0							
813.49	9.0			SS-4 8.5' - 10.0' 15" Recovery	8 23 20	7.8	-	
812.49	10.0							
811.49	11.0							
810.49	12.0							
809.49	13.0							
808.49	14.0			SS-5 13.5' - 15.0' 18" Recovery	10 39 38	5.8	-	
807.49	15.0							
806.49	16.0							
805.49	17.0							
804.49	18.0							
803.49	19.0			SS-6 18.5' - 20.0' 18" Recovery	12 35 43	6.7	-	
802.49	20.0		END of BORING at 20 Feet					

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: None
Immediately After Drilling: None

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: **B-02**
Date: Friday, September 5, 2025
Project: New Office and Storage Garage Building
3927 S. Meridian Road
Rockford, Illinois 61102
Project No.: 25G0505
Boring Location: See Boring Location Diagram
Logged By: B.A.S.
Ground Elevation: 821.27

Soil Boring Prepared for:
Mr. Mike Brien
Forest Preserves of Winnebago County
5500 Northrock Drive
Rockford, Illinois 61103

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
821.27	0.0		Approximately 8" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
820.27	1.0		Silty Clay, Trace Sand and Gravel, black, brown and gray, stiff (CL FILL)	SS-1 1.0' - 2.5' 9" Recovery	3 5 7	19.4	1.5	
819.27	2.0							
818.27	3.0			SS-2 3.5' - 5.0' 13" Recovery	2 4 4	20.8	1.0	
817.27	4.0							
816.27	5.0							
815.27	6.0		Sand and Gravel, brown, medium dense to very dense (SP-GP)	SS-3 6.0' - 7.5' 18" Recovery	3 4 6	9.8	-	
814.27	7.0							
813.27	8.0							
812.27	9.0			SS-4 8.5' - 10.0' 18" Recovery	6 8 6	8.4	-	
811.27	10.0							
810.27	11.0							
809.27	12.0							
808.27	13.0							
807.27	14.0			SS-5 13.5' - 15.0' 18" Recovery	6 20 25	7.1	-	
806.27	15.0							
805.27	16.0							
804.27	17.0							
803.27	18.0							
802.27	19.0			SS-6 18.5' - 20.0' 18" Recovery	8 27 35	7.1	-	
801.27	20.0		END of BORING at 20 Feet					

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: None
Immediately After Drilling: None

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: **B-03**
Date: Friday, September 5, 2025
Project: New Office and Storage Garage Building
3927 S. Meridian Road
Rockford, Illinois 61102
Project No.: 25G0505
Boring Location: See Boring Location Diagram
Logged By: B.A.S.
Ground Elevation: 822.11

Soil Boring Prepared for:
Mr. Mike Brien
Forest Preserves of Winnebago County
5500 Northrock Drive
Rockford, Illinois 61103

Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
822.11	0.0		Approximately 10" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
821.11	1.0		Silty Clay, Trace Sand and Gravel, black, brown and gray, stiff (CL FILL)	SS-1 1.0' - 2.5' 9" Recovery	2 6 7	20.0	1.5	
820.11	2.0							
819.11	3.0		Sand and Gravel, brown, loose to very dense (SP-GP)	SS-2 3.5' - 5.0' 13" Recovery	3 5 6	12.8	-	
818.11	4.0							
817.11	5.0			SS-3 6.0' - 7.5' 15" Recovery	4 4 5	8.3	-	
816.11	6.0							
815.11	7.0			SS-4 8.5' - 10.0' 17" Recovery	3 4 10	11.6	-	
814.11	8.0							
813.11	9.0			SS-5 13.5' - 15.0' 18" Recovery	5 24 35	6.5	-	
812.11	10.0							
811.11	11.0			SS-6 18.5' - 20.0' 18" Recovery	12 30 50/5"	6.5	-	
810.11	12.0							
809.11	13.0							
808.11	14.0							
807.11	15.0							
806.11	16.0							
805.11	17.0							
804.11	18.0							
803.11	19.0							
802.11	20.0		END of BORING at 20 Feet					

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: None
Immediately After Drilling: None

Soil Boring Log

Construction & Geotechnical Material Testing, Inc.
60 Martin Lane, Elk Grove Village, Illinois 60007
Telephone (630) 595-1111 ♦ Fax (630) 595-1110

Boring No.: **B-04**
Date: Friday, September 5, 2025
Project: New Office and Storage Garage Building
3927 S. Meridian Road
Rockford, Illinois 61102
Project No.: 25G0505
Boring Location: See Boring Location Diagram
Logged By: B.A.S.
Ground Elevation: 820.93

Soil Boring Prepared for:
Mr. Mike Brien
Forest Preserves of Winnebago County
5500 Northrock Drive
Rockford, Illinois 61103

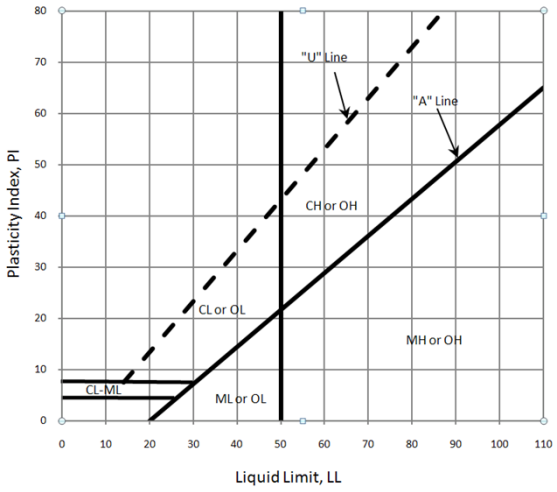
Elevation	Depth	Strata	Soil / Rock Description	Sample Type & No. Depth Interval (Ft) Recovery (in)	Blow Count	Moisture Content (%)	Unconfined Compressive Strength (TSF)	Notes & Test Results
820.93	0.0		Approximately 6" of Topsoil					Unconfined compressive strength of soil samples estimated using a calibrated penetrometer.
819.93	1.0		Silty Clay, Trace Sand and Gravel, black, brown and gray, stiff (CL FILL)	SS-1 1.0' - 2.5' 10" Recovery	4 5 6	17.2	1.25	**Dry Density:** 1.0' - 2.5' = 106.0 lbs./ft³
818.93	2.0							
817.93	3.0							
816.93	4.0		Sand and Gravel, brown, loose to very dense (SP-GP)	SS-2 3.5' - 5.0' 13" Recovery	3 7 4	7.8	-	
815.93	5.0							
814.93	6.0			SS-3 6.0' - 7.5' 14" Recovery	3 3 6	9.6	-	
813.93	7.0							
812.93	8.0							
811.93	9.0			SS-4 8.5' - 10.0' 18" Recovery	4 5 5	10.4	-	
810.93	10.0							
809.93	11.0							
808.93	12.0							
807.93	13.0							
806.93	14.0			SS-5 13.5' - 15.0' 18" Recovery	8 23 25	7.0	-	
805.93	15.0							
804.93	16.0							
803.93	17.0							
802.93	18.0							
801.93	19.0			SS-6 18.5' - 20.0' 18" Recovery	10 29 36	6.4	-	
800.93	20.0		END of BORING at 20 Feet					

Drilling Contractor: CGMT, Inc.
Drilling Method: 3¼" O.D. H.S.A. Split Spoon Sampling
Drilling Equipment: CME-45C Truck Mounted Drill Rig
REVIEWED BY: NPW

Water Level (Ft.)
During Drilling: None
Immediately After Drilling: None

UNITED SOIL CLASSIFICATION SYSTEM
(ASTM D-2487)

Major Division		Group Symbol	Typical Names	Classification on basis of percentage of fines	Classification Criteria
Coarse-grained soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Less than 5% pass No. 200 sieve	$C_u = D_{60}/D_{10}$ greater than 4 $C_z = (D_{30})^2/(D_{10}XD_{60})$ between 1 & 3
		GP	Poorly graded gravels and gravel-sand mixtures, little or no fines		Not meeting both criteria for GW
		GM	Silty gravels, gravel-sand-silt mixtures	More than 12% pass No. 200 sieve	Atterberg limits plot below "A" line or plasticity index less than 4
		GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits plot above "A" line and plasticity index greater than 7
	Sands: More than 50% of coarse fraction passes No. 4 sieve	SW	Well-graded sands and gravelly sands, little or no fines	5% to 12% pass No. 200 sieve	$C_u = D_{60}/D_{10}$ greater than 6 $C_z = (D_{30})^2/(D_{10}XD_{60})$ between 1 & 3
		SP	Poorly graded sands and gravelly sands, little or no fines		Not meeting both criteria for SW
		SM	Silty sands, sand-silt mixtures	Borderline classification requiring use of dual symbol: GW, GP, SW, SP; GM, GC, SM, SC	Atterberg limits plot below "A" line or plasticity index less than 4
		SC	Clayey sands, sand-clay mixtures		Atterberg limits plot above "A" line and plasticity index greater than 7
Fine-grained soils: 50% or more passing No. 200 sieve	Silts and Clays: Liquid limit 50% or less	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	Note: U-line represents approximate upper limit of LL and PI combinations natural soils (empirically determined). ASTM D-2487	
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
		OL	Organic silts and organic silty clays of low plasticity		
	Silts and Clays: Liquid limit greater than 50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts		
		CH	Inorganic clays of high plasticity, fat clays		
		OH	Organic clays of medium to high plasticity		
Highly organic soils		Pt	Peat, muck and other highly organic soils		Fibrous organic matter; will char, burn or glow



Plasticity chart for the classification of fine-grained soils. Tests made on fraction finer than No. 40 sieve

Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC, well-graded gravel-sand mixture with clay binder

UNIFIED SOIL CLASSIFICATION SYSTEM

REFERENCE NOTES FOR BORING LOGS

I. Drilling and Sampling Symbols:

SS – Split Spoon Sampler
ST – Shelby Tube Sampler
RC – Rock Core: NX, BX, AX
PM – Pressuremeter
DC – Dutch Cone Penetrometer
RB – Rock Bit Drilling
BS – Bulk Sample of Drilling
PA – Power Auger (no sample)
HSA – Hollow Stem Auger
WS – Wash Sample

Standard Penetration (Blows/Ft) refers to the blows per foot of a 140 lb. hammer falling 30 inches on a 2 inch O.D. split spoon sampler, as specified in ASTM D-1586. The blow count is commonly referred to as the N-value.

II. Correlation of Penetration Resistances to Soil Properties:

Relative Density-Sands, Silts

SPT – N	Relative Density
0 – 3	Very Loose
4 – 9	Loose
10 – 29	Medium Dense
30 – 49	Dense
50 – 80	Very Dense

Consistency of Cohesive Soils

Unconfined Compressive Strength, Qp, tsf	Consistency
under 0.25	Very Soft
0.25 – 0.49	Soft
0.50 – 0.99	Firm
1.00 – 1.99	Stiff
2.00 – 3.99	Very Stiff
4.00 – 8.00	Hard
over 8.00	Very Hard

III Unified Soil Classification Symbols:

GP – Poorly Graded Gravel
GW – Well Graded Gravel
GM – Silty Gravel
GC – Clayey Gravel
SP – Poorly Graded Sand
SW – Well Graded Sand
SM – Silty Sand
SC – Clayey Sand
ML – Low Plasticity Silt
MH – High Plasticity Silt
CL – Low Plasticity Clay
CH – High Plasticity Clay
OL – Low Plasticity Organic
OH – High Plasticity Organic
CL-ML – Dual Classification (Typical)

IV. Water Level Measurement Symbol:

WL – Water Level
WS – While Sampling
WD – While Drilling
BCR – Before Casing Removal
ACR – After Casing Removal
WCI – Wet Cave In
DCI – Dry Cave In

The water levels are those water levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in a granular soil. In clays and plastic silts, the accurate determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally applied.

SUITABILITY AND SIZING FOR PRIVATE SEWAGE DISPOSAL SYSTEMS
WINNEBAGO COUNTY DEPARTMENT OF PUBLIC HEALTH

NAME: Winn Co Forest Preserv LOCATION: 3927 S. Meridian Road P/C# ____-____
LOT NO., PLAT NO, & SUBDIVISION

PIN# 14 - 25 - 300 - 005 FIELD INVESTIGATION ____

OBSERVATIONS:	SOIL TYPE	DEPTH BEDROCK	DEPTH TO SEASONAL WETNESS
SOIL BORING#1	419B	>84"	>84"
SOILBORING#2	"	>84"	>84"
SOILBORING#3	"	>84"	>84"
SOILBORING#4	"	>84"	>84
SOILBORING#5			
SOILBORING#6			

LOCATION OF BORINGS:

X Appears to be in the approximate area indicated on the attached "Drawing for Soil Borings".

_____Area marked for soil borings did not appear to correspond with the location of your four corners and its GPS coordinates that was indicated on the attached "Drawing for Soil Borings"

_____Borings were also done in an area other than that staked, these were done in the approximate area indicated by the GPS coordinates and drawing.

NOTES AND/OR DIAGRAM:

IMPORTANT: The above results apply only to the top 6 to 7 feet of undisturbed soil in the area staked for the seepage field. Any cutting or filling of the lot could change the suitability of these soils and another soil boring will be required.

DATE: 9-30-25 SIGNATURE: _____
SOIL SCIENTIST

_____INTERPRETATION_____

Based on the above field investigation of this property, according to the Suitability and Sizing Chart of the Winnebago County Private Sewage Disposal Code, it has absorption limitation characteristics of Moderate. Therefore the following applies:

SYSTEM SIZING:
3 Bedroom = 600 gallons/day ÷ _____ = _____ square feet.
4 Bedroom = 800 gallons/day ÷ _____ = _____ square feet.
_ Bedroom = _____ gallons/day ÷ _____ = _____ square feet.

SEPTIC TANK SIZING: .40

	Without Garbage Disposal	With Garbage Disposal
2-3 Bedroom	1200 gallon cap.	1500 gallon cap.
4 Bedroom	1500 gallon cap.	1875 gallon cap.

_____Since this property has severe/very severe soil type (s), a permit will not be granted to install a private sewage disposal system. For further investigation of the property, please call 815-720-4103 to set up an appointment if applicable. Alternatively, you may submit engineered plans for a system that overcomes all soil limitations, but a letter from this Department must be issued approving such plans prior to a permit being issued.

X SLIGHT AND MODERATE SOILS:
The septic system must be placed in the area of the borings or additional borings and fees will be required. Do not cut or fill in the area of the borings. Keep all traffic off the area both before and after installation. A site plan must be approved by this department before permits are issued.

_____RESTRICTED SOILS:
The septic system must be placed in the area of the borings or additional borings and fees will be required. Do not cut or fill in the area of the borings. Keep all traffic off the area before and after installation. A site plan must be approved by this department before permits are issued. Be advised this highly permeable soil type _____ has the potential for groundwater contamination (Section 86-80 Appendix A of the Winnebago County Sewage Disposal Code).

REMARKS:
X See Soil Scientist notes
X System size by usage .40 Loading rate

DATE: 9/30/25 SIGNATURE _____
Licensed Environmental Health Practitioner

CC: WINNEBAGO COUNTY SOIL & CONSERVATION DISTRICT

SOIL SUITABILITY FOR PRIVATE SEWAGE DISPOSAL SYSTEMS
WINNEBAGO COUNTY DEPARTMENT OF PUBLIC HEALTH

Date of Report: 9-30-25	Applicant: Winnebago County Forest Preserve
Date of Fieldwork: 9-29-25	Location: 3927 S. Meridian Road
	Soil Boring #: 7457

CPSC
Certified Professional Soil Classifier

Report prepared by: Dennis Anthony, CPSC, Winnebago County SWCD: _____
Signature

Soil Boring #1 Latitude: _____ Longitude: _____

Depth of Horizon in inches	Matrix Color	Texture	Redoximorphic features/mottles	Structure	Consistence	coatings	Estimated Loading Rate - G/D/ft²	Notes
0-7	7.5yr 4/2	SIL		2-f-gr/vf-bk	FR		.75	
7-10	" 5/3	SIL		2-vf-bk	FR		.75	
10-16	" 5/4	SIL to SICL		2-vf/f-bk	FR	4/3-4/4 c	.62	
16-30	" 5/4	SICL		3-f/m-pr/bk	FI	4/3 c	.52	
30-38	" 5/4-5/6	SICL	CFD 6/3, FFD 6/2	2-m-pr/bk	FI	4/3 c Dry 8/3 si	.52	
38-47	" 5/6	SICL	"	2-m/c-pr 2/1-m/c-bk	FR	"	.62	Loess to this depth
47-54	5yr 4/6 w/ 5/6	CL		"	FR	4/4 c	.52	till
54-60	" 5/6	CL-SCL		1-pr/bk	FR	Few 4/4 c	.52	
60-78+	7.5yr 6/6	SL		1-bk to 0-ma	VFR		.62	

Soil Type: 419B Slope:	Limiting Layer type: None Observed Saturation depth:	Depth: Compaction & depth:
Remarks:		

Soil Boring #2 Latitude: _____ Longitude: _____

Depth of Horizon in inches	Matrix Color	Texture	Redoximorphic features/mottles	Structure	Consistence	coatings	Estimated Loading Rate - G/D/ft²	Notes
0-7	7.5yr 4/2	SIL		2-f-gr/vf-bk	FR		.75	
7-11	" 5/3	SIL		2-vf-bk	FR		.75	
11-17	" 5/4	SIL to SICL		3-f-bk	FR	4/3-4/4 c	.62	
17-28	" 5/4	SICL		3-f-pr/bk	FI	4/3 c	.52	
28-38	" 5/4-5/6	SICL	CFD 6/3	3to2-m-pr/bk	FI	4/3 c Dry 8/3 si	.52	Loess to this depth
38-48	5yr 4/6 w/ 5/6	CL		2-c-pr 2/1-m/c-bk	FI	4/4 c	.40	till
48-64	" 5/6	SCL w/ CL		2-c-pr 1-c-bk	FR	4/4 c	.52	
64-84	" 4/6	SL w/ SCL		1-c-pr/bk	VFR-FR		.45	

Soil Type: 419B Slope:	Limiting Layer type: None Observed Saturation depth:	Depth: Compaction & depth:
Remarks:		

Soil Boring #3 Latitude:_____ Longitude: _____

Depth of Horizon in inches	Matrix Color	Texture	Redoximorphic features/mottles	Structure	Consistence	coatings	Estimated Loading Rate - G/D/ft²	Notes
0-8	7.5yr 4/2	SIL		2-f-gr/vf-bk	FR		.75	
8-12	" 5/3	SIL		2-vf-bk	FR		.75	
12-18	" 5/4	SIL to SICL		3-f-bk	FR	4/3-4/4 c	.62	
18-30	" 5/4	SICL		3-f-pr/bk	FI	4/3 c	.52	
30-40	" 5/4	SICL	CFD 6/3	3-m-pr/bk	FI	4/3 c Dry 8/3 si	.52	
40-50	" 5/4-5/6	SICL	CFD 6/3	2-c-pr/bk	FR	"	.62	Loess to this depth
50-62	5yr 4/6 w/ 5/6	CL		2-c-pr 1-c-bk	FR	4/4 c	.52	till
62-84	" 5/6	SCL w/ CL		1-c-pr/bk	FR		.45	

Soil Type: 419B	Limiting Layer type:	Depth:
Slope:	Observed Saturation depth:	Compaction & depth:

Remarks:

Soil Boring #4 Latitude:_____ Longitude: _____

Depth of Horizon in inches	Matrix Color	Texture	Redoximorphic features/mottles	Structure	Consistence	coatings	Estimated Loading Rate - G/D/ft²	Notes
0-7	7.5yr 4/2	SIL		2-f-gr/vf-bk	FR		.75	
7-11	" 5/3	SIL		2-vf-bk	FR		.75	
11-18	" 5/4	SIL to SICL		3-f-bk	FR	4/3-4/4 c	.62	
18-30	" 5/4	SICL		3-f-pr/bk	FI	4/3 c	.52	
30-40	" 5/4-5/6	SICL	CFD 6/3	3to2-m-pr/bk	FI	4/3 c Dry 8/3 si	.52	Loess to this depth
40-48	5yr 4/6 w/ 5/6	CL		2-c-pr 2/1-m/c-bk	FI	4/4 c	.40	till
48-62	" 5/6	SCL w/ CL		2-c-pr 1-c-bk	FR	4/4 c	.52	
62-84	" 4/6	SL w/ SCL		1-c-pr/bk	FR		.45	

Soil Type: 419B	Limiting Layer type: None	Depth:
Slope:	Observed Saturation depth:	Compaction & depth:

Remarks:

Field Investigation

* Information contained in this report may be subject to modification if additional field data is collected.
* Altering or disturbing the natural soils in the area designated for the soil absorption area may result in revocation of your septic permit. For more specific information refer to the Winnebago County Health Code.

Other Notes:

1. Textural classification is based on particle size classes of the United States Department of Agriculture.
2. All abbreviations used to describe color, texture, structure and consistence are standardized in the *Soil Survey Manual.*
3. Descriptions of redoximorphic features include quantity, size, contrast, and Munsell Color Chart notation.

#7457

401 Division Street
P.O. Box 4009
Rockford, Illinois 61110
Phone: (815) 720-4100

New Construction Soil Boring Fee: ~~$393.00~~ 475.00
Repair/Replacement Soil Boring Fee: ~~$357.00~~

SOIL BORING APPLICATION

NOTE: The following information, forms and the drawings for soil borings are required by the Winnebago County Private Sewage Code, and must be provided by the applicant before the soil borings application will be accepted for processing. These requirements furnished by the applicant are to assure that the soil borings are conducted in the exact area where the private sewage disposal system is to be constructed and with the proper approvals from other agencies if needed.

LOCATION INFORMATION: Maps for locating the property are not provided by the Winnebago County Health Department

Pin Number: 14-25-300-005 Property Code Number: _____ Plat Number: _____

Subdivision: _____ Lot Number: _____ Property Size: 102 (square feet (acres))

Address: 3927 S. Meridian Rd City: Rockford State: IL Zip: 61102

☑ New Construction ☐ Repair ☐ Addition

APPLICATION INFORMATION

Relation to the property: ☐ Owner ☐ Realtor ☐ Contractor ☐ Other

Name: Winnebago County Forest Preserve District Phone: (815) - 516 2654

Mailing Address: 5500 Northrock Dr. City: Rockford State: IL Zip 61103

Person to provide access to property Mike Brien Day time phone: (815) - 988 - 2981

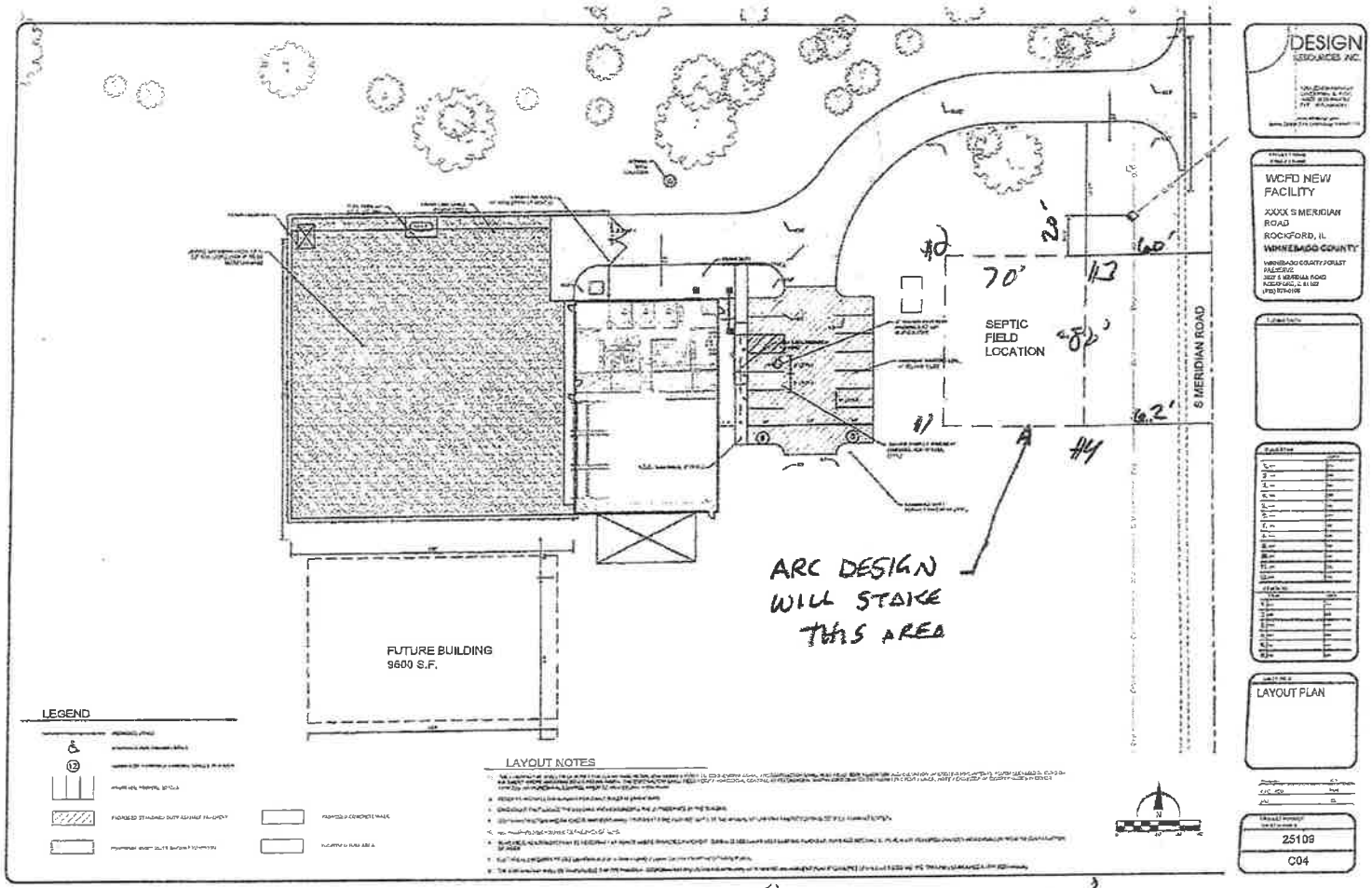
Checklist	Acreage in the County		Lot in a Subdivision	
Maps, Pin No., Property Code No., Zoning Approvals are available at the Winnebago County Administration offices 404 Elm Street	Applicant	Health Dept.	Applicant	Health Dept.
Zoning Approval				
Boundry Delineation Information				
Plat Map from a Plat Book		✓		
Subdivision Map (signed if new)		✓		
Street Map Showing Major Streets & Cross Roads		✓		
Flood Plain Information				
Property Code Number		✓		
Pin Number	14-25-300-005	✓		

Application Submitted By: Michael Brien Date: 9/11/2025

Application Received By: Ernesto Date: 9-23-25

Note: Area for layout drawing on back. Applicants are responsible for researching location of public water & sewer to the property.

CT42 Ernesto



#1 N42°13'25.3"
W089° 10'25.0"

#2 26.2"
25.1"

#3 26.1"
24.1"

#4 25.3"
24.1"

SECTION 00 4100

BID FORM

THE PROJECT AND THE PARTIES

TO:

Forest Preserves of Winnebago County

5500 Northrock Drive

Rockford, Illinois 61103

FOR:

Construction of a new Building Addition and associated sitework.
Project: New Natural Resource Building for FPWC
Architects Project Number: BA 2025-09

DATE:(Bidder to enter date)

SUBMITTED BY: (Bidder to enter name and address)

Bidder's Full Name.

Address

City, State, Zip

OFFER

Having examined the Place of The Work and all matters referred to in the Instructions to Bidders and the Bid Documents prepared by Blakemore Architects for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of:

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

We have included the required performance assurance bonds in the Bid Amount as required by the Instructions to Bidders.

All applicable federal taxes are included and State of Illinois taxes are included in the Bid Sum.

Project is Tax Exempt. .

All Cash Allowances described in Section 01 2100 - Allowances are included in the Bid Sum.

ACCEPTANCE

This offer shall be open to acceptance and is irrevocable for 60 days from the bid closing date.

If this bid is accepted by Owner within the time period stated above, we will:
Execute the Agreement within seven days of receipt of Notice of Award.
Furnish the required bonds within seven days of receipt of Notice of Award.
Commence work within seven days after written Notice to Proceed of this bid.

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, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

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.

CONTRACT TIME

If this Bid is accepted, we will:

Complete the Work in _____ calendar weeks from Notice to Proceed. Provide preliminary scedule along with bid.

UNIT PRICES

The following are Unit Prices for specific portions of the Work as listed. The following is the list of Unit Prices:

ITEM DESCRIPTION - UNIT QUANTITY - UNIT PRICE - ITEM VALUE

Earth Excavation - Each - Cubic Yard - $

Engineered Fill - Each - Cubic Yard - $

Duplex Outlet-Installed - Each - - $ .....

Data Outlet Box and piping - Each - - $ .....

CHANGES TO THE WORK

When Architect establishes that the method of valuation for Changes in the Work will be net cost plus a percentage fee in accordance with General Conditions, our percentage fee will be:

_____ percent overhead and profit on the net cost of our own Work;

_____ percent on the cost of work done by any Subcontractor.

On work deleted from the Contract, our credit to Owner shall be Architect-approved net cost plus _____ of the overhead and profit percentage noted above.

ADDENDA

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.

Addendum # _____ Dated _____
Addendum # _____ Dated _____
Addendum #_____Dated_____
Addendum #_____Dated_____

BID FORM SUPPLEMENTS

The following information is included with Bid submission:

Subcontractors: _____, _____, _____.
Unit Prices: _____, _____, _____.
Alternatives: Alternate Bid A-2: Cost to provide a Performance Bond Alternate A-1 Credit to provide Metal framed Canopy vs Base Bid Wood Framed Canopy as shown in drawings. Alternate Bid C-1: Concrete Dumpster Pad as shown in drawing C05. Alternate Bid C-2: Heavy Duty asphalt pavement at rear Storage Yard. See drawing C05.

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

Document 00 4322 - Unit Prices Form: Include a listing of unit prices specifically requested by Contract Documents.
Document 00 4323 - Alternates Form: Include the cost variations to the Bid Sum applicable to the Work as described in Section 00 4323.
Document 00 4327 - Separate Prices Break-Out Form: Include a listing of separate prices as specifically requested in Contract Documents.

Document 00 4336 - Subcontractors: Include the names of all Subcontractors and the portions of the Work they will perform.

BID FORM SIGNATURE(S)

The Corporate Seal of

_____

(Bidder - print the full name of your firm)
was hereunto affixed in the presence of:

_____

(Authorized signing officer, Title)
(Seal)

_____

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 00 4322

UNIT PRICES FORM

PARTICULARS

The following is the list of Unit Prices referenced in the bid submitted by:

(Bidder):

TO (Owner): Forest Preserves of Winnebago County

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

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

UNIT PRICE LIST

ITEM DESCRIPTION UNIT QUANTITY UNIT VALUE

Earth Excavation.....--Per Each Cubic Yard..... -- $_____

Compacted Structural Fill....-- Per Each Cubic Yard -- $_____

Cost per duplex outlet installed to nearby circut...--Per each duplex --$_____

Cost per data outlet box and piping to above ceiling (wire by others)...--Per each outlet box--$_____

END OF SECTION

SECTION 00 4323

ALTERNATES FORM

PARTICULARS

THE FOLLOWING IS THE LIST OF ALTERNATES REFERENCED IN THE BID SUBMITTED BY:

(BIDDER):

TO (Owner): Forest Preserves of Winnebago County

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

ALTERNATES LIST

THE FOLLOWING AMOUNTS SHALL BE ADDED TO THE BID AMOUNT. REFER TO SECTION 01 2300 - Alternates.

ALTERNATIVE A-2: PROVIDE COST OF THE PERFORMANCE BOND.
(COST TO BE INCLUDED IN GC'S TOTAL SUBMITTED BID) $ _____

ALTERNATE BID A-1: METAL FRAMED CANOPY AT MAIN ENTRY IN LIEU OF WOOD FRAMED CANOPY. (DEDUCT) $_____

ALTERNATED BID # C-1: CONCRETE DUMPSTER PAD
(ADD) $_____

ALTERNATE BID # C-2: HEAVY DUTY ASPHALT AT REAR STORAGE YARD
(ADD) $_____

END OF SECTION

SECTION 00 4327
SEPARATE PRICES BREAK-OUT FORM
PARTICULARS
THE FOLLOWING IS THE LIST OF SEPARATE PRICES REFERENCED IN THE BID SUBMITTED BY:
(BIDDER) _____

TO (OWNER): FOREST PRESERVES OF WINNEBAGO COUNTY
DATED _____ AND WHICH IS AN INTEGRAL PART OF THE BID FORM.

ITEM DESCRIPTIONS

Item # 1:

Description: SITE CONSTRUCTION
Value: $ _____

Item # 2:

Description: GENERAL BUILDING CONSTRUCTION
Value: $ _____

Item # 3:

Description: MECHANICAL
Value: $ _____

Item # 4:

Description: ELECTRICAL
Value: $ _____

Item # 5:

Description: PLUMBING
Value: $ _____

END OF SECTION

SECTION 00 4336

PROPOSED SUBCONTRACTORS FORM

PARTICULARS

Herewith is the list of Subcontractors referenced in the bid submitted by:

(Bidder):General Contractor

TO (Owner): FOREST PRESERVES OF WINNEBAGO COUNTY

Dated: and which is an integral part of the Bid Form.

The following work will be performed (or provided) by Subcontractors and coordinated by us:

LIST OF SUBCONTRACTORS

WORK SUBJECTSUBCONTRACTOR NAME

Site Work_____

Excavation_____

Concrete_____

Structural Precast Planks_____

Masonry_____

Pre-engineered Metal Building System_____

Structural Steel Erection_____

Painting_____

Doors/Frames/Hardware_____

Flooring: Carpet & VCT_____

Gypsum Board / Ceilings_____

Overhead Doors_____

HVAC_____

Electrical_____

Plumbing _____

END OF SECTION

SECTION 00 5200

AGREEMENT FORM

PART 1 GENERAL

FORM OF AGREEMENT

2.01 THE AGREEMENT TO BE EXECUTED IS ATTACHED FOLLOWING THIS PAGE.

2.02 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions.

B. Section 00 7300 - Supplementary Conditions.

2.03 MODIFICATIONS TO THE AGREEMENT FORM

A. See attached Owners General Conditions form (Following the Suplementary Conditions of the Contract for construction 00 7301).

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

4.01 AIA DOCUMENT A101, OWNER-CONTRACTOR AGREEMENT FORM - STIPULATED SUM 2017 EDITION, FORMS THE BASIS OF CONTRACT BETWEEN THE OWNER AND CONTRACTOR.

END OF SECTION

AIA® Document A201® – 2007

General Conditions of the Contract for Construction

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

New Natural Resource Building for Forest Preserves of Winnebago County-General Construction Bid
Meridian Road
Winnebago County, Illinois

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

THE OWNER:
(Name, legal status and address)

Forest Preserves of Winnebago County
5500 Northrock Drive
Rockford, Illinois 61103

THE ARCHITECT:
(Name, legal status and address)

Blakemore Architects, Inc
400 N. First Street
Rockford, Illinois 61107

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3 CONTRACTOR
4 ARCHITECT
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11 INSURANCE AND BONDS
12 UNCOVERING AND CORRECTION OF WORK
13 MISCELLANEOUS PROVISIONS
14 TERMINATION OR SUSPENSION OF THE CONTRACT
15 CLAIMS AND DISPUTES

Init.
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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 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 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 and the Architect's consultants 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.

§ 1.2 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.

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§ 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 and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment 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 this 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 material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them 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 material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

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 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

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§ 2.2.2 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.

§ 2.2.3 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. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.2.4 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 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.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work that is 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, 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.

§ 2.4 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 written 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 deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor 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. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor 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 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 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.

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§ 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 2.2.3, 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.

§ 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 make 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 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, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and 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 written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required 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 authorized by the Architect in accordance with Sections 3.12.8 or 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.

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§ 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.

§ 3.5 WARRANTY

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 Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 TAXES

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.

§ 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion 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 21 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 an equitable adjustment in the Contract Sum or Contract Time, or both. 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 in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

§ 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.

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§ 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 furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply 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 or Architect 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 SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a 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.

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

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

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§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

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

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

§ 3.12.3 Samples are physical examples 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 the way by which 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 is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is 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 without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect 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.

§ 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 requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has 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 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 on previous submittals. In the absence of such written notice, the Architect'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. 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 cause such services or certifications 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. 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

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to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, 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. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and 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 and patching shall be restored to the condition existing prior to the cutting, fitting and 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 such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

§ 3.15 CLEANING UP

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove 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 Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK

The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

§ 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 such 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 the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

§ 3.18 INDEMNIFICATION

§ 3.18.1 To the fullest extent permitted by law the Contractor shall indemnify 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 bodily injury, sickness, disease or death, 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

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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 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.

§ 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.

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

§ 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 date the Architect issues the final Certificate 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, except as provided in Section 3.3.1.

§ 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 report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) 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 FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the

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Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such 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, material and equipment 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 Architect 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 precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize 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 duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 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 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 subcontractors of a separate contractor.

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§ 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 or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14-day period shall constitute notice of no reasonable objection.

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

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably 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 substitute a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these 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. 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 in writing; 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.

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§ 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 such 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 Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 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.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the 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, separate contractors and the Owner until subsequently revised.

§ 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, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor 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 report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 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 the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors 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.

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§ 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, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed 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 Architect and signed by the Owner 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 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

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

§ 7.3.6 A Construction Change Directive signed 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.

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§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and 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 7.3.7 shall be limited to the following:

.1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;

.2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and

.5 Additional costs of supervision and field office personnel directly attributable to the change.

§ 7.3.8 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 Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect'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 and Contractor agree with a determination made by the Architect 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 Architect 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 has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

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, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be

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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 an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order 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

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

§ 9.2 SCHEDULE OF VALUES

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

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect 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. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material 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 Architect, 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 material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 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.

§ 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

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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, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect'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 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 above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 If the Architect withholds certification 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 material or equipment suppliers 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 Architect and the Architect will reflect such payment on the next Certificate for Payment.

§ 9.6 PROGRESS PAYMENTS

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

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§ 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.

§ 9.6.3 The Architect 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 material and equipment 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 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, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment 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 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 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 and 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, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.7 FAILURE OF PAYMENT

If the Architect does not issue a Certificate 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 certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, 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 will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the 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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§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such 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 as required under Section 11.3.1.5 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 written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (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 and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. 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. If such lien 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 such lien, including all costs and reasonable attorneys' fees.

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§ 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 certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect 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; or
- **.3** terms of special warranties required by the Contract Documents.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

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 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 or the Contractor's Subcontractors or Sub-subcontractors; 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.

§ 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 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 owners and users of adjacent sites and utilities.

§ 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.

§ 10.2.5 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, except damage or loss 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.

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§ 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, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 HAZARDOUS MATERIALS

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. 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 report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written 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 such material or substance or who are to perform the task of removal or safe containment of such 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 in the amount of the Contractor's reasonable additional costs of shut-down, 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 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 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 indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance 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 indemnify the Contractor for all cost and expense thereby incurred.

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§ 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.

ARTICLE 11 INSURANCE AND BONDS
§ 11.1 CONTRACTOR'S LIABILITY INSURANCE
§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- **.1** Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
- **.2** Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- **.3** Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- **.4** Claims for damages insured by usual personal injury liability coverage;
- **.5** Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- **.6** Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- **.7** Claims for bodily injury or property damage arising out of completed operations; and
- **.8** Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2 OWNER'S LIABILITY INSURANCE
The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 PROPERTY INSURANCE
§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's

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risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE

The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

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§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 WAIVERS OF SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance 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 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

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.

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§ 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, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after 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 an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner 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 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. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 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 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 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, whether completed or partially completed, of the Owner or separate contractors 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.

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ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 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 such 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 such assignment.

§ 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES

§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, 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 there under, except as may be specifically agreed in writing.

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public 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 Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 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 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 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.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

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§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

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 or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, 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 promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, 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' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has 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' written 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 for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- **.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.

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§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written 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 as described in 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 written 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 Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

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, 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.

§ 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written 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.

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Claims by either party must 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 CONTINUING CONTRACT PERFORMANCE

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. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.5.2 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.

§ 15.1.6 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 the 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 is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, 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 mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no 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.

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§ 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 such 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 mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 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 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 15.1.6 shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 ARBITRATION

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

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§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 CONSOLIDATION OR JOINDER

§ 15.4.4.1 Either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Either party, at its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as the Owner and Contractor under this Agreement.

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SECTION 00 7301

SUPPLEMENTARY CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

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Owners Section One General Conditions (Attaced to the back of this Supplemetary Conditions of the Contract for Construction)

ARTICLE 1 GENERAL PROVISIONS

A. The "General Conditions of the Contract for Construction" AIA Document A 201, 2007 Edition; Articles 1 through 14, is a part of the Contract Documents attached herein.

B. The aforementioned AIA General Conditions shall remain in effect except for such modifications or deletions and such supplementary conditions as specified in this Section. Unaltered portions of the General Conditions shall remain in affect.

1.1BASIC DEFINITIONS

A. Section 1.1 of the General Conditions is supplemented as follows:

1.1.3 The term "General Work" shall mean the work, other than Mechanical and Electrical Work, specified in any or all Sections of Divisions 1 through 14.

The term "Mechanical Work" shall mean the Plumbing, Heating and Ventilating Work specified in any or all Sections of Divisions 1 and 15 and other Divisions specified. The term "Electrical Work" shall mean the Electrical Work specified in any or all Sections of Divisions 1 and 16 and other Divisions specified.

1.1.4 Where the word "building", "project" or "work" occurs herein or in the Specifications, it shall be construed as applying to all buildings. In all cases where device, material, units or part of equipment is referred to as singular in number, it is intended that such reference shall apply to as many such devices as are required to complete project and/or work on the project.

1.1.5 "Provide" wherever used in the specifications or on the drawings shall mean "furnish and install in place".

1.1.6 "Provide" wherever used in the specifications or on the drawings shall mean "furnish and install in place".

1.1.7 The term "Project Manual" shall mean the volume that includes the Bidding Requirements, Conditions of the Contract and the Specifications and other technical data and soil boring reports.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

A. Subparagraph 1.2.1 of the General Conditions is supplemented as follows:

1.In the case of an inconsistency between drawings and specifications or within either document, not clarified by addenda, the better quality or greater quantity of Work shall be provided in accordance with the Architect's interpretation.

2.The Contractor shall provide all work and materials which any Section or part of the drawings, specifications or conditions require him to provide regardless of whether such requirement is or is not faithfully repeated in other parts of documents thereof to which the provision might be appropriate.

3.Where new rooms are shown on the floor plans but are not listed in the Room Finish Schedule, those rooms shall be finished the same as other rooms of a similar nature as listed in the Room Finish Schedule. Where new doors are designated on the floor plans but are not listed in the Door Schedule, provide doors, frames and hardware of the same type as are to be provided for rooms of a similar nature.

B. Sub-paragraph 1.2.2 of the General Conditions is supplemented as follows:

1.Project Manual Explanation:

a. Project Manual is composed of Title Page, Index, Bidding Requirements and Forms, Conditions of the Contract and Specifications. Divisions and Sections are arranged in format conforming to the 16 Division System of the CSI.

b. Where Sections contain “Work Includes” list, it merely serves as a table of contents for items described in the Section and is not intended to limit or restrict volume or type of work required by the Section of Specifications.

c. Imperative language is used generally in the specifications. Except as otherwise specified, requirements expressed imperatively are to be performed by the Contractor. For clarity of reading at certain locations, contrasting subjective language is used to describe the responsibilities which must be fulfilled indirectly by the Contractor or, when so noted, by others.

C. Subparagraph 1.2.3 of the General Conditions is supplemented as follows:

1. Where materials or devices are specified in these documents by reference to Government, Manufacturer’s Association or Professional Society Standards, the pertinent sections of the latest edition of such standards, unless otherwise specified, shall have the same force and effect as if set forth in full in these specifications. The following abbreviations will be used as indicated for the principal societies:

AASHTO American Association of State Highway & Transportation Officials
ACI American Concrete Institute
AIA American Institute of Architects
AIEE American Institute of Electrical Engineers
AISC American Institute of Steel Construction
AMCA Air Moving and Conditioning Association
ANSI American National Standards Institute
ASCE American Society of Civil Engineers
ASME American Society of Mechanical Engineers
ASTM American Society of Testing Materials
AWI Architectural Woodwork Institute
AWS American Welding Society
NEC National Electric Code
NFPA National Fire Protection Association
SMACNA Sheet Metal and Air Conditioning Contractors National Association
UL Underwriter’s Laboratories

1.5 EXECUTION OF CONTRACT DOCUMENTS

A.Subparagraph 1.5.2 of the General Conditions is supplemented as follows:

1.Site Investigation:

a. By executing the Contract, the Contractor acknowledges that he has satisfied himself as to the nature and location of the work, the general and local conditions, including those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, ground water table or similar physical conditions of the ground, the character, quality and quantity of surface and sub-surface materials to be encountered, the character of equipment and facilities needed prior to and during the execution of the work and all other matters which can in any way

affect the work or the cost thereof under this Contract. Any failure by the Contractor to acquaint himself with all the available information concerning these conditions will not relieve him from any obligation with respect to his Contract.

ARTICLE 3 CONTRACTOR

3.1 GENERAL

A. For the purpose of definition under Article 3 CONTRACTOR, Paragraph 3.1 of the General Conditions is supplemented as follows:

3.1.1 Contractor: The word “Contractor” is recognized as a party to the contract. The term “Contractor” unless otherwise modified, shall mean the Contractor to whom the contract has been awarded to perform the work required by all drawings and all 16 Divisions of the specifications and all Addenda issued. The terms General Contractor, Plumbing Contractor, Heating Contractor, Electrical Contractor, etc., may appear in certain Sections for clarity of describing the responsibilities which must be fulfilled as part of their respective Divisions of work.

3.4 LABOR AND MATERIALS

A. Paragraph 3.4 of the General Conditions is supplemented as follows:

1. In order that ready availability of materials, parts or components for repair, replacement or expansion may be assured, all such materials, parts and components shall be obtained where feasible from sources that maintain a regular domestic stock. Foreign produced materials and components shall be used only with Architect’s prior written approval.
2. Materials: Substitution, Acceptance. Materials are specified in the following ways:

a. Where materials are listed by manufacturer and trade name with no qualifying statement, comparable materials of other manufacturers complying with or exceeding the specification for the intended use, and as approved by the Architect, may be furnished. Such approved materials will be included in the bidding documents by Addendum or may be submitted on the substitution sheet of the Bid Form.

b. Where more than one material or manufacturer and trade name are listed, Contractor has the option of selecting any one of the manufacturers or materials named. Within 30 days after award of contract and before ordering material and equipment, contractor shall submit in quadruplicate to Architect, listing of manufacturers or materials contractor proposes to use.

c. Where material is listed by description or by SATM or Fed Spec numbers, any product meeting or exceeding requirements of such specification will be acceptable if material does not alter details as shown on drawings. If requested by Architect, evidence shall be furnished showing that material meets requirements of specifications.

d. Materials shall be new and of the weights, grades, thickness and quality specified. Manufactured items or equipment shall be based on names specified. In substituting items or equipment Contractor assumes responsibility for any changes in system or for modifications required in other work to accommodate such substitution, despite Architect’s acceptance of the substitution, either in the specifications or in an Addendum, and shall coordinate with other contractors whose work may be affected by such substitution.

e. After the award of the Contract, substitutions will be considered only under one or more of the following conditions:

(1) Required for compliance with subsequent interpretation of code requirements or insurance regulations.

(2) Unavailability of specified products, through no fault of the Contractor.

(3) Subsequent information discloses inability of specified products to perform properly or to fit into designated space.

(4) When it is clearly seen, in the judgment of the Architect that a substitution would be substantially to the Owner’s best interest, in terms of cost, time or other considerations.

f. Unless otherwise specifically provided for in the specifications, all workmanship, equipment, materials and articles incorporated in the work covered by this contract are to be of the best grade of their respective kinds for the purpose. When required by the Specifications, or when called for by the Architect, the Contractor shall furnish to the

Architect for his review the name of the manufacturer of materials, machinery, mechanical and other equipment which he contemplates incorporating in the work, together with their respective performance capacities and other pertinent information. Samples of materials shall be submitted for review when and as directed. Machinery or equipment materials and articles installed or used without such review shall be at the risk of subsequent rejection.

3. Anchors and/or Fasteners: Use of fibrous braid or non-metallic expansion shields will not be permitted for fastening any material or fabricated items.

4. Labor: Contractors and subcontractors employed upon work shall be required to conform to labor laws of the State and various acts amendatory and supplementary thereto and to other laws, ordinances and legal requirements applicable thereto.

a. Work shall be performed by trained experienced personnel, skilled in their various crafts, under full time supervision of an approved engineer or foreman.

3.5 WARRANTY

A. Subparagraph 3.5.1 of the General Conditions is supplemented as follows:

1. The Contractor is obligated to correct, at his own expense for a period of one year or such longer period as may be specified, all work found defective or not in accordance with the contract documents. This shall not establish a period of limitation with respect to any other obligation that the Contractor might have under the contract.

3.6 TAXES

A. Subparagraph 3.6.1 of the General Conditions is supplemented as follows:

1. The Contractor shall also pay unemployment and social security taxes or other taxes imposed by Local, City, State or Federal governmental bodies. If the tax laws are subsequently amended by legislation during the life of the contract, the Contractor shall provide the net change caused by such amendment.

2. This project is Tax Exempt. Owners Tax Exempt Number is E99923483

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

A. Subparagraph 3.10.1 of the General Conditions is supplemented as follows:

1. As soon as possible, the Contractor shall develop a construction Schedule for his work and make copies for Architect's information. The contractor shall issue a copy of his schedule to the subcontractors for mechanical and electrical, who, in turn, shall promptly prepare construction schedules for their work. The General Contractor shall then make a combined Horizontal Bar Chart of Work for all parties involved, which will be used throughout construction to keep this project on schedule.

2. The Horizontal Bar Chart for the Work shall be posted in the project construction office and shall be brought up to date monthly by the General Contractor. Updated charts shall include schedule changes for the work of all prime contractors involved. Copies of updated bar charts shall be sent to the Owner and the Architect monthly.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

A. Subparagraph 3.11.1 of the General Conditions is supplemented as follows:

1. The Contractor shall maintain record drawings throughout the construction of the project and shall be held solely responsible for their accuracy in accordance with Section 01700. The contractor shall update all modifications in the general site and building construction and shall require that all subcontractors update their respective record drawings one or more times each week. Contractor payment is contingent upon receipt of updated as built drawings and specifications.

2. Record drawings shall be turned over to the Architect at completion of the project.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

A. Subparagraph 3.12.1 of the General Conditions is supplemented as follows:

1. Only shop drawings that have been reviewed by Contractor and Architect shall be used at the jobsite and all copies shall bear the stamps of both the Contractor and Architect indicating general conformance to the design concept and contract documents. The contractor is required

to review the shop drawings in detail for compliance with all applicable code requirements. The review made by the architect is advisory only and applies to the design arrangment and interpetion. This review shall not be construed as relieving the Contractor from compliance with the contract documents nor does it relieve the contractor (or theire sub-contractors) of responsibility for accruacy of details, dimensions or quanities. Changes on contract requirments cannot be made via shop drawing review but only by a properly executed change order.

3.18 INDEMNIFICATION

A. Paragraph 3.18 of the General Conditions is supplemented as follows:

1. Add a new subparagraph numbered 3.18.3 as follows: “None of the foregoing provisions shall deprive the Owner or the Architect of any action, right or remedy otherwise available to them or either of them at common law”.

2. Add a new subparagraph numbered 3.18.4 as follows: “In the event that any party is requested but refuses to honor the indemnity obligation hereunder, then the party indemnifying shall, in addition to all other obligations, pay the cost of bringing any such action, including attorneys fees, to the party requesting indemnity.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.2 MUTUAL RESPONSIBILITY

A. Subparagraph 6.2.2 of the General Conditions is supplemented as follows:

1.Each contractor shall perform work in proper sequence in relation to that of other contractors. Mechanical contractors shall fit their piping and ductwork into structure as job conditions may demand. Final decision as to right-of-way and run of pipes, ducts etc., shall be made by Architect or his representative at project coordination meetings.

2.Each contractor and subcontractor shall obtain complete data at site and inspect surfaces that are to receive his work before proceeding with his work; shall be solely responsible for accuracy of measurements and laying out of work; shall correct errors or defects due to faulty measurements taken, information obtained, layout or due to failure to report discrepancies. Work of previous contracts found to be unacceptable to receive work of this contract shall be reported to the Architect by contractors finding such conditions prior to beginning of the work.

3.Each contractor shall give due notice and proper information to other contractors of any special provision necessary for the placing and setting of his work coming in contact with work of other contractors. Failing to do so in proper time, he shall be held responsible and shall pay for any and all alterations and repairs necessitated by such neglect.

4.Each contractor shall cooperate in every way possible to allow for installation of equipment that is to be provided by Owner or Equipment Contractors during the course of the construction.

5.Each contractor shall furnish and install during the progress of construction all necessary sleeves, hangers etc., required for his work. Installation must be done at such time and in such a manner as not to delay or interfere with any other building operation. Where any such work has not been done, or coordinated with the other trades, and where the proper installation of all apparatus and materials included in the specification is governed thereby, or where correction of defective work or where additional work is ordered, which requires cutting or fitting, the Contractor responsible for such defective or ill-timed work shall, at his own expense, do all such cutting, fitting, patching or repairing.

6.The fire protection contractor shall meet with all other subcontractors, and the General Contractor to assure that the fire protection systems in now way hinder any other trade or sub contractor or systems.

ARTICLE 7 CHANGES IN THE WORK

7.1 CHANGES

A. Subparagraph 7.1.1 of the General Conditions is supplemented as follows:

No contractor shall have the right to prosecute or a suit-at-law to recover for an extra, unless his claim is based upon written change order signed by Owner.

B. Subparagraph 7.2.1 of the General Conditions is supplemented as follows:

In addition to information required by the General Conditions, Change Orders shall include itemized costs of related accessories separate from the cost of each item.

ARTICLE 8 TIME

8.2 PROGRESS AND COMPLETION

A. Subparagraph 8.2 of the General Conditions is supplemented as follows:

1.It is hereby understood and mutually agreed by and between Contractor and Owner that date of beginning, rate of progress and time for completion of work to be done hereunder are essential conditions of this contract.

2.Work shall proceed regularly, diligently and uninterrupted at such rate of progress as will insure the substantial completion of the work within the estimated completion time stated by Contractor or as otherwise established in the contract.

ARTICLE 9 PAYMENTS AND COMPLETION

9.3 APPLICATIONS FOR PAYMENT

A. Subparagraph 9.3.1 of the General Conditions is supplemented as follows:

1.As soon as possible the Contractor shall submit to the Owner an estimated draw schedule for each month, based upon the date established for completion of the project.

2.Owner will make payment to Contractor for value, proportionate to amount of contract, of labor and material incorporated in work in any calendar month. Payments will be made on approved periodic estimates submitted in triplicate by Contractor.

3.Upon determination by the Architect and acceptance by the Owner, the final payment will be made including retained percentages within 45 days after final acceptance of the work.

B. Subparagraph 9.3.3 of the General Conditions is supplemented as follows:

1.All materials and work covered by partial payments made shall thereupon become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and work upon which payments have been made or the restoration of damaged work, or as a waiver of the right of the Owner to require the fulfillment of the terms of the contracts.

9.8 SUBSTANTIAL COMPLETION

A. Subparagraph 9.8 of the General Conditions is supplemented and modified as follows:

1.When the Architect determines that the work or designated portions thereof are substantially complete, the Architect will establish the date of substantial completion, as defined hereafter, and the date of acceptance of work by the Owner, through the use of a Certificate of Substantial Completion (AIA Document G704) and through other closing procedures which the Architect may direct. In any case, the Architect will prepare for submission to the Contractor a list of items to be completed or corrected hereafter referred to as the “punch list”. The failure to include any item on the punch list does not alter the responsibility of the Contractor to complete all work in accordance with the Contract Documents. The Architect will recommend final payment to the Contractor when the work on all punch lists is satisfactorily completed, all record drawings and guarantees are provided, and the Contractor meets all other requirements of the contract documents and paragraph 9.8 of the General Conditions.

2.Substantial Completion:

The Date of Substantial Completion of the Work or designated portion thereof is the Date certified by the Architect when construction is sufficiently complete, in accordance with the Contract Documents, so the Owner can occupy the Work or designated portion thereof for the use for which it is intended.

On the Certificate of Substantial Completion, a time shall be fixed, not to exceed sixty (60) days, within which the Contractor shall finish all items on the final punch list accompanying the Certificate.

9.9 PARTIAL OCCUPANCY OR USE

A. Subparagraph 9.9.1 of the General Conditions is supplemented as follows:

1.In addition to all other precautions required by the Contract, such as barricades, signs, warning lights, etc., to make project completely safe for public use, the Contractor should provide and maintain dust tight barriers in the event of partial occupancy before substantial completion. Cost

of barriers shall be paid by Contractor if project is behind schedule and by Owner if project is ahead of schedule.

2.Moving of equipment into building under other contracts or by the Owner will not constitute partial occupancy.

9.10 FINAL COMPLETION AND FINAL PAYMENT

A. Subparagraph 9.10.2 of the General Conditions is supplemented as follows:

1.Liens:

a. Neither the final payment nor any part of the retained percentage shall become due until the Contractor, if required, delivers to the Owner a complete release of all liens arising out of this contract, or receipts in full in lieu thereof and if required in either case, an affidavit that, so far as he has knowledge or information, the releases and receipts include all labor and material for which a lien could be filed; but the Contractor may, if any subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the Owner, to indemnify him against any lien. If any lien remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging such a lien, including all costs and attorneys' fees.

ARTICLE 11 INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

A.Subparagraph 11.1.1 of the General Conditions is supplemented as follows:

1.During the term of the contract, the Contractor shall, at his own expense, purchase and maintain the following insurance in companies properly licensed and satisfactory to the Owner:

a. Workmen's Compensation including Occupational Disease and Employer's Liability Insurance.

1) State: Statutory amounts and coverage as required by Workman's Compensation Laws.

2) Worker's compensation insurance with statutory limits and employer's liability insurance with limits of not less than $500,000 per occurrence, per employee for disease and $500,000 aggregate for disease.

b. Comprehensive General Liability: Including coverage for direct operations, sublet work, contractual liability, completed operations and products liability, with limits not less than those stated below, which insurance shall fully protect him from claims for damages for bodily injury including accidental death, as well as claims or property damage and loss of use of property which may arise from activities under or incidental to the Contract, whether such activities be by himself or any of his subcontractors, or by anyone directly or indirectly employed or otherwise contracted by any of them.

1) Commercial general liability insurance with:

a)Limits of not less than $5,000,000.00.

b)Coverage to include:

i.Projects/completed operations to be maintained for a period of not less than three (3) years following the completion and final acceptance of the work;

ii. Project specific limits of liability;

iii. Contractual liability, specifically referring to the indemnity obligations in this Contract;

iv. Broad form property damage, including products/completed operations.

v.Personal injury liability with employee and contractual exclusions deleted.

vi. Deletion of explosion, collapse and underground (XCU) exclusions;

vii. Sever ability of interest and cross liability endorsements with copies attached to the certificate of insurance.

c)(Regarding Completed Operations and Products Liability - Continue coverage in force for one year after completion of the work and acceptance by the Owner.)

c.Personal Injury with Employment Exclusion Deleted:

1) $500,000 aggregate

2. Comprehensive automobile liability insurance with limits of $2,000,000.00 combined single limit covering owned, non-owned and hired vehicles.

B. Add a new subparagraph to General Conditions numbered 11.1.1.1, immediately prior to subparagraph 11.1.2 as follows:

1.The contractor shall also purchase and maintain such insurance as will protect the Owner (and his appointed "Owner's Representative") and the Architect and their agents and employees from and against all claims, damages, losses and expenses including attorneys' fees arising out of or resulting from the performance of the work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting there from, and (2) is caused in whole or in part by any negligent act or omission of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party to whom insurance is afforded pursuant to this paragraph.

2.In any and all claims against the Owner (and his appointed " Owner's Representative") or the Architect or any of their agents or employees by an employee of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the insurance obligation under this Paragraph 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 or any subcontractor under workman’s compensation acts, disability benefit acts or other employee benefit acts.

3.The insurance obligations of the Contractor under this Paragraph shall not extend to the liability of the Architect, his agents or employees arising out of (1) the preparation of approval of maps, drawings, opinions, reports, surveys, Change Orders, designs, or specifications, or (2) the giving of or the failure to give directions or instructions by the Architect, his agents or employees provided such giving or failure to give is the primary cause of the injury or damage.

4.This insurance shall be for the same limits stated for the Contractor’s other liability insurance.

C. Change the first line of subparagraph 11.1.2 of General Conditions to read as follows: “The insurance required by subparagraphs 11.1.1 and . . .”

D. All policies and certificates of insurance shall expressly provide that no less than sixty (60) days prior notice shall be given to Owner in the event of material alteration, cancellation or intent to non-renew the coverage evidenced by such policies or certificates of insurance.

E. Contractor shall carry sufficient comprehensive insurance on his equipment at site of work and en route to and from site to fully protect him; Contractor shall require the same coverage of his subcontractors. It is expressly understood and agreed that Owner and/or Architect shall have no responsibility therefore.

F. A certificate of insurance shall be filed with the Owner evidencing the coverage set forth above and including: An additional insured endorsement naming Owner, and any owned, affiliated or subsidiary company or corporation that is a party to this Contract and their board members, officers, employees, agents and consultants as additional insured. Any insurance maintained by the additional insureds shall be in excess of any coverage provided by the Contractor or its Subcontractors.

H. Intentionally left blank –

I. Contractors shall procure and maintain during the life of the Agreement, including any extensions thereof, the type of insurance specified, with insurance companies rated according to the most recent edition of A.M. Best, but not less than A (X).

1. Delete the semicolon at the end of Clause 11.1.1.1 and add:

including private entities performing Work at the site and exempt from the coverage on account of number of employees or occupation, which entities shall maintain voluntary compensation coverage at the same limits specified for mandatory coverage for the duration of the Project;

J. Delete the semicolon at the end of Clause 11.1.1.2 and add:

or persons or entities excluded by statute from the requirements of Clause 11.1.1.1 but required by the Contract Documents to provide the insurance required by that Clause;

K. Add the following clauses 11.1.1.9:

1.Liability Insurance shall include all major divisions of coverage and be on a comprehensive basis including:

a.Premises Operations (including X, C and U coverage as applicable).
b.Independent Contractors' Protective.
c.Products and Completed Operations.
d.Personal Injury Liability with Employment Exclusion deleted.
e.Owned, non-owned and hired motor vehicles.
f.Broad Form Property Damage including Completed Operations.
g.Completed operations coverage for two years after completion of the Work or for such longer period of time as described in the Contract Documents.
h.Waiver of Subrogation in favor of the additional insureds.
i.All policy or endorsements limitations relating specifically to operations pertaining to railroad property shall be eliminated. This is required only if the Work is on or within railroad property.

L. Add the following Clause 11.1.2.1 to 11.1.2:

1.The Contractor's Liability Insurance required by Subparagraph 11.1.1 shall be written for not less than the following limits, or greater if required by law:

a.State Statutory
b.Applicable Federal Statutory
c.Employer's Liability: $2,000,000 per Accident $2,000,000 Each Occurrence
d.Disease Policy Limit $2,000,000 Disease Each Employee

2.Commercial General Liability (including Premises Operations; Independent Contractor's Protective, Products and completed operations, Broad Form Property Damage): The limits of liability shall be written on an occurrence basis and shall provide coverage for not less than the following amounts:

a.Bodily Injury: $5,000,000 Each Occurrence, $5,000,000 Aggregate
b.Property Damage: $5,000,000 Each Occurrence, $5,000,000 Aggregate
c.Products and Completed Operations to be maintained for three (3) years after final payment: $5,000,000 Each Occurrence, $5,000,000 Aggregate
d.Property Damage Liability Insurance shall provide X, C and U coverage.
e.Broad Form Property Damage Coverage shall include Completed Operations.
f.Fire Legal Liability: $100,000 Each Occurrence

Note: Owner is added as an Additional Insured on a primary & non-contributory basis by Endorsement on the commercial general liability policy.

3.Broad Form Contractual Liability

a.Bodily Injury: $1,000,000 Each Occurrence, $1,000,000 Aggregate
b.Property Damage: $1,000,000 Each Occurrence, $1,000,000 Aggregate
c.Personal Injury with Employment Exclusion deleted: $1,000,000 Aggregate

4.Personal Injury Liability with Employment Exclusion deleted: $1,000,000 Aggregate

5. Business Auto Liability (including owned, non-owned and hired vehicles):

a.Bodily Injury: $2,000,000 Each Occurrence, $2,000,000 Aggregate
b.Property Damage: $2,000,000 Each Occurrence

Note: Owner is added as an Additional Insured on a primary & non-contributory basis by Endorsement on the commercial general liability policy.

6.Umbrella Excess Liability

a.$5,000,000 Occurrence
b.$5,000,000 Aggregate
c.$10,000 for self insured hazards each occurrence

7.Aircraft Liability (owned and un-owned) when Aircraft are used in the performance of the Contract: $10,000,000 each occurrence combined single limit for bodily injury and property damage.

11.3 PROJECT MANAGEMENT PROTECTIVE LIABILITY INSURANCE

A.Subparagraph 11.3.1 of the General Conditions is supplemented as follows:

1.This insurance will be purchased and maintained by the contractor, and shall be subject to a maximum of $500.00 deductible and all losses falling within the scope of the deductible amount shall be borne by the Contractor.

11.4 PERFORMANCE AND PAYMENT BOND

A.Performance Bond and Payment Bond will be required.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

12.2 CORRECTION OF WORK

A. Subparagraph 12.2.1 of the General Conditions is supplemented as follows:

1. Approval of any material or work at any stage of construction will not prevent its subsequent rejection for cause.

2. Guarantees and Warranties:

a.Nothing herein intends or implies that warranties or guarantees shall apply to work which has been abused or neglected by Owner or his successor in interest, or which has been subject to usual wear and tear or accidental damage not chargeable to Contractor or his agents.

b.Guarantee and Warranty time periods shall commence with the date of acceptance by Owner of the Certificate of Substantial Completion except as related to items of incomplete or uncorrected work noted on the Certificate's Punch List. The guarantee and warranty time periods for Punch List item shall commence with the date of Final Completion established by the Architect's issuance of the final certificate of payment.

c.The Contractor is obligated to correct at his own expense for a period of one year or such longer period as may be specified, all work found defective or not in accordance with the contract documents. This shall not establish a period of limitation with respect to any other obligation, which the Contractor might have under the contract.

ARTICLE 13 MISCELLANEOUS PROVISIONS

13.5 TESTS AND INSPECTIONS

A.Subparagraph 13.5.2 of the General Conditions is supplemented as follows:

1.The laboratory or inspection agency will be by the Owner and will perform, or cause to be performed, tests necessary to determine if specified results have been obtained. Contractor shall call for and schedule testing.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

A.Subparagraph 14.1.1 if the General Conditions is supplemented as follows:

1.If the work should be stopped under an order of any court, or other public authority for a period of thirty (30) days, through no act or fault of the Contractor or of anyone employed by him, then the contractor may, upon twenty-one (21) days written notice to the Owner and the Architect, terminate this Contract and recover from the Owner payment for all work executed and any proven loss sustained for any materials and reasonable profit and damages.

2.If the Architect, or Owner if the architect is not reviewing payment requests under design build projects, has not issued a certificate for payment, through no fault of the Contractor, within twenty-one (21) days after the contractor's formal request for payment, or if the Owner has not made payment to the Contractor within twenty-one (21) days of its maturity and presentation, then the Contractor may, upon twenty-one (21) days written notice to the Owner and Architect, stop the work or terminate this Contract as set out in the preceding paragraph.

ARTICLE 15 CLAIMS AND DISPUTES

15.1 CLAIMS AND DISPUTES

A. Subparagraph 15.1 of the General Conditions is supplemented as follows:

1. Whenever any employee, agent or other representative of Contractor, or any employee, agent or other representative of a subcontractor, whose activities on or about the site arise out of the

work of a contractor, shall cause or be a substantial factor in causing any damage (including but not limited to breaking, burning, overheating, freezing, exposing disconnecting, misconnecting, failing to guard or protect, and depriving of support) to the work, materials or property of a third party (including but not limited to the Owner, other contractors, subcontractors, material suppliers, delivery persons, frequenters, security holders, adjacent land owners, bodies politic, utilities or members of the public) such Contractor or Subcontractor shall promptly proceed to remedy and correct such damage and to pay all costs, expenses and damages involved. To the extent that such Contractor or Subcontractor shall fail to do so, he shall be accountable, under his contract with the Owner, for all damages to the Owner directly or consequentially arising there from whether liquidated or not, and whether certain or contingent, including but not limited to costs of renovation, repair, replacement or relocation, vicarious liabilities, losses by delays, charges for architectural or their services, and extra costs, charges, work or materials of every description. Upon certification by the Architect of the identity of the responsible party and of the extent of such damage so cause, Owner shall be entitled for its security, to withhold or deduct from payments otherwise due such contractor any sum reasonably estimated to be required to secure Owner's right to such account, until Owner shall otherwise be fully indemnified and made whole. Such liability to account shall be deemed contractual and shall arise regardless of whether or not circumstances of conventional tort are present or proven, and shall bind the sureties and indemnitors of such Contractor or Subcontractor but the Owner shall not be deemed to have waived, released, settled or otherwise impaired its right to full account by reason of any payment, withholding, deduction, failure to withhold or deduct, or other form of claim or failure to claim; and in no event shall exercise or non-exercise of the Owner's right to be deemed or implied to impose on the Owner any liability toward any other person; or to affect, except as expressly provided, the rights or liabilities of any of the parties arising independently of this provision.

2. Whenever the Contractor or Subcontractors whose activities cause any such damage cannot in the opinion of the Architect, be specifically ascertained, or whenever a Contractor's or Subcontractor's proportionate responsibility to account therefore according to the foregoing provisions cannot, in the opinion of the Architect, be finally determined, the party to whose work sections the damage pertains shall proceed promptly to remedy and correct such damage, as extra work, and the reasonable charges for so doing, together with the amounts of any further damages which may so arise, shall be certified by the Architect to the Owner, with authorization to charge the aggregate sum to the respective accounts of all contractors who, directly or through subcontractors, material suppliers or delivery persons were engaged in any activity at the site of the damage when it arose, in proportion to the gross amounts of their respective contracts. Such allocated accountability shall continue as security to the Owner, until a different accountability is ascertained, in the opinion of the Architect or until the Owner is otherwise fully indemnified and made whole.

END OF SECTION

SECTION ONE: GENERAL CONDITIONS

AMERICANS WITH DISABILITIES ACT

The Bidder will comply with all applicable provisions of the Americans with Disabilities Act (Public Law 101-336, 42 USC 12101-12213) and all applicable Federal Regulations under the Act, including 28 CFR Parts 35 and 36.

CANCELLATION The Forest Preserves of Winnebago County reserves the right to cancel any Contract in whole or in part without penalty due to failure of the Bidder to comply with terms, conditions and specifications of their awarded Contract.

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

The Bidder certifies, by submission of this Bid or acceptance of this Contract, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency. It further agrees by submitting this Bid that it will include this clause without modification in all lower tier transactions, solicitations, bids, contracts, and subcontracts. Where the Bidder or any lower tier participant is unable to certify to this statement, it shall attach an explanation in their bid response. Additionally, for all new Bidder's and Bidder's to be paid, the District will review the Federal and State Excluded Parties List System prior to requesting the Bidder be created in our accounting system.

CHANGES

The Forest Preserves of Winnebago County reserves the right to make any desired change in the specifications after the same shall have been put under contract; but the change so made, with the price to be added or deducted from the contract price, therefore, shall be agreed upon in advance between County and the successful Bidder. The District shall issue to the successful Bidder a written change order to the original contract; such change orders shall be binding upon both parties thereto and shall in no way invalidate or make void the terms of the original contract not modified by such change.

COMMENCEMENT OF WORK

The successful Contractor must not commence any billable work prior to the Forest Preserves of Winnebago County's execution of the contract, issuance of a purchase order or until all required documents have been submitted. Work done prior to these circumstances shall be at the Contractor's risk.

COMPLIANCE WITH LAWS

All services, work and materials that in any manner affect the production, sale, or payment for the product or service contained herein must comply with all Federal, State, County and Municipal laws, statutes, regulations, codes, ordinances and executive orders in effect now or later and whether or not they appear in this document, including those specifically referenced herein. The successful Bidder must be authorized to do business in the State of Illinois, and must be able to produce a Certificate of Good Standing with the State of Illinois upon request. The Bidder must obtain all licenses, certificates and other authorizations required in connection with the performance of its obligations hereunder, and Bidder must require any and all Subcontractors to do so. Failure to do so is an event of disqualification

and/or default and may result in the denial of this Bid and/or termination of this Agreement. In the event Federal or State funds are being used to fund this Contract, additional certifications, attached as addenda, will be required. Lack of knowledge on the part of the Bidder will in no way be cause for release of this obligation. If the Forest Preserves of Winnebago County becomes aware of violation of any laws on the part of the Bidder, it reserves the right to reject any Bid, cancel any Contract and pursue any other legal remedies deemed necessary.

COST OF THE BID

Expenses incurred in the preparation of Bids in response to this IFB is the Bidder's sole responsibility. There is no expressed or implied obligation by the Forest Preserves of Winnebago County to reimburse any individual or firm for any costs incurred in preparing or submitting Bids, providing additional information when requested by the Forest Preserves of Winnebago County, or for participating in any selection interviews.

DISPUTES

In case of disputes as to whether or not an item or service quoted or delivered meets specifications, the decision of the Executive Director, or authorized representative, shall be final and binding to all parties.

ENTIRE AGREEMENT

These Standard Terms and Conditions of the Bid shall apply to any contract or order awarded as a result of this Bid except where special requirements are stated elsewhere in the Bid; in such cases the special requirements shall apply. Further, the written contract and/or order with referenced parts and attachments shall constitute the entire agreement and no other terms and conditions in any document, acceptance, or acknowledgement shall be effective or binding unless expressly agreed to in writing by the contracting authority.

DEVIATIONS, EXCEPTIONS OR ALTERNATES

Deviations, exceptions or alternates from terms, conditions, or specifications shall be described fully, on Bidder's letterhead, signed, and attached to the Invitation for Bid. In the absence of such statement, the Bid shall be accepted as in strict compliance with all terms, conditions, and specifications and the Bidder shall be held liable. Bidders are cautioned to avoid making deviations and exceptions to the specifications, which may result in rejection of their Bid. If deviations, exceptions or alternates are submitted, it is the Forest Preserves of Winnebago County's sole and final decision whether specifications have been met and will be considered for award.

FREEDOM OF INFORMATION

Any responses and supporting documents submitted in response to a Bid will be subject to disclosure under the Illinois Freedom of Information Act. The County will assume that all information provided in a Bid is open to inspection or copying by the public unless clearly marked with the appropriate exception that applies under the Freedom of Information Act. Additionally, if providing documents that you believe fall under an exception to the Freedom of Information Act, please submit both an un-redacted copy along with a redacted copy which has all portions redacted that you deem to fall under a Freedom of Information Act exception.

GOVERNING LAWS AND REGULATIONS

The Bidder is required to be familiar with and shall be responsible for complying with all Federal, State, and local laws, ordinances, rules, and regulations that in any manner affect the work. Knowledge of occupational license requirements and obtaining such licenses for the County of Winnebago and municipalities within the County are the responsibility of the Bidder.

HOLD HARMLESS CLAUSE

The Bidder covenants and agrees to indemnify, hold harmless and defend the Forest Preserves of Winnebago County, its Board members, officers, employees, agents and servants from any and all claims for bodily injury, including death, personal injury, and property damage, including damage to property owned by the District, and any other losses, damages, and expenses of any kind, including attorneys' fees, costs and expenses, which arise out of, in connection with, or by reason of services provided by the Bidder or any of its Sub-consultant(s) in any tier, occasioned by the negligence, recklessness, or intentionally wrongful conduct of the Bidder, or its Sub-consultant(s) in any tier, their officers, employees, servants or agents. In the event that the completion of the project (to include the work of others) is delayed or suspended as a result of the Bidder's failure to purchase or maintain the required insurance, the Bidder shall indemnify the Forest Preserves of Winnebago County from any and all increased expenses resulting from such delay. Should any claims be asserted against the Forest Preserves of Winnebago County by virtue of any deficiency or ambiguity in the plans and specifications provided by the Bidder, the Bidder agrees and warrants that Bidder shall hold the Forest Preserves of Winnebago County harmless and shall indemnify it from all losses occurring thereby and shall further defend any claim or action on the Forest Preserves of Winnebago County's behalf.

INDEMNITY

The Bidder shall, at all times, fully indemnify, hold harmless, and defend the Forest Preserves of Winnebago County and their officers, agents, and employees from and against any and all claims and demands, actions, causes of action, and cost and fees of any character whatsoever made by anyone whomsoever on account of or in any way growing out of the performance of this Contract by the Bidder and its employees, or because of any act or omission, neglect or misconduct of the Bidder, its employees and agents or its Subcontractors including, but not limited to, any claims that may be made by the employees themselves for injuries to their person or property or otherwise, and any claims that may be made by the employees themselves or by the Illinois Department of Labor for the Bidder's violation of the Illinois Prevailing Wage Act (820 ILCS 130/1 et seq.). Such indemnity shall not be limited by reason of the enumeration of any insurance coverage or bond herein provided. Nothing contained herein shall be construed as prohibiting the Forest Preserves of Winnebago County and their officers, agents, or its employees, from defending through the selection and use of their own agents, attorneys and experts, any claims, actions or suits brought against them. The Bidder shall likewise be liable for the cost, fees and expenses incurred in the Forest Preserves of Winnebago County's or the Bidder's defense of any such claims, actions, or suits. The Bidder shall be responsible for any damages incurred as a result of its errors, omissions or negligent acts and for any losses or costs to repair or remedy construction as a result of its errors, omissions or negligent acts.

NON-COLLUSION

The Bidder, by its officers, agents or representatives present at the time of filing this IFB, say that neither they nor any of them, have in any way directly or indirectly, entered into any arrangement or agreement with any other Bidder's, or with any public officer of the Forest Preserves of Winnebago County, whereby, the Bidder has not paid or is to pay to such Bidder or public officer any sum of money, anything of value or has not directly or indirectly entered into any arrangement or agreement with any other Bidder(s). Whereby, no inducement of any form or character other than that which appears upon the face of the IFB will be suggested, offered, paid or delivered to any person whomsoever to influence the acceptance of the said IFB or understanding of any kind whatsoever, with any person whomsoever to pay, deliver to, or share with any other person in any way or manner, any of the proceeds on the Contract sought by this IFB.

PROMPT PAYMENT ACT

The Bid should provide that all payments are subject to Local Governmental Prompt Payment Act.

TAXES NOT APPLICABLE

The Winnebago County Forest Preserve District as a Governmental Unit pays neither Federal Excisen or Illinois Retailers Occupational Tax, and therefore those taxes should be excluded from quotation. Illinois Exemption E9992-3483-06.

PROTEST

Firms wishing to protest any IFB and/or awards shall notify the Executive Director of the Forest Preserves of Winnebago County in writing within five (5) calendar days after the IFB due date/opening. The notification should include the IFB number, the name of the firm protesting and the reason why the firm is protesting the IFB. The Forest Preserves of Winnebago County will respond to the protest within five (5) calendar days.

RESERVATION OF RIGHTS

The Forest Preserves of Winnebago County reserves the right to reject any or all Bids failing to meet the District's specifications or requirements and to waive technicalities. If, in the District's opinion, the lowest Bid is not the most responsible Bid, considering value received for monies expended, the right is reserved to make awards as determined solely by the judgment of the District. Intangible factors, such as the Bidder's reputation and past performance, will also be weighed. The Bidder's failure to meet the mandatory requirements of the IFB will result in the disqualification of the Bid from further consideration. The Forest Preserves of Winnebago County further reserves the right to reject all Bids and obtain goods or services through intergovernmental or cooperative agreements, or to issue a new and revised IFB. Submission of a Bid confers no rights on the Bidder to a selection or to a subsequent Contract. All decisions on compliance, evaluation, terms and conditions shall be made solely at the Forest Preserves of Winnebago County's discretion and shall be made in the best interest of the District.

SUBSTANCE ABUSE PREVENTION

The Substance Abuse Prevention on Public Works Act, Public Act 95-0635, prohibits the use of drugs and alcohol, as defined in the Act, by employees of the contractor and by employees of all approved subcontractors while performing work on a public works project. The contractor/subcontractor hereby certifies that it has a superseding collective bargaining agreement or makes the public filing of its written substance abuse prevention program for the prevention of substance abuse among its employees who are not covered by a collective bargaining agreement dealing with the subject as mandated by the Act. Bidders and their subcontractors (if applicable) certifies that the entity has signed collective bargaining agreements that are in effect for all of its employees, and that deal with the subject matter of Public Act 95-0635, or certifies that the contracting entity has in place for all of its employees not covered by a collective bargaining agreement a written substance abuse prevention program that deals with subject of the Act, and will attach the substance abuse prevention program that meets or exceeds the requirements of Public Act 95-0635.

TERMINATION, CANCELLATION AND DAMAGES

The Forest Preserves of Winnebago County may terminate based on the Bidder's breach or default. Unless the breach or default creates an emergency, as determined in the County's sole discretion, the Bidder shall be given notice and a five (5) day opportunity to cure before the termination becomes effective. If the District terminates this Contract because of the Bidder's breach or default, the District shall have the right to purchase items or services elsewhere and to charge the Bidder any additional cost incurred, including but not limited to the cost of cover, incidental and consequential damages and the cost of re-bidding. The District may offset these additional costs against any sums otherwise due to the Bidder under this Bid or any unrelated Contract. The Forest Preserves of Winnebago County may terminate any Contract or agreement resulting from this IFB at any time for any reason by giving at least thirty (30) days' notices in writing to awarded Bidder. If the Contract is terminated by the District as provided herein, the Bidder will be paid a fair payment as negotiated with the District for the work completed as of the date of termination.

BIDDER'S RESPONSIBILITY FOR SERVICES PROPOSED

The Bidder must thoroughly examine and will be held to have thoroughly examined and read the entire IFB document. Failure of Bidder's to fully acquaint themselves with existing conditions or the amount of work involved will not be a basis for requesting extra compensation after the award of a Contract.

WITHDRAWAL OF BIDS

Bids may be modified or withdrawn by an authorized representative of the Bidder or by formal written notice prior to the final due date and time specified for Bid submission. Submitted Bids will become the property of the Forest Preserves of Winnebago County after the Bid submission deadline. However, no Bidder shall withdraw or cancel their Bid for a period of sixty (60) days after said advertised closing time for the receipt of Bids; the successful Bidder shall not withdraw or cancel their Bid after having been notified by the Executive Director, or their designee, that said Bid has been accepted by the Forest Preserves of Winnebago County Board. The Bidder, by signing the Bid Form, acknowledges, understands and abides by all of the above "Requirements for Bidding and Instructions to Bidders".

SECTION 01 1000

SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: New Natural Resource Building for FPWC

B. Owner's Owner's Name: Forest Preserves of Winnebago County.

C. Architect's Name: Blakemore Architects, Inc.

D. The Project consists of the construction of a new office and garage building and associated site work.

E. Project is Tax Exempt Status. All contractors break out sales tax in their bids. Owners Tax Exempt Number is E99923483

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 5200 - Agreement Form.

1.03 OWNER OCCUPANCY

A. Owner intends to continue to occupy portions of the existing building during the final stages of construction to install furniture and equipment in the garage area.

1.04 CONTRACTOR USE OF SITE AND PREMISES

A. Arrange use of site and premises to allow:
   1. Owner occupancy.
   2. Work by Others.

B. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

C. Existing building spaces may not be used for storage.

D. Utility Outages and Shutdown:
   1. Limit disruption of utility services to hours the building is unoccupied.
   2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
   3. Prevent accidental disruption of utility services to other facilities.

1.05 SPECIFICATION SECTIONS APPLICABLE TO EVERY CONTRACT

A. Unless otherwise noted, provisions of the sections listed below apply to every contract. Specific items of work listed under individual contract descriptions constitute exceptions.

B. Section 01 2000 - Price and Payment Procedures.

C. Section 01 2100 - Allowances.

D. Section 01 2200 - Unit Prices.

E. Section 01 2300 - Alternates.

F. Section 01 2500 - Substitution Procedures.

G. Section 01 3000 - Administrative Requirements.

H. Section 01 3216 - Construction Progress Schedule.

I. Section 01 4000 - Quality Requirements.

J. Section 01 5000 - Temporary Facilities and Controls.

K. Section 01 5100 - Temporary Utilities.

L. Section 01 6000 - Product Requirements.

M. Section 01 7000 - Execution and Closeout Requirements.

N. Section 01 7800 - Closeout Submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2000

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. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

A. Section 00 5200 - Agreement Form: Contract Sum, retainages, payment period, monetary values of unit prices.

B. Document 00 7300 - Supplementary Conditions.

C. Section 01 2200 - Unit Prices: Monetary values of unit prices; Payment and modification procedures relating to unit prices.

1.03 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.

B. Forms filled out by hand will not be accepted.

C. Submit a printed schedule on AIA Form G703 - Application and Certificate for Payment Continuation Sheet. Contractor's standard form or electronic media printout will be considered.

D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization and bonds and insurance.

F. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.

G. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Monthly. 1 pdf electronic copy of Pay Request along with waivers to be submitted directly to Blakemore Architects.

B. Forms filled out by hand will not be accepted.

C. Present required information in typewritten form.

D. Form: AIA G702 Application and Certificate for Payment and AIA G703 - Continuation Sheet including continuation sheets when required.

E. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of work.
   3. Scheduled Values.
   4. Previous Applications.
   5. Work in Place and Stored Materials under this Application.
   6. Authorized Change Orders.
   7. Total Completed and Stored to Date of Application.
   8. Percentage of Completion.
   9. Balance to Finish.
   10. Retainage.

F. Execute certification by signature of authorized officer.

G. 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.

H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

I. Include the following with the application:
   1. Transmittal letter as specified for submittals in Section 01 3000.
   2. Construction progress schedule, revised and current as specified in Section 01 3000.
   3. Partial release of liens from all Subcontractors and vendors.
   4. Project record documents as specified in Section 01 7800, for review by Owner which will be returned to the General Contractor.
   5. Affidavits attesting to off-site stored products.

J. Prior to acceptance of Pay Request the Architect shall review the set of "As-built" drawings in the job trailer/field office. Failure to provide up-to-date "As-built" drawings will result in delay's in pay request approvals.

1.05 MODIFICATION PROCEDURES

A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in General Contractor's employ or subcontractors of changes to Contract Documents.

B. For minor changes not involving an adjustment to the Contract Price or Contract Time, Blakemore Architects will issue instructions directly to General Contractor.

C. Blakemore Architects will advise of minor changes in the Work not involving an adjustment to Contract Sum or Contract Time as authorized by the Conditions of the Contract by issuing supplemental instructions on AIA Form G710.

D. For other required changes, Blakemore Architects will issue a document signed by Owner instructing General Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change.

E. Substantiation of Costs: Provide full information required for evaluation.
   1. On request, provide the 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 with additional information:
      a. Origin and date 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.

F. Execution of Change Orders: Blakemore Architects will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

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 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:

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2100

ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cash allowances.

B. Inspecting and testing allowances.

1.02 RELATED REQUIREMENTS

A. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CASH ALLOWANCES

A. Costs Included in Cash Allowances: Cost of product to General Contractor or subcontractor, less applicable trade discounts.

B. Differences in costs will be adjusted by Change Order.

1.04 INSPECTING AND TESTING ALLOWANCES

A. Costs Included in Inspecting and Testing Allowances: Cost of engaging an inspecting or testing agency; execution of inspecting and tests; and reporting results.

B. Costs Not Included in the Inspecting and Testing Allowances:
   1. Costs of incidental labor and facilities required to assist inspecting or testing agency.

C. Payment Procedures:
   1. Submit one copy of the inspecting or testing firm's invoice with next application for payment.

D. Differences in cost will be adjusted by Change Order.

1.05 ALLOWANCES SCHEDULE

A. Inspecting and Testing Allowance: Include the sum of $30,000.00 for payment of inspecting services specified in Section 01 4000 - Quality Requirements.

B. Well water system including pump, pressure tank, design of system and installation including county permit fees: Include the allowance of $12,000.00. Installation of electrical to the pump shall be included in the Electrical Contractor bid per Electrical Sheets.

C. Staking Allowance: Include the sum of $5000.00 for surveying and staking of the building _____.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2200

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 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for Unit Prices.

B. Document 00 4322 - Unit Prices Form: List of Unit Prices as supplement to Bid Form

C. Section 01 2000 - 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 by Volume: Measured by cubic dimension using mean length, width and height or thickness.

E. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Blakemore Architects prior to starting work.

F. General Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes, calculate and certify quantities for payment purposes.

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 which is incorporated in or made necessary by the Work and accepted by Blakemore Architects, multiplied by the unit sum/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 authority of Owner to assess the defect and identify payment adjustment is final.

1.08 SCHEDULE OF UNIT PRICES

A. Item: Earth Excavation and removal from site per cubic yard; Section 02315 Excavation.

B. Item: Compacted Structural Fill in Place per cubic yard; Section 02316 Fill and Backfill.

C. Item: Duplex electrical outlet-installed to nearby circut.

D. Item: Data outlet box and conduit to above ceiling-installed.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2300

ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

C. Documentation of changes to Contract Sum and Contract Time.

1.02 RELATED REQUIREMENTS

A. Document 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for Alternates.

1.03 ACCEPTANCE OF ALTERNATES

A. Alternatives quoted on Contractor's letterhead, from items requested in the drawings, will be reviewed and accepted or rejected at Owner's option. Accepted alternatives will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.04 SCHEDULE OF ALTERNATES

A. Alternate No. A-2 - Cost to Provide Owner with Performance Bond:

B. Alternate No. A-1 - Deductive cost to construct metal frame canopy design vs wood framed option:

C. Alternate No. C-1 - Concrete Dumpster Pad:

D. Alternate No. C-2 - Heavy Duty Asphalt at Rear Storage Yard:

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 00 2113 - Instructions to Bidders: Restrictions on timing of substitution requests.

B. Section 01 2200 - Unit Prices, for additional unit price requirements.

C. Section 01 2300 - Alternates, for product alternatives affecting this section.

D. Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.

E. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by General Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond General Contractor's control.
      a. Unavailability.
      b. Regulatory changes.

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.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.

D. Limit each request to a single proposed substitution item.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Time Restrictions:
   1. Instructions to Bidders specifies time restrictions and the documents required for submitting substitution requests during the bidding period.

B. Submittal Form (before award of contract):

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 10 days prior to time required for review and approval by Blakemore ArchitectsBlakemore Architects, 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 Blakemore Architects, 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 Blakemore Architects for any required redesign, time spent processing and evaluating the request.

3.04 RESOLUTION

A. Blakemore Architects may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

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.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record.

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Preconstruction meeting.

C. Progress meetings.

D. Construction progress schedule.

E. Coordination drawings.

F. Submittals for review, information, and project closeout.

G. Number of copies of submittals.

H. Requests for Interpretation (RFI) procedures.

I. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions: Dates for applications for payment.

B. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.

C. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Blakemore Architects:
   1. Requests for Interpretation (RFI).
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Substantial Completion.
   11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

A. Schedule meeting after Notice of Award.

B. Attendance Required:
   1. Owner.
   2. Blakemore Architects.
   3. General Contractor.
   4. All major sub-contractors.

C. Agenda:
   1. Execution of Owner-General Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   3. Distribution of Contract Documents.

4. Submission of list of subcontractors, schedule of values, and progress schedule.
5. Designation of personnel representing the parties to Contract, Owner and Blakemore Architects.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
7. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with One copies to Blakemore Architects, Owner, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, as appropriate to agenda topics for each meeting.

D. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Maintenance of progress schedule.
7. Corrective measures to regain projected schedules.
8. Planned progress during succeeding work period.
9. Maintenance of quality and work standards.
10. Effect of proposed changes on progress schedule and coordination.
11. Other business relating to work.

E. Record minutes and distribute copies within two days after meeting to participants, with copies to Blakemore Architects, Owner, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

A. Within 20 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 20 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Submit updated schedule with each Application for Payment.

3.04 REQUESTS FOR INFORMATION (RFI)

A. 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.

B. 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.
2. Prepare in a format and with content acceptable to Owner.
   a. Use AIA G716 - Request for Information .

C. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

D. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.

E. Review Time: Blakemore Architects will respond and return RFIs to General 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.

F. 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 General 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. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.

3.05 SUBMITTAL SCHEDULE

A. Submit to Blakemore Architects for review a schedule for submittals in tabular format.
   1. Submit at the same time as the preliminary schedule specified in Section - 01 3216 - Construction Progress Schedule.
   2. Coordinate with General Contractor's construction schedule and schedule of values.
   3. Format schedule to allow tracking of status of submittals throughout duration of construction.

3.06 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 to Blakemore Architects for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed only for aesthetic, color, or finish selection. Architect to review all samples with Owner prior to release.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.07 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. Other types indicated.

B. Submit for Blakemore Architects's knowledge as architect for Owner.

3.08 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.09 NUMBER OF COPIES OF SUBMITTALS

A. Documents for Review:
   1. Small Size Sheets, Not Larger Than 8-1/2 by 11 inches: Submit the number of copies that General Contractor requires, plus two copies that will be retained by Blakemore Architects.
   2. Larger Sheets, Not Larger Than 36 by 48 inches: Submit the number of opaque reproductions that General Contractor requires, plus two copies that will be retained by Blakemore Architects.

B. Documents for Information: Submit two copies.

C. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.

D. Samples: Submit the number specified in individual specification sections; one of which will be retained by Blakemore Architects.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to General Contractor unless specifically so stated.

3.10 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Use a separate transmittal for each item.
   2. Transmit using approved form.
      a. Use General Contractor's form, subject to prior approval by Blakemore Architects.
   3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
   4. Identify: Project; General Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   5. Apply General 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 General Contractor, or without General Contractor's stamp will not be acknowledged, reviewed, or returned.
   6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
      a. Deliver submittals to Blakemore Architects at business address.
   7. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. For each submittal for review, allow 10 days excluding delivery time to and from the General Contractor.
      b. For sequential reviews involving Blakemore Architects's consultants, Owner, or another affected party, allow an additional 7 days.
   8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   9. Provide space for General Contractor and Blakemore Architects review stamps.
   10. When revised for resubmission, identify all changes made since previous submission.
   11. 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.

B. Product Data Procedures:
   1. Submit only information required by individual specification sections.
   2. Collect required information into a single submittal.
   3. 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. Do not reproduce Contract Documents to create shop drawings.
   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.

E. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

F. Identify Project, General Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.

G. Apply General 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.

H. Deliver submittals to Blakemore Architects at business address.

I. Schedule submittals to expedite the Project, and coordinate submission of related items.

J. For each submittal for review, allow 15 days excluding delivery time to and from the General Contractor.

K. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.

L. Provide space for General Contractor and Blakemore Architects review stamps.

M. When revised for resubmission, identify all changes made since previous submission.

N. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

O. Submittals not requested will not be recognized or processed.

3.11 SUBMITTAL REVIEW

A. Submittals for Review: Blakemore Architects will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Blakemore Architects will acknowledge receipt and review. See below for actions to be taken.

C. Blakemore Architects's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

D. Blakemore Architects's and consultants' actions on items submitted for review:
   1. Authorizing purchasing, fabrication, delivery, and installation:
      a. "Approved", or language with same legal meaning.
      b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
         1) At General Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
      c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
   2. Not Authorizing fabrication, delivery, and installation:
      a. "Revise and Resubmit".

1) Resubmit revised item, with review notations acknowledged and incorporated.

b. "Rejected".

1) Submit item complying with requirements of Contract Documents.

E. Blakemore Architects's and consultants' actions on items submitted for information:

1. Items for which no action was taken:

a. "Received" - to notify the General Contractor that the submittal has been received for record only.

2. Items for which action was taken:

a. "Reviewed" - no further action is required from General Contractor.

END OF SECTION

SECTION 01 3216
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Construction progress schedule, bar chart type.

1.02 RELATED SECTIONS

A. Section 01 1000 - Summary: Work sequence.

1.03 SUBMITTALS

A. Within 10 days after date of Agreement, submit preliminary schedule.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Submit updated schedule every 30 days to Owner and Architect.

D. Submit under transmittal letter form specified in Section 01 3000 - Administrative Requirements.

1.04 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify work of separate stages and other logically grouped activities.

C. Include conferences and meetings in schedule.

D. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

E. Provide legend for symbols and abbreviations used.

3.02 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

3.03 REVIEW AND EVALUATION OF SCHEDULE

A. Evaluate project status to determine work behind schedule and work ahead of schedule.

B. After review, revise as necessary as result of review, and resubmit within 10 days.

3.04 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Annotate diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

3.05 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to General Contractor's project site file, to subcontractors, suppliers, Blakemore Architects, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION

SECTION 01 4000

QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. References and standards.

B. Submittals.

C. Quality assurance.

D. Control of installation.

E. Tolerances.

F. Testing and inspection agencies and services.

G. Control of installation.

H. Tolerances.

I. Manufacturers' field services.

J. Defect Assessment.

K. Construction Staking.

1.02 RELATED REQUIREMENTS

A. Document 00 3100 - Available Project Information: Soil investigation data.

B. Document 00 7200 - General Conditions: Inspections and approvals required by public authorities.

C. Section 01 2100 - Allowances: Allowance for payment of testing services.

D. Section 01 3000 - Administrative Requirements: Submittal procedures.

E. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Testing Agency Qualifications:
   1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.

C. Design Data: Submit for Blakemore Architects's knowledge and for Owner, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
   1. Include required product data and shop drawings.
   2. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
   3. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

D. Test Reports: After each test/inspection, promptly submit two copies of report to Blakemore Architects and to General Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.

j. Compliance with Contract Documents.
k. When requested by Blakemore Architects, provide interpretation of results.

2. Test reports are submitted for Blakemore Architects's knowledge and for Owner, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and General Contractor or installation/application subcontractor to Blakemore Architects, in quantities specified for Product Data.
1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
2. Certificates may be recent or previous test results on material or product, but must be acceptable to Blakemore Architects.

F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

G. Manufacturer's Field Reports: Submit reports for Blakemore Architects's benefit and for Owner.
1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications:
1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.

1.05 TESTING AND INSPECTION AGENCIES AND SERVICES

A. General Contractor shall employ and pay for services of an independent testing agency to perform specified testing and inspection. Concrete Testing and Soils compactions

B. Employment of agency in no way relieves General Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

C. General Contractor shall provide surveyor services for all site, building and utility placement layout and staking, and for verification of installed foundations.

D. General Contractor Employed Agency:
1. Testing agency: Comply with requirements of ASTM E329, ASTM E 548, ASTM E543, ASTM C1021, ASTM C1077, and ASTM C1093.
2. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Blakemore Architects before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Blakemore Architects before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 TESTING AND INSPECTION

A. See individual specification sections for testing required.

B. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Blakemore Architects and General Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Blakemore Architects and General Contractor of observed irregularities or non-compliance of Work or products.
   5. Perform additional tests and inspections required by Blakemore Architects.
   6. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:
   1. Agency may not approve or accept any portion of the Work.
   2. Agency may not assume any duties of General Contractor.
   3. Agency has no authority to stop the Work.

D. General Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Blakemore Architects and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by General Contractor beyond specified requirements.

3.04 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanshipstart-up of equipment,test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.05 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. If, in the opinion of Blakemore Architects, it is not practical to remove and replace the work, Blakemore Architects will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary sanitary facilities.

C. Temporary Controls: Barriers, enclosures, and fencing.

D. Security requirements.

E. Vehicular access and parking.

F. Waste removal facilities and services.

G. Project identification sign.

H. Field offices.

1.02 RELATED REQUIREMENTS

A. Section 01 5100 - Temporary Utilities.

1.03 TEMPORARY UTILITIES - SEE SECTION 01 5100

A. General Contractor shall provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.

1.04 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.

1.05 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.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 FENCING

A. Construction: General Contractor's option.

B. Construction: Commercial grade chain link fence.

1.07 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.08 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings as required to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.

B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:

1.09 SECURITY

A. Protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Coordinate with Owner's security program.

1.10 VEHICULAR ACCESS AND PARKING

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.11 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. 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.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.12 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 new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5100

TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heat, ventilation, and water.

1.02 RELATED REQUIREMENTS

A. Section 01 5000 - Temporary Facilities and Controls:

1.03 TEMPORARY ELECTRICITY

A. Cost: By General Contractor.

B. Provide power service required from utility source.

C. Provide temporary electric feeder from nearest source as directed by electric utility electrical service at location as directed.

D. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.

E. Provide main service disconnect and over-current protection at convenient location and meter.

F. Permanent convenience receptacles may be utilized during construction.

G. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.04 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. General Contractor to coordinate with Electrical Contractor to provide and maintain LED lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.

B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

C. Maintain lighting and provide routine repairs.

D. Permanent building lighting may be utilized during construction.

1.05 TEMPORARY HEATING

A. Cost of Energy: By General Contractor

B. General Contractor to 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.

1.06 TEMPORARY COOLING

A. Cost of Energy: By General Contractor.

B. General Contractor to provide cooling devices and cooling if 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.

1.07 TEMPORARY VENTILATION

A. Utilize existing ventilation equipment. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

1.08 TEMPORARY WATER SERVICE

A. Cost of Water Used: By General Contractor.

B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations.

E. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Document 00 2113 - Instructions to Bidders: Product options and substitution procedures prior to bid date.

B. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

C. Section 01 4000 - Quality Requirements: Product quality monitoring.

D. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 REFERENCE STANDARDS

A. NEMA MG 1 - Motors and Generators.

B. 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.

D. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

PART 2 PRODUCTS

2.01 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. Containing lead, cadmium, or asbestos.

C. Provide interchangeable components by the same manufacture for components being replaced.

D. 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.

E. 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.

2.02 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.

2.03 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 2500 - Substitution Procedures.

B. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

D. A request for substitution 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.
   2. Will provide the same warranty for the substitution as for the specified product.
   3. Will 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. Will reimburse Owner and Blakemore Architects for review or redesign services associated with re-approval by authorities.

E. 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.

F. Substitution Submittal Procedure:
   1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
   2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
   3. The Blakemore Architects will notify General Contractor in writing of decision to accept or reject request.

3.02 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to General Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with General Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

B. General 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.

3.03 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.

3.04 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 01 7419.

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. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

G. Comply with manufacturer's warranty conditions, if any.

H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

K. 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 01 7000

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Pre-installation meetings.

C. Cutting and patching.

D. Surveying for laying out the work.

E. Cleaning and protection.

F. Starting of systems and equipment.

G. Demonstration and instruction of Owner personnel.

H. Closeout procedures, including General Contractor's Correction Punch List, except payment procedures.

I. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

B. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

C. Section 01 5000 - Temporary Facilities and Controls: Temporary exterior enclosures.

D. Section 01 5100 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.

E. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

F. Section 07 8400 - Firestopping.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Cutting and Patching: Submit written request 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.
   6. Include in request:
      a. Identification of Project.
      b. Location and description of affected work.
      c. Necessity for cutting or alteration.
      d. Description of proposed work and products to be used.
      e. Alternatives to cutting and patching.
      f. Effect on work of Owner or separate Contractor.
      g. Written permission of affected separate Contractor.
      h. Date and time work will be executed.

C. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.04 QUALIFICATIONS

A. For survey work, G.C shall employ a land surveyor registered in Illinois. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in Illinois. 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.

1.05 PROJECT CONDITIONS

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion. Provide of necessary EPA permits.

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

D. 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.
   5. Provide Silt fencing as required by local authority.

E. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

1.06 COORDINATION

A. 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.

B. Notify affected utility companies and comply with their requirements.

C. 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.

D. 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.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

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 01 6000 - 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 Owner and 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 two copies to Blakemore Architects, 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. General Contractor shall locate and protect survey control and reference points.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to civil engineer and owner.

E. Utilize recognized engineering survey practices.

F. 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.

G. Periodically verify layouts by same means.

H. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. 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.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. 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 Blakemore Architects before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. 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.

C. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
   3. 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.
   4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, Telecommunications, and Security Systems): 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. 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.

E. 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.

F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

G. 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.

H. 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.

I. Clean existing systems and equipment.

J. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

K. Do not begin new construction in alterations areas before demolition is complete.

L. 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 cutting and patching including excavation and fill to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit products together to integrate with other work.

E. 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.

F. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

G. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

H. Restore work with new products in accordance with requirements of Contract Documents.

I. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

J. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

K. 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.

L. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

M. Make neat transitions. Patch work to match adjacent work in texture and appearance.

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 and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 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. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. 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.

C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

D. Verify that wiring and support components for equipment are complete and tested.

E. Execute start-up under supervision of applicable General Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

A. Demonstrate operation and maintenance of products to Owner's tennant personnel two weeks prior to date of Substantial Completion.

B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.

3.12 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.13 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

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. Clean filters of operating equipment.

G. Clean debris from roofs, downspouts, 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.

3.14 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Blakemore Architects and Owner.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the General Contractor's Correction Punch List for General Contractor's Notice of Substantial Completion.

C. Notify Blakemore Architects when work is actually ready for Substantial Completion walk through.

D. Submit written certification containing General 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 Blakemore Architects's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Blakemore Architects's and General Contractor's comprehensive list of items identified to be completed or corrected and submit to Blakemore Architects.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Accompany Project Coordinator on General Contractor's preliminary final inspection.

H. Notify Owner and the Architect when work is considered finally complete.

I. Complete items of work determined by Blakemore Architects listed in executed Certificate of Substantial Completion.

3.15 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Furnish service and maintenance of components indicated in specification sections for one year from date of Substantial Completion.

D. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

E. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

F. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect .

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Blakemore Architects will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Blakemore Architects comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 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. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

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: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

F. Record Drawings and 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. 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. 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.

D. 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.

E. Provide servicing and lubrication schedule, and list of lubricants required.

F. Include manufacturer's printed operation and maintenance instructions.

G. Include sequence of operation by controls manufacturer.

H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

I. Provide control diagrams by controls manufacturer as installed.

J. Provide General Contractor's coordination drawings, with color coded piping diagrams as installed.

K. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

L. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

M. Include test and balancing reports.

N. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

D. Prepare data in the form of an instructional manual.

E. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

F. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

G. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Blakemore Architects, Consultants, General Contractor and subcontractors, with names of responsible parties.

H. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

I. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

J. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.

K. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

L. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Blakemore Architects, General Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
      a. Significant design criteria.
      b. List of equipment.
      c. Parts list for each component.

d. Operating instructions.
e. Maintenance instructions for equipment and systems.
f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

3. Part 3: Project documents and certificates, including the following:
   a. Shop drawings and product data.
   b. Air and water balance reports.
   c. Certificates.
   d. Photocopies of warranties and bonds.

M. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Blakemore Architects, Consultants, and General Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

N. Provide a digital copy of all close-out documents and warrantee data.

3.06 WARRANTIES AND BONDS

A. Obtain 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 warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of General Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 02 4100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of built site elements.

1.02 RELATED REQUIREMENTS

A. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

B. Section 01 7000 - 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.

C. Section 31 2323 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

PART 3 EXECUTION

2.01 DEMOLITION

A. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in 31 2323.

B. See civil/landscape drawings for existing trees to be removed.

2.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Provide, erect, and maintain temporary barriers and security devices.
   3. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   4. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
   5. 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.

2.03 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.

2.04 DEBRIS AND WASTE REMOVAL

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 03 0516

UNDERSLAB VAPOR BARRIER - STEGO

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet vapor barrier under concrete slabs on grade.
   1. At Office Areas.

1.02 RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories: Forms and accessories for formwork.

B. Section 03 2000 - Concrete Reinforcing.

C. Section 03 3000 - Cast-in-Place Concrete: Preparation of subgrade, granular fill, placement of concrete.

1.03 REFERENCE STANDARDS

A. 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.

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products.

C. Samples: Submit samples of underslab vapor barrier to be used.

D. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Underslab Vapor Barrier:
   1. Water Vapor Permeance: Not more than 0.010 perms, maximum.
   2. Thickness: 10 mils.
   3. Product:
      a. Stego Industries LLC; Stego Wrap Vapor Barrier: www.stegoindustries.com.

B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.

B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.

C. Lap joints minimum 6 inches.

D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.

F. Repair damaged vapor retarder before covering with other materials.

END OF SECTION

SECTION 03 1000

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 03 0516 Underslab Vapor Barrier

B. Section 03 2000 - Concrete Reinforcing.

C. Section 03 3000 - Cast-in-Place Concrete.

D. Section 07 2100 - Building Insulation: Rigid insulation

1.03 REFERENCE STANDARDS

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010.

B. ACI 301 Specifications for Structural Concrete; 2010 (Errata 2012).

C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.

D. ACI 347R - Guide to Formwork for Concrete; 2014.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver prefabricated forms and installation instructions in manufacturer's packaging.

B. Store prefabricated forms off ground in ventilated and protected manner to prevent deterioration from moisture.

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 to provide resultant concrete that conforms to design with respect to shape, lines, and dimensions.

C. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.

D. Comply with relevant portions of ACI 347R, ACI 301, and ACI 318.

2.02 WOOD FORM MATERIALS

A. Form Materials: At the discretion of the Contractor.

2.03 REMOVABLE PREFABRICATED FORMS

A. Preformed Steel Forms: Minimum 16 gage, 0.0598 inch thick, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

B. Void Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete mix until initial set; 2 inches thick.

2.04 FORMWORK ACCESSORIES

A. Form Ties: Snap-off type, galvanized metal, fixed length, 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. Composition: Colorless mineral oil-based, soy-based, or vegetable-oil based compound.
   2. Do not use materials containing diesel oil or petroleum-based compounds.
   3. VOC Content: None; water-based.
   4. Products:
      a. SpecChem, LLC; Bio Strip WB (water-based): www.specchemllc.com/sle.
      b. W.R. Meadows, Inc; Duogard: www.wrmeadows.com/sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

C. Dowel Sleeves: Plastic sleeve and nailable plastic base for smooth, round, steel load-transfer dowels.
   1. Products:
      a. BoMetals, Inc; QuicDowel: www.bometals.com/sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

D. Expanded Metal Lath Tie Wire: 16-gage

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 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. Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.

G. Coordinate this section with other sections of work that require attachment of components to formwork.

H. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect before proceeding.

I. Lap expanded metal lath sheets 4 to 6 inches at ends and 2-rib minimum at sides.

3.03 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.

3.04 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.

B. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

C. Install rigid insulation specified under Section 07 21 00 between formwork faces, allowing for full concrete cover of reinforcing and ensuring that insulation will not be displaced by concrete pour.

3.05 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.

3.06 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.

B. Construct and align formwork for elevator hoistway in accordance with ASME A17.1.

3.07 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 03 2000
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

A. Section 03 1000 - Concrete Forming and Accessories.

B. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).

B. ACI SP-66 - ACI Detailing Manual; 2004.

C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.

D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.

E. CRSI (DA4) - Manual of Standard Practice; 2009.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Deformed billet-steel bars.
   2. Unfinished.

B. Stirrup Steel: ASTM A1064/A1064M steel wire, unfinished.

C. Steel Welded Wire Reinforcement (WWR): Plain type; ASTM A1064/A1064M.
   1. Form: Flat Sheets.

D. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   3. Provide stainless steel components for placement within 1-1/2 inches of weathering surfaces.

2.02 RE-BAR SPLICING:

A. Coupler Systems: Mechanical devices for splicing reinforcing bars; capable of developing full steel reinforcing design strength in tension and compression.
   1. Products:
      a. Dayton Superior Corporation; Bar Lock Coupler System: www.daytonsuperior.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Dowel Bar Splicer with Dowel-Ins: Mechanical devices for connecting dowels; capable of developing full steel reinforcing design strength in tension and compression.
   1. Products:

a. Dayton Superior Corporation; Dowel Bar Splicer D101A with Straight Dowel-In: www.daytonsuperior.com.
b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

B. Welding of reinforcement is not permitted.

C. 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. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Maintain concrete cover around reinforcing as described on Drawings.

END OF SECTION

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Floors and slabs on grade.

B. Concrete foundation walls.

C. Joint devices associated with concrete work.

D. Concrete curing.

E. Concrete slab joint filler.

F. Salt Sealer for exterior Concrete.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories: Forms and accessories for formwork.

B. Section 03 20 00 - Concrete Reinforcing.

C. Section 07 92 00 - Joint Sealants: Products and installation for sealants for saw cut joints and isolation joints in slabs.

D. Section 07 21 00 - Thermal Insulation: Foundation insulation

1.03 REFERENCE STANDARDS

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

B. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).

C. ACI 302.1R - Guide for Concrete Floor and Slab Construction; 2004 (Errata 2007).

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.

E. ACI 306R - Cold Weather Concreting; 2010.

F. ACI 308R - Guide to Curing Concrete; 2001 (Reapproved 2008).

G. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2019.

H. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.

I. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.

J. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.

K. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2013.

L. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2012.

M. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

N. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

O. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.

1.04 SUBMITTALS

A. See Section 01 33 00 - Submittals, for additional requirements

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 301, Section 4 - Concrete Mixtures.

D. Samples: Submit samples of underslab vapor retarder to be used.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318 .

B. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.01 FORMWORK

A. Comply with requirements of Section 03 10 00.

2.02 REINFORCEMENT

A. Comply with requirements of Section 03 20 00.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.

B. Fine and Coarse Aggregates: ASTM C33.

C. Fly Ash: ASTM C618 , Class F.

D. Water: Clean and not detrimental to concrete.

E. Fiber Reinforcement: Alkali-resistant complying with ASTM C1116/C1116M, Type III.
   1. Fiber Type: Alkali-resistant polypropylene.
   2. Fiber Length: 1.5 inch, nominal.
   3. Manufacturers:
      a. Forta Corporation; GREEN-NET: www.forta-ferro.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ADMIXTURES

A. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

B. Air Entrainment Admixture: ASTM C260/C260M .
   1. Manufacturers:
      a. Daravair product line by Grace Construction Products.
      b. Master Aire AE 90, MasterAIr VR 10, or MasterAir AE 200 by BASF - Master Builders, Inc.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
   1. Manufacturers:
      a. Daracem 19 or ADVA 100, Grace Construction Products.
      b. Eucon 537, Euclid Chemical Co.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

D. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
   1. Manufacturers:
      a. Daratard 17, Grace Construction Products.
      b. Eucon Retarder 75 or 100, Euclid Chemical Co.
      c. MasterPozzolith Series, by BASF - Master Builders, Inc.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

E. Water Reducing Admixture: ASTM C494/C494M Type A.
   1. Manufacturers:
      a. Euclid Chemical Company; EUCON NW: www.euclidchemical.com/#sle.
      b. WRDA 82, Grace Construction Products.
      c. Eucon WR-91, Euclid Chemical Co..
      d. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 ACCESSORY MATERIALS

A. Foundation Insulation: As specified under Section 07 21 00

B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Grout: Comply with ASTM C1107/C1107M .
   2. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.
   3. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.
   4. Flowable Products:
      a. Dayton Superior Corporation; Sure-Grip Precision Grout: www.daytonsuperior.com/#sle.
      b. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; DURAGROUT: www.laticrete.com/our-products/concrete-construction-chemicals.
      c. SpecChem, LLC; SC Precision Grout: www.specchemllc.com.
      d. W. R. Meadows, Inc; 588-10K: www.wrmeadows.com.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M , Type II.
   1. Manufacturers:
      a. Euclid Chemical Company; AKKRO-7T: www.euclidchemical.com.
      b. SpecChem, LLC; Strong Bond Acrylic Bonder: www.specchemllc.com.
      c. W. R. Meadows, Inc; ACRY-LOK-: www.wrmeadows.com.
      d. Euclid Chemical Co.; Product: Flex-Con; www.euclidchemical.com .
      e. Dayton Superior; Acrylic Bonding Agent J40.
      f. Substitutions: See Section 01 60 00 - Product Requirements.

B. Epoxy Bonding System:
   1. Manufacturers:
      a. Euclid Chemical Company; DURALFLEX LV: www.euclidchemical.com.
      b. Dayton Superior Corporation; Perma Prime 3C: www.daytonsuperior.com.
      c. SpecChem, LLC; SpecPoxy 1000, SpecPoxy 2000, SpecPoxy 3000, or SpecPoxy 3000FS: www.specchemllc.com.
      d. W. R. Meadows, Inc; Rezi-Weld Gel Paste, Rezi-Weld Gel Paste State, Rezi-Weld 1000: www.wrmeadows.com.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

C. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
   1. Material: Closed-cell, non-absorbent, compressible polyethylene or polymer foam in sheet form.
   2. Manufacturers:
      a. Nomaco, Inc; Nomaflex: www.nomaco.com.
      b. W. R. Meadows, Inc; Deck-O-Foam Joint Filler with pre-scored top strip: www.wrmeadows.com.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

D. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.
   1. Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
   2. Height: To suit slab thickness.
   3. Manufacturers:
      a. BoMetals, Inc; Quickey: www.bometals.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

E. Control Joint Filler:

1. BASF
2. TF-100, fast - setting two-component polyurea control joint filler.

2.07 CURING MATERIALS

A. Material must be compatible with resilient flooring and carpeting adhesives. Contractor shall verify compatibility before applying curing compound

2.08 DENISFIERS AND SEALERS

A. Sealer: Penetrating type, water-based, low-VOC content.
   1. Ultrasil Li+ manufactured by Euclid Chemical Co.: www.euclidchemical.com.
   2. L.M. Scofield Company; Selectseal Plus: www.scofield.com
   3. Permaguard SPS manufactured by L & M Construction Chemicals: www.lmcc.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.
   5. Provide Salt Sealer:
      a. BASF
         1) Master Protect H 1000, High - performance, clear, breathable silane penetrating sealer. ASTM: D 6532. water exclusion, ASTM D 6490 Water Vaopr Transmission.
         2) Coverage: 250 sf / gallon.
         3) Install after 14-28 days.
         4) Clean all surfaces, power wash.
         5) Temp.:min 20F and rising
         6) Install per manif. instructions.

2.09 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Concrete Strength: Establish required average strength for each type of 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: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

2.10 MIX PROPORTIONING

A. Minimum amount of cementitious material identified in the following mix proportions shall apply for all mixes for which field experience or trial mixture information required by ACI 318 is not provided.

CLASS	TYPE OF CONSTRUCTION	MIN COMP STRENGTH AT 28 DAYS, PSI	MAX AGGREGATE SIZE, INCH	MIN LBS OF CEMENT PER CUBIC YARD	AIR ENTRAINMENT PERCENT +/- 1.5 %	NOTES
1	FOOTINGS	3000	1.0	470	NONE	10, 3
2	FOUNDATION WALLS, GRADE BEAMS & PIERS	4500	0.75	494	NONE	11, 4
3	INTERIOR SLABS ON GRADE	4000	0.75	540	NONE	4, 10

4	**EXTERIOR SLABS**	**5000**	**0.75**	**564**	**6.0**	**1, 5, 7, 11**
5	**MISC CONC**	**3000**	**0.75**	**470**	**6.0**	**1, 11**
6	**CONCRETE TOPPINGS**	**4000**	**0.375**	**540**	**NONE**	**4,10**

A. Notes:

1 - Air Entrained Concrete: Use for all exterior walls, exterior slabs, walks, platforms, ramps, steps, all portions of the site development concrete subject to freezing and thawing.
3 - Maximum water-cement ratio by weight shall be 0.55
4 - Maximum water-cement ratio by weight shall be 0.50
5 - Maximum water-cement ratio by weight shall be 0.40
6 - Do not use admixtures , plasticizers, slag, fly ash or other cement-replacing products.
7 - Provide at Contractor's option, a super plasticizer to mix
8 - Provide non-slip abrasive aggregate surface on all metal pan stairs and landings.
9 - Equilibrium dry weight of lightweight aggregate mix shall not exceed 115 pounds per cubic foot per ASTM C 567, Section 9.5.
10 - Maximum of 30 percent total replacement of Portland cement with Ground Granulated blast-Furnace Slag and fly ash at a ratio of 1:1; up to 250 pounds, with a maximum 15 percent fly ash content. If fly ash is used alone, limit the maximum replacement to 15 percent.
11 - Maximum of 30 percent total replacement of Portland cement with Ground Granulated blast-Furnace Slag and fly ash at a ratio of 1:1 where freeze-thaw durability and exposure to deicers is likely; up to 350 pounds, with a maximum of 20 percent fly ash. If fly ash is used alone, limit the maximum replacement to 20 percent.

2.11 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M .

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that forms are clean and free of rust before applying release agent.

B. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

C. 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.

D. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. 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. Consult manufacturer'r installation requirements.

3.02 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R .

B. Place concrete for floor slabs in accordance with ACI 302.1R .

C. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

D. 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.

E. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.03 SLAB JOINTING

A. Locate joints as indicated on the drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

E. Install joint devices in accordance with manufacturer's instructions.

F. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

G. Apply sealants in joint devices in accordance with Section 07 92 00, and as required herein.
   1. BASF TF-100 Control Joint Filler:
      a. Concrete must be fully cured [28 days min., 90-120 day prefered].
      b. Joint surfaqces must be clean dry free of dirt loose particles, oil, grease, asphalt, tar, paint, wax, rust, waterproofing, curing compounds, membranes, other foriegn matter.
      c. Clean concrete where necessary with sandblasting, grinding, or wire bruxhing.
      d. Install TF-100 at full depth to allow for proper load transfer.
      e. Do not install over backer rod in saw cut joints.
      f. Read and follow all manufacturer's installation requirements.

3.04 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. An independent testing agency, as specified in Section 01 40 00, will inspect finished slabs for conformance to specified tolerances.

B. Maximum Variation of Surface Flatness:
   1. Exposed Concrete Floors: 1/4 inch in 10 feet. (FF25)
   2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet. (FF25)
   3. Under Carpeting: 1/4 inch in 10 feet. (FF30-35) (FL20-25)

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

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
   1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.

C. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R ; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
   2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R ; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
   3. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R , minimizing burnish marks and other appearance defects.
      a. Chemical Hardener: See Section 03 35 11.

D. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

3.06 CURING AND PROTECTION

A. Comply with requirements of ACI 308R . 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.

C. Surfaces Not in Contact with Forms:
   1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
   2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
      a. Spraying: Spray water over floor slab areas and maintain wet.
   3. Final Curing: Begin after initial curing but before surface is dry.
      a. Moisture-Retaining Sheet: Lap strips not less than 3 inches and seal with waterproof tape or adhesive; secure at edges.

D. Apply concrete sealer in accordance with manufacturer's instructions. See Section 3.09 below.

E. Install foundation insulation as specified under Section 07 21 00 and as shown on Drawings.

3.07 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - 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 conformance 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 100 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 conforming to 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 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

B. Exterior concrete to be sealed with ChemMasters Silencure SRT (Cure and Silane Sealer) which is to be applied by the concrete contractor.

C. Interior concrete (exposed) to be sealed with BASF Lapidolith which is to be applied by the contract contractor.

END OF SECTION

SECTION 03 4113

PRECAST CONCRETE HOLLOW CORE PLANKS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Precast floor planks with poured concrete topping slabs.

B. Connection plates with brackets.

C. Grouting plank joint keys.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary.

B. ACI SPEC-301 - Specifications for Concrete Construction.

C. ACI 301 - Specifications for Structural Concrete.

D. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.

E. ASTM A416/A416M - Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete.

F. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.

G. PCI MNL-116 - Manual for Quality Control for Plants and Production of Structural Precast Concrete Products.

H. PCI MNL-120 - PCI Design Handbook - Precast and Prestressed Concrete.

I. PCI MNL-123 - Design and Typical Details of Connections for Precast and Prestressed Concrete.

J. PCI MNL-126 - Manual For The Design of Hollow Core Slabs.

K. PCI (CERT) - PCI Plant Certification.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate location of hanger tabs and devices for mechanical and electrical work and cutting of field openings.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate standard component configuration, design loads, deflections, and cambers.

C. Shop Drawings: Indicate plank locations, unit identification marks, connection details, edge conditions, bearing requirements, support conditions, dimensions, openings, openings intended to be field cut, and relationship to adjacent materials.

1. Provide shop drawings with Structural Engineering by and Illinois licensed Structural Engineer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Illinois..

B. Erector Qualifications: Company specializing in performingthe type of work specified in this section, with minimum 5 years ofdocumented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Lifting or Handling Devices: Capable of supporting member in positions anticipated during manufacture, storage, transportation, and erection.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Precast Concrete Hollow Core Planks:
   1. Any manufacturer with PCI Plant Certification.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PRECAST UNITS

A. Precast Hollow Core Planks: Comply with PCI MNL-120, PCI MNL-126, PCI MNL-124, ACI CODE-318, and ACI SPEC-301.
   1. Dimensions as indicated on drawings.
   2. Design connections in accordance with PCI MNL-123.
   3. Design components to accommodate construction tolerances, deflection of other building structural members and clearances of intended openings.

2.03 MATERIALS

A. Concrete Materials: ACI SPEC-301.

B. Tensioning Steel Tendons: ASTM A416/A416M, Grade 250 - 250K psi; seven-wire stranded steel cable; low-relaxation type; full length without splices; weldless; uncoated.

C. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi) deformed steel bars.

D. Non-Shrink Grout: Non-metallic, minimum compressive strength of 10,000 psi at 28 days.

2.04 ACCESSORIES

A. Connecting and Supporting Devices: Plates, angles, items cast into concrete, items connected to steel framing members, and inserts: ASTM A36/A36M carbon steel; prime painted.

B. Bearing Pads: High density plastic, 1/8 inch thick, smooth on one side. Vulcanized elastomeric compound molded to size.

2.05 FABRICATION

A. Embed anchors, inserts, plates, angles, and other items at locations indicated.

B. Provide openings required by other sections, at locations indicated.

C. Cut exposed ends flush.

2.06 SOURCE QUALITY CONTROL

A. Produce planks in accordance with requirements of PCI MNL-116. Maintain plant records and quality control program during production of precast planks. Make records available upon request.

PART 3 EXECUTION

3.01 PREPARATION

A. Prepare support devices for the erection procedure and temporary bracing.

3.02 ERECTION

A. Erect members without damage to structural capacity, shape, or finish. Replace or repair damaged members.

B. Install bearing pads and sill seal at bearing ends of planks as indicated.

C. Align and maintain uniform horizontal and end joints, as erection progresses.

D. Maintain temporary bracing in place until final connection is made. Protect members from staining.

3.03 TOLERANCES

A. Erect members level and plumb within allowable tolerances. Comply with PCI MNL-135, except as specifically amended below.

3.04 PROTECTION

A. Protect members from damage caused by field welding or erection operations.

3.05 CLEANING

A. Clean weld marks, dirt, and blemishes from surface of exposed members.

END OF SECTION

SECTION 04 0511
MORTAR AND MASONRY GROUT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcement and Anchorage.

B. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Loose steel lintels.

B. Section 07 84 00 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.

1.03 REFERENCE STANDARDS

A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; 2011.

B. ASTM A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.

E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

F. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2014.

G. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2011.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and masonry accessories.

1.05 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/530.1/ERTA , except where exceeded by requirements of the contract documents.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 MORTAR AND GROUT MATERIALS

A. Mortar and Grout-See structural drawings.

2.02 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
   1. Blok-Lok Limited: www.blok-lok.com.
   2. Hohmann & Barnard, Inc: www.h-b.com/sle.
   3. Wire Bond (Masonry Reinforcing Corporation of America): www.wirebond.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Reinforcing Steel: ASTM A615/A615M , Grade 60 (60,000 psi), deformed billet bars; uncoated.

C. Single Wythe Joint Reinforcement: Truss or ladder type; ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3; 0.1483 inch side rods with 0.1483 inch cross rods;

width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.

2.03 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
   1. Manufacturers:
      a. Blok-Lok Limited: www.blok-lok.com.
      b. Hohmann & Barnard, Inc: www.h-b.com/sle.
      c. WIRE-BOND: www.wirebond.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Joint Filler: Closed cell Neoprene; oversized 50 percent to joint width; self expanding; 1/4 inch wide by maximum lengths available.
   1. Manufacturers:
      a. Hohmann & Barnard, Inc: www.h-b.com/sle.
      b. Wire Bond (Masonry Reinforcing Corporation of America): www.wirebond.com.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

C. Concrete Block - Core Insulation
   1. Spray Type: For sound control between Office and Production areas
   2. Manufacturers:
      a. CFI Foam Inc. Core Foam Masonry Foam Insulation.
         cfiFOAM, Inc.
         P.O. Box 10393
         Knoxville, TN 37939
         865.588.4465
      b. Icynene-Core Fill 500
         6747 Campobello Road
         Mississauga ON
         L5N 2L7 Canada
         1-800-758-7325

2.04 LINTELS

A. Miscellaneous steel type as provided under Section 05 50 00 - Metal Fabrications

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running.-Verify and match existing building bonding.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Concave.-Verify and match existing building

3.03 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Interlock intersections and external corners.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

H. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.04 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

3.05 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

3.06 CORE INSULATION:

A. Install foam core insulation in accordance with the manufacture's recommendations.

B. Provide at all exterior masonry wall locations.

3.07 LINTELS

A. Install loose steel lintels over openings.

3.08 CONTROL JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.09 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

3.10 TOLERANCES

A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

F. Maximum Variation from Cross Sectional Thickness of Walls: 1/8 inch.

3.11 CUTTING AND FITTING

A. Cut and fit for pipes, conduit, and sleeves. Coordinate with other sections of work to provide correct size, shape, and location.

3.12 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.13 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 04 2000

UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete Block.

B. Reinforcement and Anchorage.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 04 05 11 - Mortar and Masonry Grout.

B. Section 05 50 00 - Metal Fabrications: Loose steel lintels.

1.03 REFERENCE STANDARDS

A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; 2011.

B. ASTM A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.

E. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a (Reapproved 2014).

F. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

G. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.

H. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2014.

I. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2011.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and masonry accessories.

1.05 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/530.1/ERTA , except where exceeded by requirements of the contract documents.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depth of 8 inches (6" at some areas. See Floor Plan).
      a. Split-face units at dumpsters
      b. Provide dry Block Water Repellant toCMU at exterior CMU
   2. Compressive Strength: F'm = 1900 psi
   3. Non-Loadbearing Units: ASTM C129 .

a. Hollow block, as indicated.
b. Normal weight.

2.02 MORTAR AND GROUT MATERIALS

A. Mortar and Grout: As specified in Section 04 0511.-Provide Dry Block Water Repellant to mortar at exterior applications.

2.03 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
1. Blok-Lok Limited: www.blok-lok.com.
2. Hohmann & Barnard, Inc: www.h-b.com/sle.
3. Wire Bond (Masonry Reinforcing Corporation of America): www.wirebond.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Reinforcing Steel: ASTM A615/A615M , Grade 60 (60,000 psi), deformed billet bars; uncoated.

C. Single Wythe Joint Reinforcement: Truss or ladder type; ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.

2.04 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
1. Manufacturers:
a. Blok-Lok Limited: www.blok-lok.com.
b. Hohmann & Barnard, Inc: www.h-b.com/sle.
c. WIRE-BOND: www.wirebond.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Joint Filler: Closed cell Neoprene; oversized 50 percent to joint width; self expanding; 1/4 inch wide by maximum lengths available.
1. Manufacturers:
a. Hohmann & Barnard, Inc: www.h-b.com/sle.
b. Wire Bond (Masonry Reinforcing Corporation of America): www.wirebond.com.
c. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
1. Bond: Running.
2. Coursing: One unit and one mortar joint to equal 8 inches.
3. Mortar Joints: Concave.

3.03 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Interlock intersections and external corners.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

H. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.04 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

3.05 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

3.06 CONTROL JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.07 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

3.08 TOLERANCES

A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

F. Maximum Variation from Cross Sectional Thickness of Walls: 1/8 inch.

3.09 CUTTING AND FITTING

A. Cut and fit for pipes, conduit, and sleeves. Coordinate with other sections of work to provide correct size, shape, and location.

3.10 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

E. Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet.
   1. Repair with matching touchup material provided by the manufacturer and in accordance with manufacturer's instructions.
   2. Repair methods and results subject to Architect 's approval.

F. Clean cast stone components as work progresses; remove mortar fins and smears before tooling joints
   1. Wet surfaces with water before applying cleaner.
   2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
   3. Remove cleaner promptly by rinsing thoroughly with clear water.
   4. Do not use acidic cleaners.

3.11 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 04 4313

STONE MASONRY VENEER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Anchored field stone veneer at exterior walls.

B. Metal anchors and accessories for anchored veneer.

C. Setting mortar.

1.02 RELATED REQUIREMENTS

A. Section 04 0511 - Masonry Mortaring and Grouting: Setting and pointing mortar.

B. Section 04 2000 - Unit Masonry: Joint reinforcement, Ties, Anchors, and Through-wall flashing.

C. Section 07 6200 - Sheet Metal Flashing and Trim: Flashings.

D. Section 07 9200 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.03 REFERENCE STANDARDS

A. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation.

B. ASTM A580/A580M - Standard Specification for Stainless Steel Wire.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

D. ASTM C270 - Standard Specification for Mortar for Unit Masonry.

E. ASTM C1242 - Standard Guide for Selection, Design, and Installation of Dimension Stone Attachment Systems.

F. ASTM C1515 - Standard Guide for Cleaning of Exterior Dimension Stone, Vertical And Horizontal Surfaces, New or Existing.

G. ASTM C1528/C1528M - Standard Guide for Selection of Dimension Stone.

H. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on stone units, mortar, and reinforcement.

C. Samples: Submit two stone samples illustrating minimum and maximum stone sizes, color range, texture, and markings.

D. Samples: Submit mortar color samples.

1.05 QUALITY ASSURANCE

A. Stone Fabricator Qualifications: Company specializing in fabricating cut stone with minimum ten years of documented experience.

1.06 MOCK-UP

A. Construct stone wall mock-up, 2 feet long by 2 feet wide; include stone anchor accessories, corner condition, and typical control joint in mock-up.

B. See Section 01 4000 - Quality Requirements for additional requirements.

C. Locate at Canopy Pier.

D. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect stone from discoloration during storage on site.

1.08 FIELD CONDITIONS

A. Maintain materials and ambient air at minimum of 40 degrees F (5 degrees C) prior to, during, and for 48 hours after completion of work.

PART 2 PRODUCTS

2.01 STONE

A. Stone, General: See recommendations in ASTM C1528/C1528M.

B. Stone: Fieldstone Cobbles type, as provided by Halquist Stone variety.
   1. Color: Tones to include: grey, red, black and creamy white with blue undertones.

2.02 MORTAR APPLICATIONS

A. At General Contractor's option, mortar may be field-mixed from packaged dry materials, made from factory premixed dry materials with addition of water only, or ready-mixed.

B. Mortar Color: Natural gray unless otherwise indicated.

C. Setting Bed Mortars: Setting bed used to adhere stone veneer units to scratch coat mortar or to bondable concrete or concrete masonry.

D. Pointing Mortars: Pointing or grouting mortars used to fill the joints between individual stone veneer units once the setting bed mortar has sufficiently cured.
   1. Site-Mixed: ASTM C270, Type N or Type S, using the Proportion Method as specified in Section 04 0511.

2.03 MORTAR MIXES

A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
   1. Type: Type S.
   2. Color: Mineral pigments added as required to produce approved color sample.

2.04 ACCESSORIES - ANCHORED VENEER

A. Wall Ties: Formed steel wire, at least 1 inch diameter, stainless steel complying with ASTM A580/A580M, eye and pintle type, with provision for vertical adjustment after attachment.

B. Other Anchors in Direct Contact with Stone: ASTM A666, Type 304, stainless steel, of sizes and configurations required for support of stone and applicable superimposed loads.

C. Flashings: See Section 04 2000.

D. Back Coating:

E. Cleaning Solution: Type that will not harm stone, joint materials, or adjacent surfaces.

2.05 STONE FABRICATION - ANCHORED VENEER

A. Nominal Thickness: 4 inch.

B. Nominal Face Size: 4-8 inch.

C. Form stone corners to rounded joint profile. Clean jagged corners from stone in preparation for setting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that support work and site conditions are ready to receive work of this section.
   1. Per ASTM C1242, exterior walls to receive thin natural stone veneers should be designed with a stiffness ratio of L/1000 minimum.

B. Verify that substrates to receive mortar scratch coat or setting bed comply with stone veneer manufacturer's instructions.

1. Concrete: Verify surfaces are flat, honeycomb is filled flush, and surface is ready to receive mortar setting bed. Verify no bituminous, water repellent, or form release agents exist on concrete surface that are detrimental to mortar setting bed.

3.02 PREPARATION - ANCHORED VENEER

A. Establish lines, levels, and coursing. Protect from disturbance.

B. Clean stone prior to installation. Do not use wire brushes or implements that mark or damage exposed surfaces.

C. Coat back surfaces not to be in contact with setting mortar with back coating material. Allow coating to cure.

3.03 INSTALLATION - ANCHORED VENEER

A. Size stone units to fit opening dimensions and perimeter conditions.

B. Arrange stone coursing in random bond with consistent joint width.

C. Set stone in full mortar setting bed to fully support stone over bearing surface. Use setting buttons or shims to maintain correct joint width.

3.04 REINFORCEMENT AND ANCHORAGE - ANCHORED VENEER

A. In addition, place wall ties at maximum 3 inches on center each way around perimeter of openings, within 12 inches of openings.

3.05 INSTALLATION - MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

B. Extend metal flashings through exterior face of stone and terminate in an angled drip with hemmed edge.

3.06 CLEANING

A. Remove excess mortar as work progresses, and upon completion of work.

B. Clean soiled surfaces with cleaning solution.

C. Clean exterior stone per ASTM C1515.

D. Use non-metallic tools in cleaning operations.

3.07 PROTECTION

A. During temporary storage on site, at the end of working day, and during rainy weather, cover stone work exposed to weather with non-staining waterproof coverings, securely anchored.

END OF SECTION

SECTION 04 4316
STONE FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated oolitic limestone items.

B. Metal anchors and supports.

C. Sealing exterior joints.

D. Pointing interior joints.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Tolerances.

B. Section 04 0511 - Masonry Mortaring and Grouting.

C. Section 04 4313 - Stone Masonry Veneer: Adhered or anchored stone masonry veneer.

D. Section 07 9200 - Joint Sealants: Sealing perimeter and expansion joints in interior stone work.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

D. ASTM C270 - Standard Specification for Mortar for Unit Masonry.

E. ASTM C568/C568M - Standard Specification for Limestone Dimension Stone.

F. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.

H. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.

I. ASTM C1528/C1528M - Standard Guide for Selection of Dimension Stone.

J. ILI (HB) - Indiana Limestone Handbook.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate fabrication details, layout, pertinent dimensions, anchorages, and jointing methods.
   1. Include large scale details of decorative surfaces and inscriptions.

C. Samples: Submit two stone samples 4 by 4 inches in size, indicating color range and texture, markings, surface finish.

D. Samples: Submit mortar color samples.

1.05 QUALITY ASSURANCE

A. Limestone: Perform work in accordance with ILI (HB).

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store stone on planks, pallets, or timbers, clear of soil and soil splash.

B. Protect stone from discoloration.

PART 2 PRODUCTS

2.01 FABRICATED ITEMS

A. Stone Fabricators:
   1. Benson Stone.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Pier Caps: Indiana Limestone.
   1. Size, Shape, and Configuration: As indicated on drawings.

2.02 STONE

A. Stone, General: See recommendations in ASTM C1528/C1528M.

B. Oolitic Limestone: Indiana Oolitic Limestone; complying with ASTM C568/C568M Classification II - Medium Density.
   1. Color: Buff.
   2. Acceptable Producers:
      a. Indiana Limestone Company: www.indianalimestonecompany.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 MORTAR

A. Mortar: ASTM C270, Type N, Proportion specification, using Portland cement of white color.

B. Mortar: See Section 04 0511.

2.04 ANCHORS AND ACCESSORIES

A. Anchors and Other Components in Contact with Stone: Stainless steel, ASTM A666, Type 304.
   1. Sizes and configurations: As required for vertical and horizontal support of stone and applicable loads.
   2. Wire ties are not permitted.

B. Support Components not in Contact with Stone: Stainless steel, ASTM A240/A240M, Type 304.

C. Setting Buttons and Shims: Lead type.

D. Joint Sealant: ASTM C920 silicone sealant with movement capability of at least plus/minus 25 percent and nonstaining to stone when tested in accordance with ASTM C1248.

E. Joint Backer Rod: ASTM C1330 open cell polyurethane of size 40 to 50 percent larger in diameter than joint width.

F. Cleaning Solution: Type that will not harm stone, joint materials, or adjacent surfaces.

2.05 STONE FABRICATION

A. Fabricate stone elements in sizes and shapes as necessary and in compliance with requirements indicated on drawings and in specifications.

B. Finish exposed faces and edges of stones in compliance with indicated requirements for finish under each type and application of stone required and to match approved samples and mock-ups.

C. Fabricate units for uniform coloration between adjacent units and over the full area of the installation.

D. Inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that support work and site conditions are ready to receive work of this section.

B. Verify that built-in items are properly located and sized.

3.02 PREPARATION

A. Clean stone prior to erection. Do not use wire brushes or implements that will mark or damage exposed surfaces.

3.03 INSTALLATION

A. Set stone with a consistent joint width of 3/8 inch.

B. Joints in Exterior Work: Seal joints with joint sealant over backer rod, following sealant manufacturer's instructions; tool sealant surface to concave profile. Seal all joints

C. Joints in Interior Work: Leave perimeter joints and expansion joints open for sealant; fill other joints with pointing mortar; pack and work into voids; tool surface to concave joint.

3.04 TOLERANCES

A. Positioning of Elements: Maximum 1/4 inch from true position.

B. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

3.05 CUTTING AND FITTING

A. Obtain approval prior to cutting or fitting any item not so indicated on drawings.

B. Do not impair appearance or strength of stone work by cutting.

3.06 CLEANING

A. Remove excess joint material upon completion of work.

B. Clean soiled surfaces with cleaning solution.

C. Use nonmetallic tools in cleaning operations.

END OF SECTION

SECTION 05 4000

COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed steel stud exterior wall framing.

1.02 REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.

E. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases; 2011c.

F. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2011a.

G. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

H. ASTM F 593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

J. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.

C. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.

D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
   1. Indicate stud layout.
   2. Describe method for securing studs to tracks and for bolted framing connections.
   3. Provide design engineer's stamp on shop drawings.
   4. Provide details and calculations for factory-made framing connectors, stamped by a Professional Structural Engineer.

E. Weld Procedure Qualification Test Records: Submit successful test record of welder performing welds for joints used that are not pre-qualified by AISC.

1.04 QUALITY ASSURANCE

A. Designer Qualifications: Design framing system under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Illinois.

B. Calculate structural properties of framing members in accordance with requirements of AISI North American Specification for the Design of Cold-Formed Steel Structural Members.

C. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing:
   1. Clark Dietrich Building Systems: www.clarkdietrich.com.
   2. Marino: www.marinoware.com.
   3. The Steel Network, Inc: www.SteelNetwork.com.
   4. Telling Industries: www.tellingindustries.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Framing Connectors and Accessories:
   1. Same manufacturer as metal framing.

2.02 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Design Criteria: Provide completed framing system having the following characteristics:
   1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI S100-12.
   2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
   3. Design Loads: As indicated on the drawings.
   4. Live load deflection meeting the following, unless otherwise indicated:
      a. Exterior Walls: Maximum horizontal deflection under wind load of 1/240 of span where there is no masonry/stone veneer.
      b. Exterior Walls with Veneer: Maximum horizontal deflection under wind load of 1/480 of span where there is masonry/stone veneer.
   5. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
   6. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

2.03 FRAMING MATERIALS

A. Studs and Track: ASTM C955 ; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.
   1. Provide components fabricated from ASTM A1008/A1008M, Designation SS (structural steel).

B. Framing Connectors: Factory-made, formed steel sheet.
   1. Material: ASTM A653/A653M SS Grade 33 and 40 (minimum), with G90/Z275 hot dipped galvanized coating for base metal thickness less than 10 gage, 0.1345 inch, and factory punched holes and slots.
   2. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI S100-12 .
   3. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, shouldered screws or screws and anti-friction or stepped bushings, while maintaining structural performance of framing. Provide movement connections where indicated on drawings.
      a. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
      b. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 10 feet.

4. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.

2.04 WALL SHEATHING

A. 5/8" Fire Treated plywood sheathing with water and air barrier applied.

2.05 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.

B. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

C. Sill Gasket: 1/4 inch thick by plate width, closed cell plastic foam from continuous rolls. Provide Sill Seal manufactured by Dow, or approved equal.

D. Water-Resistive Barrier: As specified in Section 07 25 00.

2.06 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.

B. Anchorage Devices: Powder actuated.

C. Welding: In conformance with AWS D1.1/D1.1M.

PART 3 EXECUTION

3.01 INSTALLATION OF STUDS

A. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.

B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches on center. Coordinate installation of sealant with floor and ceiling tracks.

C. Place exterior perimeter bottom track directly on sill gasket and secure to subfloor, at all floor levels.

D. Place studs at 16 inches on center at first floor, 16 inches on center at second floor; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using fastener method.

E. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs, or as stated on the Drawings.

F. Install load bearing studs full length in one piece. Splicing of studs is not permitted.

G. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.

H. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

I. Install intermediate studs above and below openings to align with wall stud spacing.

J. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.

K. Attach cross studs to studs for attachment of fixtures anchored to walls.

L. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

M. Touch-up field welds and damaged primed surfaces with primer.

END OF SECTION

SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items, including:
   1. Columns and base plates
   2. Lintels
   3. Bollard
   4. Other metal fabrications shown on Drawings.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.

C. Section 09 91 13 - Exterior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

C. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

D. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

E. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions; 2015a.

F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

H. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

I. SSPC-SP 2- Hand Tool Cleaning; 1982 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Weld Procedure Qualification Test Records: Submit successful test record of welder performing welds for joints used that are not pre-qualified by AISC.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Beams: S or W shapes, ASTM A 992

B. Steel Sections: ASTM A36/A36M.

C. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

D. Plates: ASTM A 283; Grade D

E. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

F. Bolts, Nuts, and Washers: ASTM F3125/F3125M , Type 1, plain.

G. Welding Materials: AWS D1.1/D1.1M ; type required for materials being welded.

H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.

B. Lintels: As detailed; prime paint finish.

2.04 FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components as indicated on drawings.

D. Perform field welding in accordance with AWS D1.1/D1.1M .

E. Obtain approval prior to site cutting or making adjustments not scheduled.

3.02 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 5100

METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel stair framing and supports.

B. Handrails and guards.

C. Cane detection rail below stairs.

D. Pan treads to receive concrete fill, including landings.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal anchors in concrete.

B. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.

1.03 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

D. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions; 2015a.

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

F. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

G. SSPC-SP 2- Hand Tool Cleaning; 1982 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
2. Include the design engineer's stamp or seal on each sheet of shop drawings.
3. Structural calculations showing loading, member design and connection design.

C. Weld Procedure Qualification Test Records: Submit successful test record of welder performing welds for joints used that are not pre-qualified by AISC.

1.05 QUALITY ASSURANCE

A. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.

1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.

2. Handrails and Cane Detection Rails: Comply with applicable accessibility requirements of ADA Standards.
3. Structural Design: Provide complete stair and railing assemblies complying with the applicable local code.
4. Dimensions: As indicated on drawings.
5. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
6. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.

B. Metal Jointing and Finish Quality Levels:
1. Commercial: Exposed joints as inconspicuous as possible, whether welded or mechanical; underside of stair not covered by soffit IS considered exposed to view.
a. Welded Joints: Intermittently welded on back side, filled with body putty, and sanded smooth and flush.
b. Welds Exposed to View: Ground smooth and flush.
c. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts.
d. Exposed Edges and Corners: Eased to small uniform radius.
e. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for satin or matte finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Commercial, as defined above.

B. Risers: Closed.

C. Treads: Metal pan with field-installed concrete fill.
1. Concrete Depth: 1-1/2 inches, minimum.
2. Tread Pan Material: Steel sheet.
3. Tread Pan Thickness: As required by design; 14 gage, 0.075 inch minimum.
4. Pan Anchorage to Stringers: Welded to carrier angles welded to stringers.
5. Concrete Reinforcement: None.
6. Concrete Finish: For resilient floor covering.

D. Risers: Same material and thickness as tread pans.
1. Riser/Nosing Profile: Sloped riser with rounded nosing of minimum radius.
2. Nosing Depth: Not more than 1-1/2 inch overhang.
3. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.

E. Stringers: Rolled steel channels.
1. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.

G. Railings: Steel pipe railings.

H. Finish: Shop- or factory-prime painted.

I. Under Side of Stair & Platforms: Exposed to view, to be finished and painted drywall, between the steel stringers..

2.03 HANDRAILS AND GUARDS

A. Wall-Mounted Rails: Round pipe or tube rails unless otherwise indicated.
1. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.

B. Guards:
1. Top Rails and: Round pipe or tube rails unless otherwise indicated.
a. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.

2. End and Intermediate Posts: Same material and size as top rails.
    a. Horizontal Spacing: As indicated on drawings.
    b. Mounting: Welded to top surface of stringer.

2.04 MATERIALS

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

D. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
    1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M , Designation CS (commercial steel).
    2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M , Designation CS (commercial steel).

E. Concrete Fill: Portland cement Type I, 3000 psi 28 day strength, 2 to 3 inch slump.

2.05 ACCESSORIES

A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M , Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

B. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; consistent with design of stair structure.

C. Welding Materials: AWS D1.1/D1.1M ; type required for materials being welded.

D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.06 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
    1. Preparation of Steel: In accordance with SSPC-SP 2, Hand Tool Cleaning.
    2. Number of Coats: One.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

B. Supply items required to be cast into concrete and embedded in masonry with setting templates.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M .

D. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

E. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preservative treated wood materials.

B. Fire retardant treated wood materials.

C. Concealed wood blocking, nailers, and supports.

D. Miscellaneous wood nailers.

1.02 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. AWPA C9 - Plywood -- Preservative Treatment by Pressure Processes; American Wood-Preservers' Association.

D. AWPA C20 - Structural Lumber -- Fire Retardant Treatment by Pressure Processes; American Wood-Preservers' Association.

E. ITS (DIR) - Directory of Listed Products.

F. UL (DIR) - Online Certifications Directory.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials and application instructions.

C. Product Data: Submit technical data on wood treatment.

D. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.

B. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.

C. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Douglas Fir-Larch, unless otherwise indicated. Fire retardant treated.
   2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: S-dry or MC19.

C. Miscellaneous Blocking, Furring, and Nailers:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.
   3. Fire retardant treated.

2.03 CONSTRUCTION PANELS

A. APA Rated Plywood Parapet Wall Sheathing: Fire treated and Exterior Exposure Class :

B. Other Applications:
   1. Other Locations: PS 1, C-D Plugged or better.

2.04 FIRE-RETARDANT TREATMENT (FRT)

A. Products:
   1. Arxada; Dricon FS: www.arxada.com.
   2. Hoover Treated Wood Products, Inc: www.frtw.com.
   3. Viance, LLC; D-Blaze: www.treatedwood.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Factory-treat wood members in accordance with AWPA U1 and use category indicated.

C. Kiln-dry after treatment (KDAT) to maximum moisture content of 19 percent for sawn material and 15 percent for plywood.

D. Fabrication of FRT Wood:
   1. Ripping or milling of boards, lumber, and timber after treatment is not permitted.
   2. Field cutting to length and drilling of holes in boards, lumber, and timber are permitted without additional treatment.
   3. Field cutting and drilling of holes in plywood are permitted.

E. Label or brand FRT wood with classification mark of UL (DIR) or ITS (DIR) or other approved inspection agency, the treatment plant, name of treatment, species of wood, flame spread and smoke developed index, method of drying after treatment, and treating standard.

2.05 ACCESSORIES

A. Metal and Finish of Fasteners:
   1. Fire-Retardant-Treated Wood:
      a. Nails, timber rivets, wood screws, and lag screws: Hot-dip galvanized steel complying with ASTM A153/A153M, Class D.
   2. Untreated Wood: Hot-dip galvanized steel complying with ASTM A153/A153M, Class D.

B. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with 1 for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

C. Water-Resistive Barrier: See Section 07 2500.

2.06 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
   1. Kiln dry lumber after treatment to maximum moisture content of 19 percent.

a. Treat lumber exposed to weather.

2. Treat lumber in contact with roofing, flashing, or waterproofing.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

D. Exterior wall sheathing panels to be gapped 1/8" at all edges.

3.02 INSTALLATION OF ACCESSORIES AND MISCELLANEOUS WOOD

A. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.

B. Coordinate curb installation with installation of decking and support of deck openings.

3.03 INSTALLATION OF CONSTRUCTION PANELS

A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using screws. Seal joints prior to paint panels in Stock Area.

3.04 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

END OF SECTION

SECTION 06 2000

FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Hardware.

C. Finish carpentry items.

D. Install doors and frames.

E. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 06 4100 - Architectural Wood Casework: Shop fabricated custom cabinet work.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Interior Carpentry Items:
   1. Hardware Installation.

2.02 HARDWARE

A. Hardware: Comply with BHMA A156.9.

B. Install and adjust all specified hardware. See Hardware Schedule on the drawings.

C. Verify all door openings are water tight after installation of harware and weather stripping and drip caps.

2.03 FABRICATION

A. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

PART 3 EXECUTION

3.01 INSTALLATION

A. Set and secure materials and components in place, plumb and level.

END OF SECTION

SECTION 07 2100

THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at perimeter foundation wall and underside of floor slabs.

B. Batt insulation and vapor retarder in exterior and interior wall construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

D. Spray foam to seal gaps and cracks at exterior envelope.

E. Spray foam CMU cores, (see 04 2000 Unit Masonry).

1.02 RELATED REQUIREMENTS

A. Section 07 5300 - ELASTOMERIC MEMBRANE ROOFING: Insulation specified as part of roofing system.

1.03 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

E. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.

B. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.

C. Insulation in Metal Framed Walls: Batt insulation with integral vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Type and Thermal Resistance, R-value: as indicated Type IV, 5.0 (0.88) per 1 inch thickness at 75 degrees F mean temperature.
   5. Board Size: 24 x 96 inch.
   6. Board Thickness: 2 1/2 inches.
   7. Board Edges: Square.
   8. Products:

a. DuPont de Nemours, Inc; STYROFOAM HIGHLOAD 40: building.dupont.com.
b. Dow Chemical Co: www.dow.com.
c. Owens Corning Corp: www.owenscorning.com.

9. Substitutions: See Section 01 6000 - Product Requirements.

B. Rigid Cellular Polyisocyanurate (ISO) Thermal Insulation Board with Facers Both Sides: Complying with ASTM C1289.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Batt Insulation: ASTM C 665; preformed batt; friction fit, conforming to the following:
1. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
2. Thickness: as indicated on drawings.
3. Facing: Aluminum foil, flame spread 25 rated; one side.
4. Products:
a. CertainTeed Corporation; .: www.certainteed.com.
b. Johns Manville; .: www.jm.com.
c. Owens Corning Corp: www.owenscorning.com.
5. Substitutions: See Section 01 6000 - Product Requirements.
6. Provide sound batts in all interior stud partitions.
a. Owens Corning Sound Attentuation Batt Insulation. or approved equal product.

2.04 ACCESSORIES

A. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
1. Application: Sealing of interior circular penetrations, such as pipes or cables.
2. Width: Are required for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Adhere a 6 inches wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.

B. Install boards horizontally on foundation perimeter.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.04 BATT INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

C. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.05 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

Guide Specifications

PROJECT ENGINEER RESPONSIBILITY: This is a general specification guide, intended to be used by experienced construction professionals in conjunction with good construction practice and professional judgment. This guide is to aid in the creation of a complete building specification that is to be fully reviewed and edited by the engineer. Sections of this guide should be included, edited, or omitted based on the requirements of a specific project. It is the responsibility of both the specifier and the purchaser to determine if a product or system is suitable for its intended use. Neither Bay Insulation Systems, nor any of its subsidiary or affiliated companies, assume any responsibility for the content of this specification guide relative to actual projects and specifically disclaim any and all liability for any errors or omissions in design, detail, structural capability, attachment details, shop drawings or other construction related details, whether based upon the information provided by Bay Insulation Systems or otherwise.

SECTION 07 21 16
BLANKET INSULATION FOR METAL BUILDINGS

PART 1 – GENERAL

1.1 SUMMARY

A. Thermal insulation and moisture control system for metal buildings for the following applications:
   1. Walls.
   2. Roofs, with OSHA Compliant, leading-edge fall protection.

B. Related Sections:
   1. Section 13 34 00 – Fabricated Engineered Structures.
   2. Section 13 34 19 – Metal Building Systems.
   3. Division 22 – Plumbing; Rough-in utilities.
   4. Division 23 – HVAC; Rough-in utilities.
   5. Division 26 – Electrical; Rough-in utilities.

1.2 REFERENCES

A. American Society for Testing of Materials (ASTM):
   1. ASTM C991 - Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings.
   2. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
   3. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   4. ASTM E 96 - Standard Test Method for Water Vapor Transmission of Materials in Sheet Form (Procedure A).
   5. ASTM E 2178 – Standard Test Method for Air Permeance of Metal Buildings.

B. North American Insulation Manufacturers Association (NAIMA):
   1. NAIMA 202-96(R) (Rev. 2000) STANDARD For Flexible Fiberglass Insulation to be Laminated for Use in Metal Buildings.

C. National Fire Protection Association (NFPA):
   1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

D. Underwriters Laboratories (UL):
   1. UL 723 - Test for Surface Burning Characteristics of Building Materials.

1.3 DESIGN REQUIREMENTS

A. Insulation R-Value for installed roof system-See drawings.

B. Insulation R-Value for installed wall system-See drawings.

C. The installed roof and wall systems shall provide a continuous vapor barrier.

1.4 SUBMITTALS

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A. Product Data: Provide manufacturer's data for each of the following, including:
   1. Roof installation instructions.
   2. Wall installation instructions.
   3. Product data sheet.
   4. Design consideration guide.
   5. Recycle content certification for fiberglass insulation products – minimum 50% recycled content for all fiberglass insulation materials.

B. Shop Drawings: Provide shop drawings that indicate the following:
   1. Liner fabric layout.
   2. Insulation layout and cut list.
   3. Customer and project information.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Companies shall be familiar with the installation practices associated with banded liner systems.

B. Bay Insulation shall approve all materials used in the SkyLiner® Insulation System. Contact Bay Insulation for specific materials approved for use with the SkyLiner® Insulation System.
   1. Substitution of any original components will nullify compliance with OSHA standards for fall protection.

1.6 SAFETY PRECAUTIONS

A. Installation contractor must have a site-specific safety plan and comply with all OSHA applicable local rules and regulations when installing this system.

B. Workers must use OSHA required fall protection when installing the banding and fabric system at heights (see OSHA regulations at 29 CFR 1926, Subpart M).

C. The SkyLiner® Insulation System meets:
   1. OSHA 29 CFR 1926.502(c)(4)(i) – Except as provided in paragraph (c)(4)(ii) of this section, safety nets and safety net installations shall be drop-tested at the jobsite after initial installation and before being used as a fall protection system, whenever relocated, after major repair, and at 6-month intervals if left in one place. The drop test shall consist of a 400-pound (180 kg) bag of sand 30" ± 2" (76 cm ± 5 cm) in diameter dropped into the net from the highest walking/working surface at which employees are exposed to fall hazards, but not less than 42" (1.1 m) above that level.
   2. OSHA 29 CFR 1926.502(i)(2) – All other covers shall be capable of supporting, without failure, at least twice the weight of employees, equipment and materials that may be imposed on the cover at any one time.
   3. OSHA 29 CFR 1926.754(e)(3) – covering roof and floor openings.
   4. OSHA 29 CFR 1926.754(e)(3)(i) – Covers for roof and floor openings shall be capable of supporting, without failure, twice the weight of the employees, equipment and materials that may be imposed on the cover at any one time.

D. Banding has sharp edges. Cut proof gloves should be worn when handling.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products indoors or in a dry, covered area.

B. Do not open products until ready to use.

C. Protect products from potential construction site damage.

D. Use care when opening products as pallets may shift during shipment.

E. Banding has sharp edges. Wear cut proof gloves when handling.

F. Wear safety glasses when unpacking materials.

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1.8 PROJECT CONDITIONS

A. For best results, do not install this system outside of the temperature, humidity, ventilation, and environmental limits recommended by the manufacturer. Products should be kept covered and dry at temperatures less than 100°F prior to installation.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Basis of Design: Bay Insulation Systems, Inc., Green Bay, WI, 54311; www.bayinsulation.com.

2.2 MATERIALS

Note: Bay Insulation Systems shall approve all materials used in the SkyLiner® Insulation System. Contact Bay Insulation for specific materials approved for use within the SkyLiner® Insulation System.

A. The SkyLiner® System consists of the following materials:
   1. Unfaced light density fiberglass metal building insulation in one of the following product categories:
      a. Metal Building Insulation.
         1) Complies with ASTM C991 Type 1.
         2) Complies with NAIMA 202-96-REV 2000.
         3) Flame Spread Index <25 and Smoke Developed Index <50 when tested in accordance with ASTM E84, NFPA 255 and UL 723.
         4) Certified by SCS Global Services to contain a minimum of 65% recycled glass content, 18% pre-consumer and 47% post-consumer.
         5) Thermal Resistance: Available R-Values = R10, R11, R13, R16, R19, R25 or R30.
         6) Unfaced.
         7) GREENGUARD Indoor Air Quality Certified®.
         8) GREENGUARD Gold Certified.
      b. Metal Building Filler Blanket Insulation.
         1) Flame Spread Index <25 and Smoke Developed Index <50 when tested in accordance with ASTM E 84, NFPA 255 and UL 723.
         2) Certified by SCS Global Services to contain a minimum of 65% recycled glass content, 18% pre-consumer and 47% post-consumer.
         3) Thermal Resistance: Available R-Values = R10, R11, R13, R16, R19, R25 or R30.
         4) Unfaced.
         5) GREENGUARD Indoor Air Quality Certified®.
         6) GREENGUARD Gold Certified.
   2. Fabric liner facing/vapor barrier composed of woven high-density polyethylene coated on both sides with polyethylene. Complies with the following:
      a. ASTM C1136, Types I through VI.
         1) Type 1-IV exception for dimensional stability (value is <2.0%).
      b. Perm rating: 0.02 or 0.03 when tested in accordance with ASTM E 96 Procedure A.
      c. Flame Spread Index < 25 and Smoke Developed Index < 50 when tested in accordance with ASTM E 84.
      d. Color:
         1) Bright White, Sky Blue Backing.
   3. Vapor barrier adhesive. Complies with the following:
      a. BayGrip™ Contact Adhesive; CA Compliant.
      b. BayGrip™ Fast Dry Pressure Sensitive Adhesive; CA Compliant.
   4. Double sided vapor barrier tape. Complies with the following:
      a. SkyLiner Double-Faced Tape.
      b. 2” width.
   5. Patch tape. Complies with the following:
      a. SkyLiner Repair Tape.

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6. Metal Banding/Straps. Complies with the following:
   a. SkyLiner® Banding, 1” x 0.023 continuous length metal banding.
   b. Exposed color to match vapor barrier.
      1) White.
7. Thermal breaks.
   a. Closed cell polyethylene foam tape for wall applications. Complies with the following:
      1) 0.125” thick to 0.375” thick.
      2) 3.0” wide.
   b. Thermal spacer blocks. Complies with the following:
      1) Extruded or expanded polystyrene.
      2) Minimum width 3.0”.
      3) Thickness 0.5” to 1.0”.
8. Fasteners & Clips.
   a. SkyLiner® Safety Clip System, to include offset clip + fastener + banding, 16” either side of each frame. (Required for fall protection installation.)
   b. Tek 2 and Tek 4.5.
9. Insulation Hangars.
   a. SkyLiner® SkyHook™ for Walls.
   b. SkyLiner® Insul-Hold for Walls, insulation hangars.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which work of this section will be installed. Verify that adjacent materials are dry and ready to receive insulation. Verify structure, bracing, and concealed building systems have been tested and inspected.

B. Provide written report listing conditions detrimental to performance of work in this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install liner system in accordance with manufacturer’s installation instructions and approved shop drawings.

B. Purlin and girt attachment surfaces should be clean and dry prior to attaching two-faced tape or sealing adhesive.

C. Installed fiberglass insulation should fit snugly against purlin and girt walls in the cavity space. Avoid gaps, voids, and any excess compression.

3.3 CLEANING

A. Clean dirt from vapor barrier fabric using a soft cloth with soap and water or non-abrasive household cleaner. Solvent-based cleaners and abrasive pads should be avoided.

3.4 APPENDIX

A. Refer to the Bay Insulation Systems publications listed below for product information, including uses, descriptions, physical properties, performance, specification compliance and application recommendations. Copies of these documents can be found at www.bayinsulation.com.
   1. SkyLiner® New Construction Installation Instructions – Bay Publication 13290508.
   2. SkyLiner® New Construction Walls Installation Instructions – Bay Publication 13290509.
   3. SkyLiner® White Fabric Specification Sheet – Bay Publication 13290216.
   4. SkyLiner® Black Fabric Specification Sheet – Bay Publication 13290211.
   5. BayGrip™ for SkyLiner® Data Sheet– Bay Publication 13290306.

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6. BayGrip™ Spray for SkyLiner® Data Sheet– Bay Publication 13290307.

END OF SECTION

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SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, and Window and Door Trim Accents.

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood nailers for sheet metal work.

B. Section 07 9005 - Joint Sealers.

1.03 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free.

E. CDA A4050 - Copper in Architecture - Handbook.

F. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples, 2" by 4" inch in size illustrating material and color of typical pre-finished coping.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

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 MANUFACTURERS

A. Sheet Metal Flashing and Trim:
   1. Petersen Aluminum Corporation: www.pac-clad.com/#sle.

2.02 SHEET MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A 653/A 653M, with G90/Z275 zinc coating; minimum 24 ga. thick base metal, shop pre-coated with Kynar 500 30 year finish warrantee, color as selected by Architect.
   1. Colors to be as follows:
      a. "Black"; as selected by architect.

2.03 ACCESSORIES

A. Fasteners: Galvanized steel .

B. Factory fabricated miters. Inside and Outside Corners.

C. 12" long, 24 ga. spring clips placed at 4'-0" o.c.

D. Factory Splice plates.

E. Sealant: Type butyl specified in Section 07 9005.

2.04 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate parapet wall coping cleats of [20 guage galvanized steel.] type sheet metal.

C. Form parapet wall coping pieces 12' lengths.

D. Fabricate parapet wall coping corners from one piece with minimum 24 inch long legs; seam for rigidity, seal with sealant.

E. Parapet wall coping, Face Height 4" min.-(see drawings). [Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip].

2.05 ACCESSORIES

A. Primer Type: Zinc chromate.

B. Concealed Sealants: Non-curing butyl sealant.

C. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

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.

3.03 INSTALLATION

A. Comply with drawing details.

B. Secure flashings in place using concealed fasteners.

C. Parapet wall copings - Snap On Installation.

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.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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 07 9005

JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sealants and joint backing.

B. Precompressed foam sealers.

C. Provide sealants at;
   1. Bathroom ceramic fixtures and countertops.
   2. Bathroom fixtures and wall surfaces.
   3. Countertops and wall surfaces.
   4. Edges of all door frames and adjacent wall finishes, at all locations.
   5. Fire caulk penetrations in fire rated floors and walls at top and bottom.
   6. Seal off all walls that touch the precast concrete floor structure with sealant.
   7. Seal off all penetrations thru exterior walls for utilitiy lines, pipes, hose bibs, wiring, grills and louvers.
   8. Seal metal liner sheets to the concrete floor slabs.

D. Backer Rod

1.02 REFERENCE STANDARDS

A. ASTM C834 - Standard Specification for Latex Sealants.

B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants.

E. ASTM D1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber.

F. ASTM D1667 - Standard Specification for Flexible Cellular Materials--Poly(Vinyl Chloride) Foam (Closed-Cell).

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with other sections referencing this section.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating sealant chemical characteristics.

C. Samples: Submit two samples, 2" in size illustrating sealant colors for selection.

D. Manufacturer's Installation Instructions: Indicate special procedures.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each referenced document covering installation requirements on site.

1.06 FIELD CONDITIONS

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

1.07 COORDINATION

A. Coordinate the work with all sections referencing this section.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a two year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Gunnable and Pourable Sealants:
   1. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
   2. Dow Corning Corporation: www.dowcorning.com.
   3. Tremco Global Sealants: www.tremcosealants.com.
   4. Sherwin-Williams Company: www.sherwin-williams.com.
   5. W.R. Meadows, Inc: www.wrmeadows.com.
   6. Sika Corporationj.

B. Type A: Silicone Sealants: Joints Between Plumbing Fixtures and Walls and Floors, and Between Countertops and Walls
   1. Application: for non-porous surfaces such as Non-structural glazing, aluminum, tile, fiberglass and plastic laminate. Non-structural glazing, sanitary seals, in kitchen and restroom areas, back splashes, vanities etc. and general use on HVAC, plumbing construction.
      a. Location: Above grade. Interior and Exterior.
      b. Max. depth 1/2" Min. depth: 1/4"
      c. In deep joints the sealant depth must be controlled by Closed Cell Backer Rod.
         1) Backer rod should be approximately 25% larger in diameter than the joint width.
         2) Do not prime or puncture backer rod.
   2. Sonneborn Building Products, ChemRex, Inc; Product Sonolastic Omniplus: www.chemrex.com.
   3. Dow Corning Corp; Product 791 Silicone Weatherproofing Sealant: www.dowcorning.com.
      a. Locations
         1) Expansion Joints
         2) Connection
         3) Perimeter
         4) Movement joints
      b. Suitable for use on:
         1) Coated glass
         2) Galvanized steel
         3) Copper
         4) Masonry
   4. Dow Corning Corp; Product 795 Silicone Building Sealant: www.dowcorning.com.
      a. Locations
         1) Structural and non-structural glazing.
         2) Structural attachment of many panel systems.
         3) Panel stiffener applications
      b. Suitable for use on:
         1) Weather sealing of glass
         2) Aluminum
         3) Steel
         4) Painted metal
         5) EIFS
         6) Granite
         7) Stone
         8) Concrete
         9) Brick
         10) Plastics
   5. GE Plastics; Product GE Silicone; Silglaze II: www.gespecialtymaterials.com.
      a. Locations
         1) Structural and non-structural glazing.
         2) General Purpose sealing applications.

3) Applications where FDA or USDA compliance is required.
b. Suitable for use on:
1) Weather sealing of glass
2) Paintable applications.
6. GE Plastics; Product GE Silicone; Silpruf: www.gespecialtymaterials.com.
a. Locations
1) Structural adhesive.
2) Structural Glazing.
3) Weatherproofing Joints
b. Suitable for use on:
1) Glass
2) Polycarbonate
3) Vinyl
4) Plastics
5) Treated and untreated wood
6) and powder coated metals
7) Anodized aluminum
8) EFIS
9) Ceramic and porcelain materials
10) Concrete
11) Natural Stone
7. Surebond; Product [SB-188 Silicone Rubber].
a. Locations
1) Movement joints
2) Dissimilar metal separation
3) high temperature uses
4) -75 deg - 500 deg F
b. for use on:
1) Metal
2) Plastics
3) Fiberglass
4) Glass
5) Wood
6) Foam
7) Painted surfaces
8) Rubbers

C. Type B: Joints in Exterior Metal Work and Siding.
1. Surebond; Product [SB-895 Neutral Cure]. 100% urethane sealant
a. Locations
1) Structural adhesive.
2) Structural Glazing.
3) Weatherproofing Joints
b. Suitable for use on:
1) Glass
2) Fiberglass
3) Metal
4) Painted and galvanized metal
5) Prefinished panels
6) Composite board
7) Brick
8) EFIS
9) Laminates
10) Concrete
11) Natural Stone

2. Tremco, Inc; Product Spectrem 3 & Primer 23: www.tremcosealants.com.
    a. Locations
        1) Dynamically moving joints, ie. expansion joints
    b. Suitable for use on:
        1) Aluminum curtain walls
        2) Metal panels
        3) Window perimeters

D. Type C: Control and Expansion Joints in Paving
1. One Moisture Curing Part Gun Grade Polyurethane Sealant - Single Component, Moisture curing Polyurethane:
    a. Tremco: Dymonic:
        1) Locations:
            (a) Sealing dynamically moving joints such as:
                (1) Expansion and control joints. window, door perimeters, masonry joints, etc.
                (2) Concrete joints
                (3) Window and door perimeters
                (4) Bedding of mullions and frames
2. Sonneborn Building Products, ChemRex, Inc; Product Sonolastic SL1: www.chemrex.com.
    a. Locations
        1) Expansion joints in concrete floors
        2) Concrete sidewalks
        3) Pavements

E. Type D: Control, Expansion, and Soft Joints in Masonry, and Between Masonry and Adjacent WorkSingle Component, Fast Skinning Urethane:
1. Tremco: Tremflex 25 or Sonolastic 150.
    a. Location:
        1) General Sealing
        2) Sheet metal
        3) Flashings

F. Type E: Lap Joints in Exterior Sheet Metal Work:
1. Tremco, Inc; Product Tremco Butyl Sealant: www.tremcosealants.com.
    a. Locations:
        1) Metal Panel Joining.
        2) areas where a seal is required against neoprene, or EPDM gaskets.

G. Type F: Concealed bedding joint sealant:
1. Tremco, Inc; Product Tremco Butyl Sealant: www.tremcosealants.com.
    a. Location:
        1) Under Exterior Door Thresholds
2. BASF Construction Chemicals-Building Systems: www.chemrex.com.

H. Type G: Interior Joints for Which No Other Sealant is Indicated:
1. Tremco, Inc; Product Vulkem 116: www.tremcosealants.com.
    a. Location:
        1) Similar types of construction joints. Interior and Exterior

2.02 SEALANTS

2.03 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
   1. Preformed Compressible Foam Sealers:
      a. Emseal Joint Systems, Ltd: www.emseal.com.
      b. Sandell Manufacturing Company, Inc: www.sandellmfg.com.
      c. Dayton Superior Corporation: www.daytonsuperior.com.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Perform acoustical sealant application work in accordance with ASTM C919.

D. 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.

E. Install bond breaker where joint backing is not used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

H. Tool joints concave.

3.04 CLEANING

A. Clean adjacent soiled surfaces.

3.05 PROTECTION

A. Protect sealants until cured.

END OF SECTION

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Fire-rated hollow metal doors and frames.

C. Thermally insulated hollow metal doors with frames.

D. Tornado-resistant hollow metal doors and frames.

E. Accessories glazing and Seals.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware.

B. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

C. Section 09 9113 - Exterior Painting: Field painting.

D. Section 09 9123 - Interior Painting: Field painting.

1.03 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. ASCE: American Society of Civil Engineers.

C. HMMA: Hollow Metal Manufacturers Association.

D. NAAMM: National Association of Architectural Metal Manufacturers.

E. SDI: Steel Door Institute.

F. UL: Underwriters Laboratories.

1.04 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.

B. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council.

C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100).

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

F. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

G. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

H. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames.

I. FEMA P-361 - Safe Rooms for Tornadoes and Hurricanes: Guidance for Community and Residential Safe Rooms.

J. ICC 500 - ICC/NSSA Standard for the Design and Construction of Storm Shelters; National Storm Shelter Association.

K. ICC A117.1 - Accessible and Usable Buildings and Facilities.

L. DHI A115 Series - Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute (ANSI/DHI A115 Series).

M. ITS (DIR) - Directory of Listed Products.

N. NAAMM HMMA 805 - Recommended Selection and Usage Guide for Hollow Metal Doors and Frames.

O. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames.

P. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames.

Q. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.

R. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

S. UL (DIR) - Online Certifications Directory.

T. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.
   2. Curries, an Assa Abloy Group company: www.assaabloydss.com.
   3. Republic Doors, an Allegion brand: www.republicdoor.com.
   4. Ceco Door Products: www.cecodoor.com.
   5. Steelcraft, an Allegion brand: www.allegion.com.
   6. Steelcraft: www.steelcraft.com.

B. Hurricane-Resistant and Tornado-Resistant Hollow Metal Doors and Frames:
   1. See Door Scedule for door location and manufacturer.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
   4. Door Edge Profile: Manufacturers standard for application indicated.
   5. Typical Door Face Sheets: Flush.
   6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.

7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
9. Finish: Factory primed, for field finishing.

2.03 HOLLOW METAL DOORS

A. Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
      e. MSG No. 18.
   2. Grade: NAAMM HMMA 861, physical performance Level A.
   3. Steel-Stiffened
      a. Steel-stiffened doors designed with the combination of perimeter steel channels and core stiffeners to offer the most reliable and durable construction. For optimum security. Face sheets in gauge 16, with door thicknesses of both 1-3/4" .
      b. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
      c. Door Thickness: 1-3/4 inches, nominal.
   4. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
   5. Door Face Sheets: Flush.
   6. Weatherstripping: Refer to Section 08 7100.

B. Interior Doors, Non-Fire-Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Model 1 - Full Flush.
      c. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
   2. Based on NAAMM HMMA Custom Guidelines:
      a. Comply with guidelines of NAAMM HMMA 860 for Hollow Metal Doors and Frames.
      b. Performance Level 1 - Light Duty, in accordance with NAAMM HMMA 805.
      c. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
   3. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   4. Door Thickness: 1-3/4 inches, nominal.
   5. Texture: Smooth faces.
   6. Door Finish: Factory primed and field finished.

C. Fire-Rated Doors:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Model 1 - Full Flush.
      c. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
   2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
      a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
      b. Attach fire rating label to each fire rated unit.

3. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
4. Door Thickness: 1-3/4 inches, nominal.

D. Tornado-Resistant Doors:
1. Design and size door and frame components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M.
a. Design Wind Loads: Comply with requirements of authorities having jurisdiction.
2. Tornado Shelter Application: Comply with ICC 500 standard.
a. Commercial: Designed and tested to comply with FEMA P-361 community shelter door assembly guidelines.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. General:
1. Comply with the requirements of grade specified for corresponding door, except:
a. ANSI A250.8 Level 1 Doors: 14 gage frames.
b. Frames for Wood Doors: Comply with frame requirements specified in the drawings
2. Finish: Factory primed, for field finishing.

C. Exterior Door Frames: Full profile/continuously welded type.
1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
2. Weatherstripping: Separate, see Section 08 7100.

D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
1. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.
2. Frame Finish: Factory primed and field finished.

E. Door Frames, Fire-Rated: Face welded type.
1. Fire Rating: Same as door, labeled.

F. Tornado-Resistant Door Frames: With same tornado resistance as door; face welded or full profile/continuously welded construction, ground smooth, fully prepared and reinforced for hardware installation.
1. Frame Metal Thickness: 14 gauge, 0.067 inch, minimum.
2. Frame Finish: Factory primed and field finished.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

A. Louvers: Roll formed steel with overlapping frame; finish same as door components; factory-installed.
1. In Fire-Rated Doors: UL (DIR) or ITS (DIR) listed fusible link louver, same rating as door.
2. Style: Standard straight slat blade.

B. Glazing: As specified in Section 08 8000, factory installed.

C. Removable Stops: Formed sheet steel, mitered or butted corners; prepared for countersink style tamper proof screws.

D. Astragals and Edges for Double Doors: Pairs of door astragals, and door edge sealing and protection devices.
1. UL listed products in compliance with requirements of authorities having jurisdiction.
2. Edge Type: Beveled edge
3. Material: Steel.

E. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

F. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

2.07 FINISH MATERIALS

A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Install door hardware as specified in Section 08 7100.

3.04 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.06 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 3613
SECTIONAL DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead sectional doors, electrically operated.

B. Operating hardware and supports.

C. Electrical controls.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Steel channel opening frame.

B. Section 06 1000 - Rough Carpentry: Rough wood framing for door opening.

C. Section 07 9005 - Joint Sealers: Perimeter sealant and backup materials.

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 E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

C. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

D. DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors.

E. ITS (DIR) - Directory of Listed Products.

F. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts.

G. NEMA MG 1 - Motors and Generators.

H. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

I. NFPA 70 - National Electrical Code.

J. UL (DIR) - Online Certifications Directory.

K. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

C. Product Data: Show component construction, anchorage method, and hardware.

D. Samples: Submit two panel finish samples, 6 by 6 inch in size, illustrating color and finish.

E. Manufacturer's Installation Instructions: Include any special procedures required by project conditions.

F. Operation Data: Include normal operation, troubleshooting, and adjusting.

G. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.

H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer: Company specializing in performing the work of this section with minimum 5 years of experience.

C. Comply with applicable code for motor and motor control requirements.

D. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction, as suitable for purpose specified.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for warranty requirements.

B. Correct defective Work within a 10 year warrnty period after Date of Substantial Completion.

C. Warranty: Include coverage for electric motor.

D. Provide 3 year manufacturer warranty for electric operating equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: EnergyCore EC200 manufactured by Raynor.
   1. EnergyCore EC200 Commercial Sectional Garage Doors manufactured by Raynor.

B. Other Acceptable Manufacturers - Sectional Doors:
   1. Clopay Building Products: www.clopaydoor.com.
   2. Overhead Door Corporation: www.overheaddoor.com.
   3. Amarr.
   4. Substitutions: Not permitted.

2.02 PERFORMANCE REQUIREMENTS

A. Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.

B. Air Leakage Rate: Less than 0.40 cfm/sq ft when tested in accordance with ASTM E283/E283M at test pressure difference of 1.57 psf.

C. Thermal Transmittance: U-factor of 0.31 Btu/hr sq ft degrees F, maximum, in accordance with DASMA 102.

2.03 STEEL DOORS

A. Steel Two Sided Sectional Doors: Flush steel, insulated; standard lift operating style with track and hardware; complying with DASMA 102, Commercial application.
   1. Door Panels: Steel construction; outer steel sheet of 26 gauge, 0.016 inch minimum thickness, flush profile; inner steel sheet of 26 gauge, 0.016 inch minimum thickness, flat profile; core reinforcement _____ inch sheet steel roll formed to channel shape, rabbeted weather joints at meeting rails; polyurethane insulation.
   2. Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.
   3. Door Nominal Thickness: 2 inches thick.
   4. Exterior Finish: Factory finished with standard factory finish; Manufacturer Standard White color.
   5. Interior Finish: Factory finished with standard factory finish; White color.
   6. Operation: Electric.

B. Door Panels: Steel construction; outer steel sheet of 26 gage, .016 inch minimum thickness, flushstucco profile; inner steel sheet of 26 gage, .016 inch minimum thickness, flatstucco profile; core reinforcement manufacture standard inch sheet steel roll formed to channel shape, rabbeted weather joints at meeting rails; expanded polystyrene (EPS) insulation.

C. Door Panels: Stile and rail construction, of steel sheet.064 inch minimum thickness, with welded joints; rabbeted weather joints at meeting rails.

D. Glazing: Annealed float glass; single pane; clear; 1 inch overall thickness.

E. Warrantee; 10 year rust through and delamination.

2.04 COMPONENTS

A. Heavy Duty Track: Rolled galvanized steel, 13 gauge thick; 2 inch wide, continuous one piece per side; galvanized steel mounting brackets 13 gauge galvanized thick.

B. Heavy Duty Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.

C. Lift Mechanism: Torsion spring on cross head shaft, with braided galvanized steel lifting cables.

D. Sill Weatherstripping: Resilient hollow neoprene 3" EPDM strip, one piece; fitted to bottom of door panel, full length contact.

E. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.

F. Head Weatherstripping: EPDM rubber seal, one piece full length.

G. Panel Joint Weatherstripping: Raynor Standard, one piece full length.

H. Lock: Inside center mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior handle.

I. Provide galvanized steel stiffeners screwed to in inner panels. Minimum, 3 per 8' h. door and 5 per 14' door minimum, manufacturer shall provide more if requiredby thier in house enginnering.

2.05 MATERIALS

A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with Raynor Standard coating, stucco pencil groove surface.

B. Insulation: Rigid polystyrene.
   1. R value of 10.
   2. Same thickness as core framing members.

2.06 ELECTRICAL OPERATION

A. Electric Operators: Controlhoist Optima Model CDH - 1 11
   1. Mounting: Side mounted on cross head shaft.
   2. Motor Enclosure:
      a. Exterior Doors: NEMA MG 1, Type 4; open drip proof.
   3. 1/2 hp; manually operable in case of power failure, transit speed of 8 to 12 inches per second.
   4. Motor Voltage: 120/240 volts, single phase, 60 Hz.
   5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
   6. Controller Enclosure: NEMA 250, Type 1.
   7. Opening Speed: 8 to 12 inches per second.
   8. Brake: Adjustable friction clutch type, activated by motor controller.
   9. Manual override in case of power failure.
   10. 25 amperes maximum.
   11. Coordinate with Electrical Contractor on power requirments

B. Motor: NEMA MG1, Type 1, belt drive.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

D. Control Station: Provide standard three button (Open-Close-Stop) momentary-contact control device for each operator complying with UL 325.
   1. 24 volt circuit.
   2. Surface mounted, at interior door jamb.

3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
    a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.

E. Disconnect Switch: Factory mount disconnect switch in control panel.

F. Safety Edge: At bottom of door panel, full width; electro-mechanical sensitized type, wired to reverse door upon striking object; hollow neoprene covered to provide weatherstrip seal.

G. Control Station: Standard three button (open-close-stop) type control for each electric operator.
    1. Surface mounted.
    2. Locate at inside door jamb.

H. Provide safety reverse feature.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

B. Apply primer to wood frame.

3.03 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Anchor assembly to wall construction and building framing without distortion or stress.

C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

D. Fit and align door assembly including hardware.

E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

F. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07 9005.

G. Install perimeter trim.

3.04 TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch.

B. Maximum Variation from Level: 1/16 inch.

C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.

D. Maintain dimensional tolerances and alignment with adjacent work.

3.05 ADJUSTING

A. Adjust door assembly for smooth operation and full contact with weatherstripping.

B. Have manufacturer's field representative present to confirm proper operation and identify adjustments to door assembly for specified operation.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION

SECTION 08 4313

ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with doors and vision glass.

B. Aluminum storefront in window openings.

C. Door hardware.

D. Perimeter sealant.

1.02 RELATED REQUIREMENTS

A. Section 07 9005 - Joint Sealers: Perimeter sealant and back-up materials.

B. Section 08 8000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site.

B. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems.

C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.

D. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.

E. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

G. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

H. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

I. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

J. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

K. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.

L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

1.04 PERFORMANCE REQUIREMENTS

A. Design and size components to withstand the following load requirements without damage or permanent set, when tested in accordance with ASTM E 330, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
   1. Design Wind Loads: Comply with requirements of ASCE 7.
   2. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.

B. Movement: Accommodate movement between storefront and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.

C. Air Infiltration: Limit air infiltration through assembly to 0.06 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E 283.

D. Water Leakage: None, when measured in accordance with ASTM E 331 with a test pressure difference of 2.86 lbf/sq ft.

E. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

F. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

D. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

E. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.07 PROJECT CONDITIONS

A. Coordinate the work with installation of Stud & Drywall partitions for interior applications and steel girts and metal panel systems at exterior conditions and components or materials.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum-Framed Storefronts:
   1. Kawneer North America; Tri-fab: www.kawneer.com/#sle.
   2. Oldcastle BuildingEnvelope; 3000 XT: www.oldcastlebe.com/#sle.

2.02 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Kawneer North America; Product Trifab VG 451T: www.kawneer.com.
   2. Oldcastle BuildingEnvelope; Product Series 3000 Thermal Multipane Storefront 2" x 4-1/2" / 1/4" : www.oldcastlebe.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront - Interior Installations: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Glazing Rabbet: For 1 inch insulating glazing. [At exterior locations].
   2. Glazing Rabbet: For 1/4 inch monolithic glazing.
   3. Glazing Position: Centered (front to back).
   4. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
   5. Design Wind Load: per (ICC) International Code Council requirements, positive and negative.
   6. Air Infiltration Test Pressure Differential: 1.57 psf.
   7. Finish: Class II color anodized.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
   8. Finish Color: Black.
   9. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   10. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   11. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   12. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
   13. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   14. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Performance Requirements
   1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
      a. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
   2. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.
   3. Air Infiltration: Limit air infiltration through assembly to 0.06 cu ft/min/sq ft of wall area, measured at specified differential pressure across assembly in accordance with ASTM E283.

2.04 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
   1. Glazing Stops: Flush.

B. Swing Doors: Glazed aluminum.

1. Thickness: 1-3/4 inches.
2. Top Rail: 3.5 inches wide.
3. Vertical Stiles: 3.5 inches wide.
4. Bottom Rail: 10 inches wide.
5. Glazing Stops: Square.
6. Finish: Same as storefront.

2.05 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Structural Steel Sections: ASTM A 36/A 36M; galvanized in accordance with requirements of ASTM A 123/A 123M. Provide Steel at all vertical mullions at arched top window units.

C. Fasteners: Stainless steel.

D. Concealed Flashings: 0.018 inch thick stainless steel.

E. Perimeter Sealant: As specified in Section 07900.

F. Glass: As specified in Section 08 8000.

G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

H. Glazing Accessories: See Section 08 8000.

I. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.06 HARDWARE

A. Other Door Hardware: Storefront manufacturer's standard type to suit application.
1. Finish on Hand-Contacted Items: Stainless.
2. For each door, include pivots, push handle, pull handle, exit device, and closer.

B. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

C. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors. ADA Compliant.

D. Pivots: Offset type; top, intermediate, and bottom.
1. Provide on doors as indicated.
2. Stainless finish.

E. Push/Pull Set: Standard configuration push/pull handles.
1. Provide Stainless.
2. Full width push bars on inside of all doors.
3. 12" pull bars on outside of all doors.

F. Door Closers: Exposed overhead.
1. Provide on doors as indicated.

G. Handle Latch: See door schedule on drawings.

H. Locks: Indicated locks and exit devices.
1. Provide on doors as indicated.

I. Coordinate front entry door with Card Reader device and provide electric strike.

2.07 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

E. Arrange fasteners and attachments to conceal from view.

F. Reinforce components internally for door hardware .

G. Reinforce framing members for imposed loads.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Install hardware using templates provided.

F. Install glass and infill panels using glazing method required to achieve performance criteria; see Section 08 8000.

G. Install perimeter sealant in accordance with Section 07 9005.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

B. Provide field testing of installed storefront system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.

1. Perform a minimum of two tests in each designated area as indicated on drawings.
2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.
    a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.

C. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

C. Remove excess sealant by method acceptable to sealant manufacturer.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for hollow steel doors.

B. Lock cylinders for doors for which hardware is specified in other sections.

C. Thresholds.

D. Weatherstripping, seals and door gaskets.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames.

1.03 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council.

B. BHMA A156.1 - American National Standard for Butts and Hinges.

C. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches.

D. BHMA A156.4 - American National Standard for Door Controls - Closers.

E. BHMA A156.6 - American National Standard for Architectural Door Trim.

F. BHMA A156.7 - American National Standard for Template Hinge Dimensions.

G. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders.

H. BHMA A156.18 - American National Standard for Materials and Finishes.

I. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association.

J. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products onto which door hardware will be installed.

B. Convey Owner's keying requirements to manufacturers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project.

C. Shop Drawings:
   1. Indicate locations and mounting heights of each type of hardware, schedules, catalog cuts, .

D. Hardware Schedule: Detailed listing of each item of hardware to be installed on each door. Use door numbering scheme as included in the Contract Documents. Identify electrically operated items and include power requirements.

E. Keying Schedule: Submit for approval of Owner.

F. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

G. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

H. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

2. Tools: One set of all special wrenches or tools applicable to each different or special hardware component, whether supplied by the hardware component manufacturer or not.

1.06 QUALITY ASSURANCE

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.08 COORDINATION

A. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.

B. Furnish templates for door and frame preparation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year warranty for door closers and Locksets.

1.10 MAINTENANCE PRODUCTS

A. Provide special wrenches and tools applicable to each different or special hardware component.

PART 2 PRODUCTS

2.01 SEE DRAWINGS FOR MANUFACTURES AND PRODUCTS.

2.02 DOOR HARDWARE - GENERAL

A. Provide all hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.

B. Provide all items of a single type of the same model by the same manufacturer.

C. Provide products that comply with the following:
   1. Applicable provisions of federal, state, and local codes.

D. Function: Lock and latch function numbers and descriptions of manufactures series as listed in hardware schedule.

E. Finishes: Identified in schedule.

F. Finishes: All door hardware the same finish unless otherwise indicated.
   1. Primary Finish: Satin chrome plated over nickel on brass or bronze, 626 (approx US26D).
   2. Finish Definitions: BHMA A156.18.
   3. Exceptions:
      a. Where base metal is specified to be different, provide finish that is an appearance equivalent according to BHMA A156.18.

G. Fasteners:
   1. Concrete and Masonry Substrates: Stainless steel machine screws and lead expansion shields.

2.03 HINGES

A. Hinges: Provide hinges on every swinging door.
   1. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
   2. Provide ball-bearing hinges at all doors having closers.
   3. Provide hinges in the quantities indicated.
   4. Provide non-removable pins on exterior outswinging doors.

2.04 LOCKS AND LATCHES

A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.
   1. Hardware Sets indicate locking functions required for each door.
   2. If no hardware set is indicated for a swinging door provide an office lockset.
   3. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.

4. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.

B. Lock Cylinders: Manufacturer's standard tumbler type, six-pin standard core.
   1. Provide cams and/or tailpieces as required for locking devices required.

C. Keying: Grand master keyed.

2.05 CYLINDRICAL LOCKSETS

A. Locking Functions: As defined in BHMA A156.2, and as follows:

B. Manufacturers - Cylindrical Locksets:
   1. Schlage: www.schlage.com.
      a. [D Series], Rhodes lever handles. (See Hardware Schedule on Drawings), this shall match existing building lever style.

2.06 ELECTRIC STRIKES

A. Electric Strikes: Complying with BHMA A156.31 and UL listed as a Burglary-Resistant Electric Door Strike; style to suit locks.

B. Manufacturers:
   1. Assa Abloy Folger Adam EDC, HES, or Securitron: www.assaabloydss.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.07 CLOSERS

A. Closers: Complying with BHMA A156.4.
   1. Provide surface-mounted, door-mounted closers unless otherwise indicated.
   2. Provide a door closer on every exterior door.
   3. At outswinging exterior doors, mount closer in inside of door.

B. Manufacturers - Closers:
   1. Assa Abloy Corbin Russwin, Norton, Rixson, Sargent, or Yale: www.assaabloydss.com.

2.08 STOPS AND HOLDERS

A. Stops: Complying with BHMA A156.8; provide a stop for every swinging door, unless otherwise indicated.
   1. Provide wall stops, unless otherwise indicated.
   2. If wall stops are not practical, due to configuration of room or furnishings, provide overhead stop.
   3. Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop unless specifically so stated.

B. Wall Stops:

C. Manufacturers - Overhead Holders/Stops:
   1. Assa Abloy Rixson or Sargent: www.assaabloydss.com.
   2. Glynn-Johnson: www.glynn-johnson.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.09 GASKETING AND THRESHOLDS

A. Gaskets: Complying with BHMA A156.22.
   1. On each exterior door, provide weatherstripping gaskets, unless otherwise indicated; top, sides, and meeting stiles of pairs.
      a. Where exterior door is also required to have fire or smoke rating, provide gaskets functioning as both smoke and weather seals.
   2. On each exterior door, provide door bottom sweep, unless otherwise indicated.

B. Thresholds:
   1. At each exterior door, provide a threshold unless otherwise indicated.
   2. Field cut threshold to frame for tight fit.

C. Fasteners At Exterior Locations: Non-corroding.

2.10 KEY CONTROLS

2.11 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS

A. Provide products that comply with the following:
   1. Applicable provisions of Federal, State, and local codes.
   2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
   3. Applicable provisions of NFPA 101, Life Safety Code.

B. Finishes: Identified in drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Mounting heights for hardware from finished floor to center line of hardware item:
   1. For steel doors and frames: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."

3.03 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 4000.

3.04 ADJUSTING

A. Adjust work under provisions of Section 01 7000.

B. Adjust hardware for smooth operation.

3.05 PROTECTION

A. Protect finished Work under provisions of Section 01 7000.

B. Do not permit adjacent work to damage hardware or finish.

3.06 SCHEDULE - SEE DRAWINGS

END OF SECTION

SECTION 08 8000

GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass.

1. Clear 1/4" thick, tempered glass on interior storefront, aluminum doors and wood doors and hollow metal door and sidelight applications.

2. Gray Tinted 1" insulating glass units.

B. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 9005 - Joint Sealers: Sealant and back-up material.

B. Section 08 4313 - Aluminum-Framed Storefronts: Glazing furnished by storefront manufacturer.

1.03 REFERENCE STANDARDS

A. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

C. ASTM C1036 - Standard Specification for Flat Glass.

D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.

E. ASTM C1193 - Standard Guide for Use of Joint Sealants.

F. ASTM E 773 - Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units.

G. ASTM E 774 - Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units.

H. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.

I. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.

J. GANA (SM) - GANA Sealant Manual.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

D. Samples: Submit one samples 12x12 inch in size of glass units.

E. Certificates: Certify that products meet or exceed specified requirements.

1.05 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Sealed Insulating Glass Units: Provide a five (5) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

PART 2 PRODUCTS

2.01 GLAZING TYPES

A. Type IG-1 - Sealed Insulating Glass Units: Vision glazing.
   1. Application(s): All exterior glazing unless otherwise indicated.
      a. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum. Where indicated at tempered areas.
         1) Tint: Gray.

         Outboard Lite: Annealed float glass, 1/4 inch thick, minimum. Where indicated at non-tempered areas.
         1) Tint: Gray.
      b. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum. Where indicated at tempered areas.
         1) Tint: Clear.
      c. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum. Where indicated at non-tempered areas.
         1) Tint: Clear
      d. Total Thickness: 1 inch.

B. Type S-1 - Single Interior Vision Glazing:
   1. Applications: Interior storefronts and sidelights and Interior Hollow Metal Doors & Frames.
   2. Type: Annealed float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch.

C. Type S-1 (T) - Single Safety Glazing: Non-fire-rated. Tempered (T)
   1. Applications: Provide this type of glazing in the following locations:
      a. Glazed lites in doors, except fire doors.
      b. Where required by code
      c. Glazed sidelights to doors, except in fire-rated walls and partitions.
      d. Other locations required by applicable federal, state, and local codes and regulations.
      e. Other locations indicated on the drawings.
   2. Type: Fully tempered float glass as specified.
   3. Thickness: 1/4 inch.

2.02 GLAZING ASSEMBLIES

A. Structural Design Criteria: Select type and thickness to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with 2021 IBC code.
   1. Use the procedure specified in ASTM E1300 to determine glass type and thickness.
   2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
   3. Thicknesses listed are minimum.

B. Air and Vapor Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier:
   1. In conjunction with vapor retarder and joint sealer materials described in other sections.
   2. To maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

2.03 GLASS MATERIALS

A. Float Glass Manufacturers:

1. Old Castle Envelope.
2. Substitutions: Refer to Section 01 6000 - Product Requirements.

B. Float Glass: All glazing is to be float glass unless otherwise indicated.
1. Annealed Type: ASTM C1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
2. Heat-Strengthened and Fully Tempered Types: ASTM C1048.
3. Tinted Types: Color and performance characteristics as indicated.
4. Thicknesses: As indicated; for exterior glazing comply with specified requirements for wind load design regardless of specified thickness.

2.04 SEALED INSULATING GLASS UNITS

A. Manufacturers:
1. Guardian Industries Corporation: www.guardian.com.
2. Interpane Glass Company: www.interpane.com.
3. Oldcastle BuildingEnvelope. www.obe.com.
4. PPG
5. Substitutions: Refer to Section 01 6000 - Product Requirements.

B. Sealed Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Edge Spacers: Aluminum, bent and soldered corners.
3. Edge Seal: Glass to elastomer with supplementary silicone sealant.
4. Purge interpane space with dry hermetic air.

C. Type D-1; Exterior Insulated Glass Units : Double pane with glass to elastomer edge seal.
1. Outer pane of grey tinted and tempered glass, inner pane of clear and tempered glass.
2. Outer pane of Blue, tinted and tempered] glass, inner pane of [clear and tempered] glass.
3. Durability: Certified by an independent testing agency to comply with ASTM E 2190.
4. Comply with ASTM E 774 and E 773, Class CBA.
5. Purge interpane space with dry hermetic air.
6. Total unit thickness of 1 inch minimum.
7. Solargray Glass
   a. Control solar heat gain and glare.
   b. Visible light transmittance of 40%.
   c. 1" insulating glass unit with clear interior light.
   d. Solar Heat Gain Coefficient (SHGC) of 0.45.
   e. Reduces ultraviolet energy transmittance,
   f. Allows 20% of the UV energy to pass through.

2.05 GLAZING COMPOUNDS

A. Manufacturers:
1. GE Plastics: www.geplastics.com.
2. Pecora Corporation: www.pecora.com.
3. Substitutions: Refer to Section 01 6000 - Product Requirements.

2.06 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C 864 Option I. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.

D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option I; Black color.

E. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant.

D. Install sealants in accordance with ASTM C1193 and GANA Sealant Manual.

E. Install sealant in accordance with manufacturer's instructions.

3.03 INSTALLATION - EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)

A. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

B. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

C. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.04 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

3.05 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION

SECTION 09 2116

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Metal channel ceiling framing.

D. Acoustic insulation.

E. Gypsum wallboard.

F. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Structural steel stud framing.

B. Section 07 2100 - Thermal Insulation: Acoustic insulation.

C. Section 07 9005 - Joint Sealers: Acoustic sealant.

1.03 REFERENCE STANDARDS

A. AISI S220 - North American Standard for Cold-Formed Steel Framing - Nonstructural Members.

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing.

C. AISI SG-971 - Specification for the Design of Cold-Formed Steel Structural Members.

D. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.

E. ASTM C 36/C 36M - Standard Specification for Gypsum Wallboard; 2001.

F. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

G. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

H. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

I. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.

J. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base.

K. ASTM C1396/C1396M - Standard Specification for Gypsum Board.

L. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

M. ASTM E413 - Classification for Rating Sound Insulation.

N. GA-216 - Application and Finishing of Gypsum Panel Products.

O. UL (FRD) - Fire Resistance Directory.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data:

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 5 years of experience.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Fire-Resistance-Rated Assemblies: Provide completed assemblies with the following characteristics:
   1. Fire-Resistance-Rated Partitions: UL listed assembly No. UL U419; 1 hour rating.
   2. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 METAL FRAMING MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.

B. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. Clarkwestern Dietrich Building Systems LLC; .: www.clarkdietrich.com. Basis of design.

C. Structural Steel Framing for Application of Gypsum Board: See Section 05 4000.

D. Nonstructural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
   1. Studs: C-shaped with knurled or embossed faces.
   2. Runners: U shaped, sized to match studs.
   3. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.

E. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. CertainTeed Corporation: www.certainteed.com.
   2. Georgia-Pacific Gypsum: www.gpgypsum.com.
   3. National Gypsum Company: www.nationalgypsum.com/#sle.
   4. USG Corporation: www.usg.com.

B. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
   1. Application: Vertical surfaces behind thinset tile, except in wet areas.
   2. Regular Board Thickness: 5/8 inch.
   3. Edges: Tapered.

C. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Ceilings, unless otherwise indicated.
   2. Thickness: 5/8 inch.
   3. Edges: Tapered.
   4. Products:
      a. CertainTeed Corporation; ProRoc Interior Ceiling.
      b. National Gypsum Company; High Strength Brand Ceiling Board.
      c. USG Corporation; Sheetrock Brand Sag-Resistant Interior Gypsum Ceiling Board.
      d. Substitutions: See Section 01 6000 - Product Requirements.

D. Gypsum Wallboard: ASTM C 1396/C 1396M. Sizes to minimize joints in place; ends square cut.

1. Thickness: 5/8 inch.
2. Edges: Tapered and featured.

2.04 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: indicated on drawings inch.

B. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.

C. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
   1. Corner Beads: Low profile, for 90 degree outside corners.
      a. Products:
         1) Phillips Manufacturing Co; Everlast Corner Bead: www.phillipsmfg.com/#sle.
         2) Trim-Tex, Inc; .: www.trim-tex.com/#sle.
   2. Expansion Joints:
      a. Type: V-shaped PVC with tear away fins.
      b. Products:
         1) Phillips Manufacturing Co; 093 Expansion Control Joint: www.phillipsmfg.com/#sle.
         2) Trim-Tex, Inc; .: www.trim-tex.com/#sle.

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

E. Screws: ASTM C 1002; self-piercing tapping type.

F. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.03 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

D. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.05 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:

1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
2. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
3. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

3.06 FINISH LEVEL SCHEDULE

A. Level 1: Above finished ceilings concealed from view.

B. Level 4: Walls and ceilings scheduled to receive flat or eggshell paint finish.

END OF SECTION

SECTION 09 3000
TILE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor and wall base applications.

B. Tile for wall applications.

C. Tile for shower receptors.

D. Cementitious backer board as tile substrate.

1.02 RELATED REQUIREMENTS

A. Section 07 9005 - Joint Sealers.

1.03 REFERENCE STANDARDS

A. ANSI A108 Series/A118 Series/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).
   1. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship.
   2. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework.
   3. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units.
   4. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar.
   5. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs.
   6. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units.
   7. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation.

B. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation.

C. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate setting details.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers: All products by the same manufacturer.
   1. Floridatile.

B. Porcelain Tile: ANSI A137.1, standard grade.
   1. Color(s): As indicated on drawings.
   2. Trim Units: Matching bullnose, cove base, and cove shapes in sizes coordinated with field tile.

C. Unglazed Floor and Base Tile : ANSI A137.1
   1. Aventis HDP manufactured by Floridatile .
   2. Size and Shape: See drawings.
   3. Edges: Cushioned.
   4. Surface Finish: Unglazed.
   5. Colors: See drawings.

2.02 TRIM AND ACCESSORIES

2.03 MORTAR MATERIALS

A. Manufacturers:
   1. Mapei; Product Ultraflex 3.

B. Mortar Bed Materials: Portland cement, sand, latex additive and water.
   1. Ultraflex 3 is a premium-grade, singlecomponent, high-performance, polymermodified thin-set mortar for interior and exterior
   2. High content of a unique dry polymer, for superior adhesion to the substrate and tile.
   3. Ultraflex 3 to meet or exceeds ansi a118.4 and ansi a118.11 when mixed with water.

2.04 GROUTS

A. Manufacturers:
   1. ARDEX Engineered Cements: www.ardexamericas.com.

2.05 ACCESSORY MATERIALS

A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
   1. Type: Fluid-applied.
   2. Thickness: 20 mils, maximum.
   3. Crack Resistance: No failure at 1/8 inch gap, minimum.
   4. Fluid or Trowel Applied Type:
      a. Material: Synthetic rubber or Acrylic.
      b. Thickness: 20 mils, maximum.
      c. Products:
         1) H.B. Fuller Construction Products, Inc; TEC HydraFlex Waterproofing Crack Isolation Membrane: www.tecspecialty.com/#sle.
         2) Sika Corp; SikaTile 200 Fracture Guard Rapid: www.sika.com/#sle.

B. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
   1. Crack Resistance: No failure at 1/16 inch gap, minimum; comply with ANSI A118.12.
   2. Fluid or Trowel Applied Type:
      a. Material: Synthetic rubber or Acrylic.
      b. Thickness: 25 mils, minimum, dry film thickness.
      c. Products:
         1) ARDEX Engineered Cements; ARDEX 8+9: www.ardexamericas.com/#sle.
         2) H.B. Fuller Construction Products, Inc; TEC HydraFlex Waterproofing Crack Isolation Membrane: www.tecspecialty.com/#sle.
         3) Sika Corp; SikaTile 100 Moisture Guard: www.sika.com/#sle.

C. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 7/16 inch thick; 2 inch wide coated glass fiber tape for joints and corners.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

3.03 INSTALLATION - GENERAL

A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Sound tile after setting. Replace hollow sounding units.

G. Keep control and expansion joints free of mortar, grout, and adhesive.

H. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

J. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

L. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with The Tile Council of North America Handbook Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.

3.05 INSTALLATION - SHOWERS AND BATHTUB WALLS

A. At tiled shower receptors install in accordance with TCNA (HB) Method B415, mortar bed floor, and W244, thin-set over cementitious backer unit walls.

B. Grout with standard grout as specified above.

3.06 INSTALLATION - WALL TILE

A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244, using membrane at toilet rooms.

B. Over gypsum wallboard on wood or metal studs install in accordance with The Tile Council of North America Handbook Method W243, thin-set with dry-set or latex-portland cement bond coat, unless otherwise indicated.

3.07 CLEANING

A. Clean tile and grout surfaces.

3.08 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 5100

ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 07 2100 - Thermal Insulation: Acoustical insulation.

B. Section 21 1300 - Fire-Suppression Sprinkler Systems: Sprinkler heads in ceiling system.

C. Section 26 5100 - Interior Lighting: Light fixtures in ceiling system.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Samples: Submit One sample 6" by 6" inch in size illustrating material and finish of acoustical units.

C. Samples: Submit One sample each, 10 inches long, of suspension system main runner, cross runner, and perimeter molding.

1.05 FIELD CONDITIONS

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

B. Provide 5 percent of total acoustical unit area of each type of acoustical unit for Owner use in maintenance of project.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrong.com.
   2. Certainteed Architectural: www.certainteed.com/ceilings-and-walls.
   3. USG Corporation: www.usg.com/ceilings.
   4. Substitutions: Not permitted.

B. Suspension Systems:
   1. Same as for acoustical units.
   2. Armstrong World Industries, Inc: www.armstrong.com.
   3. Certainteed Architectural; Basis of Design: 15/16" EZ Stab Classic System: www.certainteed.com/ceilings-and-walls.
   4. USG: www.usg.com.
   5. Substitutions: Not permitted.

2.02 ACOUSTICAL UNITS

A. Manufacturers:
   1. Armstrong World Industries, Inc: www.armstrong.com.
   2. CertainTeed Corporation: www.certainteed.com.
   3. USG: www.usg.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Acoustical Tile Type LACP-2: LAB ROOM with the following characteristics:
   1. Size: 24 x 24 inches.
   2. Thickness: 3/4 inches.
   3. Composition: mineral fiber.
   4. Light Reflectance: LR 0.79.
   5. NRC: 0.70 , determined as specified in ASTM E1264.
   6. Ceiling Attenuation Class (CAC): min. 38, determined in accordance with ASTM E1264.
   7. Edge: Square.
   8. Surface Color: White.
   9. Surface burning Charachteristics: Class A. (Flame Spread 25 or under) UL Labeled.
   10. Suspension System: Concealed grid Type EZ Stab Classic System15/16" with standard "L" shaped moulding at walls..
   11. Products:
      a. Basis of Design:Certainteed Symphony m 70 Rx.

C. Acoustical Tile Type LACP -1: Painted faced mineral fiber with the following characteristics:
   1. Size: 24 by 24 inches.
   2. Thickness: 3/4 inches.
   3. Composition: Mineral Fiber.
   4. Light Reflectance: LR 0.83 percent, determined in accordance with ASTM E1264.
   5. NRC Range: 0.60., determined in accordance with ASTM E1264.
   6. Edge: Reveal.
   7. Surface Color: White.
   8. Suspension System: Concealed grid Type 15/16".
   9. Surface Burning Characteristics: Class A [under 25 flame spread]. UL Labeled.
   10. Products:
      a. Basis of Design: Certainteed Cashmere.

2.03 SUSPENSION SYSTEMS

A. Manufacturers:
   1. Armstrong World Industries, Inc: www.armstrong.com.
   2. Chicago Metallic Corporation: www.chicagometallic.com.
   3. USG: www.usg.com.
   4. Certainteed: 15/16" EZ Stab Classic System: www.certainteed.com
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold-down clips, stabilizer bars, clips, and splices as required.

C. ExposedSteel Suspension System: Formed steel, commercial quality cold rolled; Intermediate-duty; heavy-duty.
   1. Profile: Tee; 15/16 inch wide face.
   2. Finish: White painted.
   3. Products:

      a. Standard "L" Profile perimeter wall mouding, at LACP-1 and 2..
         1) Cut miter Corners.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Perimeter Moldings: Same metal and finish as grid.
   1. At Exposed Grid: Provide L-shaped molding [and or reveal moulding where specified] for mounting at same elevation as face of grid.

D. Acoustical Sealant For Perimeter Moldings: Non-hardening, non-skinning, for use in conjunction with suspended ceiling system.

E. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C 636, ASTM E 580, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected plan.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.

E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

J. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Overlap and rivet corners.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units with pattern parallel to longest room axis.

D. Fit border trim neatly against abutting surfaces.

E. Install units after above-ceiling work is complete.

F. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

G. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.
   3. Double cut and field paint exposed reveal edges.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.05 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Clean surfaces.

C. Replace damaged or abraded components.

END OF SECTION

SECTION 09 6500

RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Verification Samples: Submit two samples, 12 by 12 inch in size illustrating color and pattern for each resilient flooring product specified.

D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience and approved by flooring manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Do not double stack pallets.

1.06 FIELD CONDITIONS

A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Luxury Vinyl Tile: LVT-1.
   1. Manufacturers:
      a. Bentley-Modern-Basis of Design
   2. Plank Tile Size: 9 by 48 inch.
   3. Total Thickness: 0.1969 inch or 5 mm
   4. Pattern / Color: [Mood].
   5. Color: Integrated 801994.

2.02 RESILIENT BASE

A. Resilient Base - RB-1 and RB-2: ASTM F1861, Type TS rubber, vulcanized thermosetStyle B, Cove; style as scheduled.
   1. Manufacturers:
      a. Johnsonite, a Tarkett Company; Rubber wall base (DC): www.johnsonite.com.
      b. Roppe Corp; TP 76193 1/8" TPR Rubber: www.roppe.com.

2. Height: 4 inch. (Provide 6" at areas indicated).
3. Thickness: 0.125 inch.
4. Finish: Satin.
5. Length: 4 foot sections.
6. Color: As indicated on drawings.
7. Accessories: Premolded external corners and internal corners.
8. Manufacturers:
    a. Johnsonite, Inc: www.johnsonite.com.
    b. Roppe Corp: www.roppe.com.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

C. Adhesive for Vinyl Flooring:
1. Manufacturers:
    a. TEC Specialty Products LLC; TEC Flexera High Tack Premium Universal Adhesive: www.tecspecialty.com/#sle.
    b. Loba-Wakol, LLC; WAKOL MS 552 Resilient and Rubber Flooring Adhesive: www.loba-wakol.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

C. Verify that concrete sub-floor surfaces are dry enough and ready for resilient flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F710; obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

B. Prohibit traffic until filler is fully cured.

C. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints and butt seams tightly.

E. Set flooring in place, press with heavy roller to attain full adhesion.

F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. Install plank tile with a random offset of at least 6 inches from adjacent rows.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

3.08 SCHEDULE

A. See finish schedule on drawings.

END OF SECTION

SECTION 09 6813

TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, loose laid with edges and control grid adhered.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

1.03 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.

B. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

D. Manufacturer's Installation Instructions: Indicate special procedures.

E. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bentley; Product See Room Finish Schedule in Drawings.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Tile CarpetingType CPT-1: Tufted Textured Tiped Sheared, manufactured in one color dye lot.
   1. Product: Rough Idea manufactured by Bentley.
   2. Tile Size: 24"x24" inch, nominal.
   3. Color: Shear 8RN24 (for bidding purposes. Verify final color with Architect).
   4. Pattern: Ashlar.
   5. 100% Solution Dyed.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Adhesives: Acceptable to carpet tile manufacturer, compatible with materials being adhered; maximum VOC of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

B. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

C. Vacuum clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Adhere carpet tile to substrate along centerline of rooms, at perimeter of rooms, where tiles are cut, and at 15 foot intervals throughout rooms. Lay remainder of tile dry over substrate.

F. Trim carpet tile neatly at walls and around interruptions.

G. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 9000

PAINTING AND COATING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Exposed surfaces of steel lintels and ledge angles.
   2. Exposed steel columns, beams, floor deck, bracing & misc. steel, stairs & rails..
   3. Pipe bollards and guardrails.
   4. Mechanical and Electrical:
      a. In finished areas, paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports,, and mechanical equipment, electrical equipment, and all gas piping, ductwork, sprinkler piping, unless otherwise indicated.
      b. Painter required to caulk all wall penetrations with DAP Dynaflex 230 Premium Elastic Sealant.

D. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   4. Floors, unless specifically so indicated.
   5. Glass.
   6. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 32 1723.13 - Pavement Markings: Painted pavement markings.

B. Section 05 5000 - Metal Fabrications: Shop-primed items.

1.03 DEFINITIONS

A. Conform to ASTM D 16 for interpretation of terms used in this section.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of all 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. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

D. Product Data: Provide data on all finishing products, including VOC content.

E. Samples: Submit two painted samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded. Submit on tempered hardboard, 12 x 12 inch in size.

F. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience.

1.06 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.

1.07 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. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. Sherwin-Williams Company: www.sherwin-williams.com.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
   1. Provide paints and coatings 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. Supply each coating material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: As follows unless other primer is required or recommended by manufacturer of top coats; where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Volatile Organic Compound (VOC) Content:
   1. Provide coatings that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.

2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint ME-OP-3A - Ferrous Metals, Unprimed, Alkyd, 2 Coat:
   1. Semi-gloss: Two coats of alkyd enamel; Benjamin Moore, self priming alkyd semigloss M24.

B. Paint ME-OP-2A - Ferrous Metals, Primed, Alkyd, 2 Coat:
   1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
   2. Semi-gloss: Sherwin Williams: Spot Prime: B66W00310-Pro Industrial Pro-Cryl Universal Acrylic Primer Off White plus (2) coats: B42W00111 - Metalatex Semi-Gloss Acrylic Coating.

C. Paint MgE-OP-3A - Galvanized Metals, Acrylic, 2 Coat:
   1. One coat galvanize primer.
   2. Semi-gloss: Two coats of alkyd enamel; Benjamin Moore, self priming alkyd semigloss M29.
   3. Apply at; 50 deg F. min. & 85% humidity max. and 100 deg F. max

D. Paint E-Pav - Pavement Marking Paint:
   1. White / Yellow: One coat, Glidden, Laytex Traffic Paint.

2.04 PAINT SYSTEMS - INTERIOR

A. Paint MgI-OP-3A - Galvanized Metals, Alkyd, 2 Coat:
   1. One coat galvanize primer.
   2. Semi-gloss: Two coats of acrylic enamel; Benjamin Moore M29 direct to metal acrylic semi gloss.

B. Paint GI-OP-3L - Gypsum Board/Plaster, Latex, 3 Coat:
   1. One coat of latex primer sealer.
   2. Gloss: Two coats of latex enamel; See schedule on drawings.
   3. Semi-gloss: Two coats of latex enamel; See schedule on drawings.
   4. Eggshell: For walls, and ceilings; two coats of latex enamel; See schedule on drawings.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.

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. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to coating 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 surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Surfaces: Correct defects and clean surfaces which affect work of this section.

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. Asphalt, Creosote, or Bituminous Surfaces to be Painted: Remove foreign particles to permit adhesion of finishing materials. Apply latex based sealer or primer.

H. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

I. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.

J. Shop-Primed Steel Surfaces to be Finish Painted: 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.

K. Metal Doors and frames to be Painted: Prime metal door top and bottom edge surfaces.

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 instructions.

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance.

E. Sand metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Paint exterior electrical panels to match adjacent masonry main field color (not accent stripes).

B. Paint exterior Gas Piping to match adjacent masonry main field color (not accent stripes) .

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 SCHEDULE - SURFACES TO BE FINISHED

A. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished unless specifically noted.
   2. Fire rating labels, equipment serial number and capacity labels.

B. Paint the surfaces described in PART 1 and in PART 2, Paint Systems Articles.

C. Mechanical and Electrical: Use paint systems defined for the substrates to be finished.
   1. Paint shop-primed items occurring in finished areas scheduled to be painted.

END OF SECTION

SECTION 10 2800

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Commercial shower and bath accessories.

C. Utility room accessories.

1.02 RELATED REQUIREMENTS

A. Section 06100: Concealed supports for accessories, including in wall framing and plates and above ceiling framing.

B. Section 09 3000 - Tile

C. Section 10 2113.16 - Plastic-Laminate-Clad Toilet Compartments.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Products listed are made by Bradley.

B. Toilet Accessories:
   1. American Specialties, Inc; .: www.americanspecialties.com.
   2. Bobrick Washroom Equipment, Inc.
   3. Bradley Corporation; .: www.bradleycorp.com.

C. Provide products of each category type by single manufacturer.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.

B. Keys: Provide two keys for each accessory to Owner.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

E. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

F. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES

A. See Schedule on Drawings for specified items.

2.05 COMMERCIAL SHOWER AND BATH ACCESSORIES

A. Shower Curtain Rod: Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for installation with exposed fasteners.

B. Shower Curtain:
   1. Material: Opaque vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
   2. Size: 36 by 72 inches, hemmed edges.
   3. Grommets: Stainless steel; pierced through top hem on 6 inch centers.
   4. Color: White.
   5. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.
   6. Products:
      a. See drawings for accessory schedule.
      b. Substitutions: Section 01 6000 - Product Requirements.

C. Folding Shower Seat: Wall-mounted surface; welded tubular seat frame, structural support members, hinges, and mechanical fasteners of Type 304 stainless steel, L-shaped, right hand seat.
   1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of color as selected.
   2. Seat: Closed-cell foam rubber with vinyl-coated fabric cover, with sealed seams, of color as selected.
   3. Size: ADA Standards compliant.
   4. Products:
      a. See drawings for accessory schedule.
      b. Substitutions: Section 01 6000 - Product Requirements.

2.06 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
   1. Hooks: Two, 0.06 inch stainless steel rag hooks at shelf front.
   2. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
   3. Product: B-239x34 manufactured by Bobrick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.04 SCHEDULE

A. See Schedule on Drawings for items in addition to these specified items.

END OF SECTION

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking.

B. Section 09 9123 - Interior Painting.

1.03 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers.

B. UL (DIR) - Online Certifications Directory.

1.04 PERFORMANCE REQUIREMENTS

A. Conform to NFPA 10.

B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

C. Product Data: Provide extinguisher operational features.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:

1. Activar Construction Products Group, Inc. - JL Industries; Cosmic Extinguisher - Multipurpose Chemical: www.activarcpg.com.
2. Ansul, a Tyco Business: www.ansul.com.
3. Kidde, a unit of United Technologies Corp: www.kidde.com.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Multi Purpose - Dry Chemical Type: Standard tank, with pressure gage, 10 pound.

2.03 FIRE EXTINGUISHER CABINETS

A. Style: Architectural.

B. Metal: Formed primed steel sheet; 0.036 inch thick base metal.

C. Cabinet Configuration: Fully Recessed and Semi-recessed type.

1. Exterior nominal dimensions of 9.5 inch wide by 24 inch high by 6 inch deep. To accomodate 10 LB ABC exitnguisher.
2. Trim: Flat square edgeLarson AL 2409 R3 "Vertical Duo Door", with standard inch wide face.

3. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.

D. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinge. Larsen's Vertical Duo, with lettering "fire extinguisher".

E. Door Glazing: Float glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.

F. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

G. Fabrication: Weld, fill, and grind components smooth.

H. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.

I. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure rigidly in place.

C. Place extinguishers on wall brackets.

3.02 SCHEDULES

A. Surface Mounted Units: Dry Chemical 10 pound, ABC extinguisher placed surface mounted at each location indicated on CODE and Floor plan.

END OF SECTION

SECTION 10 5113

METAL LOCKERS - ASI STORAGE SOLUTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Heavy-duty metal lockers.

B. Locker benches.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete base construction.

B. Section 06 1000 - Rough Carpentry: Wood blocking and nailers.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.

B. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's published data on locker construction, sizes, and accessories for each product used.
   1. Care and maintenance information.

C. Shop Drawings: Indicate locker plan layout, including minimum required dimensions for installation, elevations of each locker type and numbering pattern.

D. Samples: Two, 2 by 3 inches in size, indicating color and finish of locker material.

E. Manufacturer's qualification statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect locker finish and adjacent surfaces from damage.

B. Inspect lockers and benches upon receipt of delivery, and store in secure area until ready for assembly or installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ASI Storage Solutions, located at 2171 Liberty Hill Road, Eastanollee, GA 30538. Tel: 706-827-2700. Web: www.asi-storage.com.

B. ULINE:1-800-295-5510" Basis of Design

2.02 PERFORMANCE REQUIREMENTS

A. Accessibility: Comply with ICC A117.1 and ADA Standards, Accessibility Guidelines.

2.03 HEAVY-DUTY METAL LOCKERS

A. Gear Locker Type.
   1. Selectable Attributes:
      a. Locker Configuration: Single tier.
      b. Accessible Units: Lockers constructed to comply with referenced accessibility standards are indicated on drawings.
      c. Width: 24 inches.

d. Depth: 18 inches.
e. Enclosed Locker Height: 72 inches.
f. Color: Selected from manufacturer's standard colors. Selected color applied to interior and exterior metal components.

2. Innate Attributes:
   a. Locker Case Construction: Made of formed sheet steel; metal edges finished smooth without burrs.
      1) Locker Body Components: Formed and flanged from steel sheet of the following type and minimum thicknesses:
         (a) Steel Sheet: Commercial Steel (CS), Type B, supplied for exposed applications and complying with ASTM A1008/A1008M.
   b. Ventilation Type: Diamond perforated openings.
      1) Locker sides and doors less than 20 inches high include doors with diamond-shaped perforations 7/16 inch wide x 15/16 inch high.
      2) Locker doors and sides 20 inches or higher included diamond-shaped perforations 3/4 inch wide x 1-1/2 inches.
   c. Sheet Metal Thickness:
      1) Door Frame: 16 gauge.
         (a) Vertical door frame members: Include additional 3/8-inch flange to act as full-height door strike.
         (b) Horizontal frame members: Constructed of 16-gauge steel formed in a channel shape and securely welded to vertical frame members to ensure rigidity, including horizontal cross-frame members found on double- and triple-tier lockers.
      2) Door: 14 gauge minimum formed into channel shapes on both lock and hinge side with single-bend angle formations across top and bottom.
         (a) Include full-height hat channel welded to inner face of door for added rigidity and reinforcement.
      3) Back: 18 gauge, minimum.
      4) Side: 16 gauge, minimum.
      5) Top: 16 gauge, minimum.
      6) Shelf: 16 gauge, minimum.
      7) Bottom: 16 gauge, minimum.
   d. Door Latching: Single point.
   e. Hinges: 16-gauge continuous type riveted to both door and frame. Powder-coated to match exposed color.
   f. Handle: One piece, 20 gauge, stainless steel cup designed to accommodate padlocks.
   g. Latching Type: Positive, automatic-type locking device allowing locker door to be locked when open, then closed without unlocking.
   h. Locking Type: Hasps for combination locks provided by user.
   i. Number Plates: Polished aluminum number plate with black numerals 3/8 inch high. Attached to door with rivets.
   j. Accessories:
      1) Base: 6-inch legs.
      2) Top: Continuous sloped hoods.
      3) Trim: Filler panels, Finished end panels, and Recessed trim.
   k. Interior Equipment:
      1) Shelf: Included.
      2) Wall Hook: Three single-prong hooks.
      3) Ceiling Hook: One double-prong hook.
      4) Coat Rod: Included.

2.04 LOCKER BENCHES

A. Locker Benches: Free-standing type.

1. Accessibility: Comply with ICC A117.1 and ADA Standards.
2. Bench Top: Hardwood.
    a. Thickness: 1-1/4 inches.
    b. Bracket Spacing: 60 inches on center, maximum. Project-specific spacing to be determined based on field measurements.
3. Pedestal: Brushed stainless steel trapezoid.
4. Bench Back Bracket: 1/4-inch.
    a. Color: To match lockers.
5. Wall Mount Bench Bracket: 1/4-inch.
    a. Color: To match lockers.
6. Height: 17-1/2 inches.
7. Width: 9-1/2 inches.
8. Length: 72 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and field dimensions meet manufacturer's requirements before starting work, including 1/16-inch assembly growth per locker within a set of lockers.

B. Verify that prepared bases specified in Section 03 3000 are in correct position and configuration.

3.02 INSTALLATION

A. Install in accordance with manufacturer's written instructions.

B. Install lockers plumb and square.

C. Secure lockers with anchor devices to suit substrate materials.
    1. Minimum Pullout Force: 100 lb.

D. Bolt adjoining locker units together to provide rigid installation.

E. Install end panels, filler panels, sloped tops, and miscellaneous panels.

3.03 ADJUSTING

A. Adjust moving parts for smooth operation.
    1. Adjust doors and latches to operate without binding.
    2. Verify latches are operating properly.

3.04 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Clean interior and exterior surfaces of lockers.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 12 2400
WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Window shades and accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

B. Section 09 2116 - Gypsum Board Assemblies: Substrate for window shade systems.

C. Section 09 5100 - Acoustical Ceilings: Shade Pockets, pocket closures and accessories.

1.03 REFERENCE STANDARDS

A. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of all affected installers.

B. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken.
   2. Do not install shades until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
   1. Motorized Shades: Include power requirements and standard wiring diagrams.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details.

D. Selection Samples: Include fabric samples in full range of available colors and patterns.

E. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

F. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.08 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

A. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Shade Hardware: 25 years. Lifetime.
   2. Fabric: Lifetime.
   3. Aluminum and Steel Coatings: 25 years.Lifetime.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Interior Manually Operated Roller Shades:
   1. Meco Shade.www.mecoshade.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Shade Fabric:
   1. To be selected from MechoShade selections.

2.02 WINDOW SHADE APPLICATIONS

A. Interior Roller Shades: Sheer shades. at Office 105, 106 and 107.

B. Interior Roller Shades, Single shades at all other windows - glazed curtainwalls.
   1. Type: Roll down, closed position is at window sill.
   2. Color: As selected by Blakemore Architects from manufacturer’s full range of colors.
   3. Mounting: Inside (between jambs).
   4. Operation: Manual.

2.03 ROLLER SHADES

A. Roller Shades: Fabric roller shades complete with mounting brackets, roller tubes, hembars, hardware and accessories.
   1. MECHO SHADE: "Mecho/5" Manual Shade System.
      a. Chain-driven, commercial-grade Mecho/5, manual roller-shade solution. Complete hardware-and-shadecloth solution, 25-year, Lifetime Limited Warranty.
   2. Size: As indicated on drawings.
   3. "Thermoveil" Series Fabric, color as selected by the Architect.

B. Fabric: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
   1. Sheer Shades: Reduce glare yet still reveal considerable details to the outside; no privacy; Openness Factor greater than 1 percent.
   2. Blackout Shades: Block virtually all the light; Openness Factor equal to zero (0).
   3. Flammability: Pass NFPA 701 large and small tests.

C. Roller Tubes: As required for type of operation.

D. Hembars: Designed for weight requirements and adaptation to uneven surfaces, to maintain bottom of shade straight and flat.

E. Manual Operation for Interior Shades: Clutch operated continuous loop; beaded ball chain.

2.04 ACCESSORIES

A. Brackets and Mounting Hardware: As recommended by manufacturer for mounting configuration and span indicated.

B. Fasteners: Non-corrosive, and as recommended by shade manufacturer.

2.05 FABRICATION

A. Fabricate shades to fit openings within specified tolerances.
   1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window stool.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. If substrate preparation is the responsibility of another installer, notify Blakemore Architects of unsatisfactory preparation before proceeding.

C. Start of installation shall be considered acceptance of substrates.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Installation Tolerances:
   1. Maximum Offset From Level: 1/16 inch.

C. Adjust level, projection and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.03 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12 3600
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

1.02 RELATED REQUIREMENTS

A. Section 06 4100 - Architectural Wood Casework.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1.

D. ISFA 2-01 - Classification and Standards for Solid Surfacing Material.

E. PS 1 - Structural Plywood.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

F. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Flat Sheet Thickness: 1/2 inch, minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Manufacturers:
         1) Staron.

2) Substitutions: Not permitted.
b. Finish on Exposed Surfaces: Semi-gloss, gloss rating of 25 to 50.
c. Color and Pattern: As indicated on drawings.
3. Other Components Thickness: 1/2 inch, minimum.
4. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
5. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.

B. Stainless Steel Countertops: 1, Type 304, stainless steel sheet; 16 gauge, 0.0625 inch nominal sheet thickness.
1. Finish: 4B satin brushed finish.
2. Exposed Edge Shape: Straight turndown with return; 1-1/2 inch high face, 1/2 inch return to face of case; reinforced with hardwood or steel.
3. Back and End Splashes: Same material; welded 1/4 inch radius coved joint to countertop; square top edge with 1 inch wide top surface and minimum 1/2 inch turndown.
4. Splash Dimensions: 4 inch high by 1 inch thick, unless otherwise indicated.

2.02 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
1. Join lengths of tops using best method recommended by manufacturer.
2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
2. Height: 4 inches, unless otherwise indicated.

C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

D. Stainless Steel: Fabricate tops up to 144 inches long in one piece including nosings and back and end splashes; accurately fitted mechanical field joints in lengths over that dimension are permitted.
1. Weld joints; grind smooth and polish to match.
2. Provide stainless steel hat channel stiffeners, welded or soldered to underside, where indicated on drawings.
3. Provide wall clips for support of back/end splash turndowns.
4. Sound Deadening: Apply water resistant, fire resistant sound deadening mastic to entire bottom surface.

E. Wall-Mounted Counters: Provide brackets as indicated on drawings.

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 Blakemore Architects of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Attach stainless steel countertops using stainless steel fasteners and clips.

C. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 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 13 3419
METAL BUILDING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufacturer-engineered, shop-fabricated structural steel building frame.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications.

B. Section 07 9200 - Joint Sealants: Sealing joints between accessory components and wall system.

C. Section 08 1113 - Hollow Metal Doors and Frames.

D. Section 08 3613 - Sectional Doors.

E. Section 08 5113 - Aluminum Windows.

F. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

A. AISC 360 - Specification for Structural Steel Buildings.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

F. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

G. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

I. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

K. AWS D1.1/D1.1M - Structural Welding Code - Steel.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on profiles, component dimensions, fasteners.

C. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections; wall and roof system dimensions, panel layout, general construction details, anchors and methods of anchorage, and installation; framing anchor bolt settings, sizes, locations from datum, and foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.

D. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.

E. Designer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this type of work.
   1. Design Engineer Qualifications: Licensed in Illinois.
   2. Comply with applicable code for submission of design calculations as required for acquiring permits.
   3. Cooperate with regulatory agency or authorities having jurisdiction (AHJ), and provide data as requested.

B. Perform work in accordance with AISC 360.

C. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.

D. Erector Qualifications: Company specializing in performing the work of this section with minimum 5 years experience.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Buildings Systems:
   1. Chief Buildings: www.chiefbuildings.com.
   2. Kirby Building Systems, a Nucor Company: www.kirbybuildingsystems.com.
   3. Metallic Building Systems: www.metallic.com.
   4. VP Buildings: www.vp.com.
   5. American Buildings Company.
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ASSEMBLIES

A. Continuous beam frame.

B. Primary Framing: Rigid frame of rafter beams and columns, canopy beams, intermediate columns, braced end frames, and end wall columns, and wind bracing.

C. Secondary Framing: Purlins, Girts, and Clips, and other items detailed.

D. Wall System: Preformed metal panels of horizontal profile, with sub-girt framing/anchorage assembly, and accessory components.

E. Roof System: Preformed metal panels oriented parallel to slope, with sub-girt framing/anchorage assembly, insulation, and liner panels, and accessory components.

F. Roof Slope: 1/2 inches in 12 inches.

2.03 MATERIALS - FRAMING

A. Structural Steel Members: ASTM A36/A36M.

B. Structural Tubing: ASTM A500/A500M, Grade B cold-formed.

C. Plate or Bar Stock: ASTM A529/A529M, Grade 50.

D. Anchor Bolts: ASTM A307, Grade A, with no preference for protective coatings.

E. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1; galvanized to ASTM A153/A153M.

F. Welding Materials: Perform in accordance with AWS D1.1/D1.1M.

G. Primer: Standard Manufacturer's Primer .

2.04 MATERIALS - WALLS AND ROOF

A. Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Designation SS (structural steel), Grade 33 (230), with G90/Z275 coating. See drawings for panel types and colors.

B. Trim, Closure Pieces, Caps, Flashings, Gutters, Downspouts, Fascias and Infills: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

2.05 FABRICATION - FRAMING

A. Fabricate members in accordance with AISC 360 for plate, bar, tube, or rolled structural shapes.

B. Provide framing for Exterior wall openings for windows, HVAV Louvers, doors and overhead doors including full height door tracks openings.

C. Provide wall opening framing for doors, windows, and other accessory components.

2.06 FABRICATION - WALL AND ROOF PANELS

A. Siding: Minimum 24 Ga or 0.0239 inch metal thickness, AP profile indicated, 1 inch deep, lapped edges fitted with continuous gaskets.

B. Roofing: Minimum 24 Ga or 0.0239 inch metal thickness, MCS profile, lapped edges fitted with continuous gaskets. Galvalume (GM) color

C. Liner: Minimum 24 Ga inch metal thickness, flat profile indicated, lapped V edges fitted with continuous gaskets.

D. Girts/Purlins: Rolled formed structural shape to receive siding, roofing and liner sheet.

E. Internal and External Corners: Same material thickness and finish as adjacent material, profile brake formed to required angles. Back brace mitered internal corners with 24 GA or 0.0239 inch thick sheet.

F. Flashings, Closure Pieces, Fascia: Same material and finish as adjacent material, profile to suit system.

G. Fasteners: To maintain load requirements and weather tight installation, same finish as cladding, non-corrosive type.

2.07 FABRICATION - GUTTERS AND DOWNSPOUTS

A. Form gutters and downspouts of manufacture standard profile and size to collect and remove water. Fabricate with connection pieces.

B. Form sections in maximum possible lengths. Hem exposed edges. Allow for expansion at joints.

2.08 FINISHES

A. Framing Members: Clean, prepare, and shop prime. Do not prime surfaces to be field welded.

B. Exterior Surfaces of Wall Components and Accessories: Precoated enamel on steel of modified silicone finish, Two colors as selected from manufacturer's standard range.

C. Interior Surfaces of Wall Components and Accessories: Precoated enamel on steel of modified silicone finish, White color.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position

3.02 ERECTION - FRAMING

A. Erect framing in accordance with AISC 360.

B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated.

C. Set column base plates with non-shrink grout to achieve full plate bearing.

D. Do not field cut or alter structural members without approval.

E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.03 ERECTION - WALL AND ROOF PANELS

A. Install in accordance with manufacturer's instructions.

B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

C. Fasten cladding system to structural supports, aligned level and plumb.

D. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.

E. Provide expansion joints where indicated.

F. Use concealed fasteners.

G. Install sealant and gaskets, providing weather tight installation.

3.04 ERECTION - GUTTERS AND DOWNSPOUTS

A. Rigidly support and secure components. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.

B. Slope gutters minimum 1/8 inch/ft.

C. Connect downspouts to storm sewer system.

3.05 TOLERANCES

A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.

B. Siding and Roofing: 1/8 inch from true position.

END OF SECTION

SECTION 31 1000
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing and protection of vegetation.

B. Removal of existing debris.

C. Removal of asphalt and concrete paving.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

C. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.

D. Section 31 22 00 - Grading: Topsoil removal.

E. Section 31 23 23 - Fill and Backfill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SITE CLEARING

A. Comply with other requirements specified in Section 01 70 00.

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.

3.02 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.

3.03 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 begin clearing until vegetation to be relocated has been removed.

C. Do not remove or damage vegetation beyond the limits indicated on drawings.

D. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
   1. At vegetation removal limits.

E. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

F. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
   1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
   2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
   3. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.

4. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
5. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.

G. 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.

3.04 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 31 2316
EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for footings and slabs-on-grade.

B. Trenching for utilities outside the building to utility main connections.

C. Contractor shall arrange for relocation and removal of designated utility lines.

D. Contractor shall arrange for Surveyor to lay out the building.

1.02 RELATED REQUIREMENTS

A. Document 00 31 13: Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 01 70 00 - Execution and Closeout Requirements: General requirements for dewatering of excavations and water control.

C. Section 31 23 23 - Fill and Backfill: Fill materials, filling, and compacting.

1.03 PROJECT CONDITIONS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Protect utilities that remain and protect from damage.

3.02 EXCAVATING

A. Excavate to accommodate new structures and construction operations.

B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

D. Do not interfere with 45 degree bearing splay of foundations.

E. Cut utility trenches wide enough to allow inspection of installed utilities.

F. Hand trim excavations. Remove loose matter.

G. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.

H. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 23 23.

I. Grade top perimeter of excavation to prevent surface water from draining into excavation.

J. Remove excavated material that is unsuitable for re-use from site.

K. Remove excess excavated material from site.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

3.04 PROTECTION

A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

SECTION 31 2323

FILL AND BACKFILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade, footings, slabs-on-grade, and paving.

B. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Document 00 31 13: Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 01 40 00 - Quality Control: Testing required by this Section to be by Contractor.

1.03 REFERENCE STANDARDS

A. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

1.04 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill - Type A: Crushed stone, crushed gravel or crushed concrete; washed, free of clay, shale, organic matter.

SIEVE SIZE	PERCENT PASSING
6 INCH (150 MM)	100
3 INCH (75 MM)	85 TO 100
1-1/2 INCH (37.5 MM)	50 TO 85
3/4 INCH (19 MM)	30 TO 80
NO. 4 (4.75MM)	25 TO 40
NO. 40 (425 UM)	5 TO 20
NO. 100 (150 UM)	2 TO 5
NO. 200 (75 UM)	2

A. Structural Fill - Type B: Crushed stone, crushed gravel or crushed concrete; washed, free of clay, shale, organic matter (I DOT).

SIEVE SIZE PERCENT PASSING	
3 INCH (75 MM)	90 TO 100
1-1/2 INCH (37.5 MM)	60 TO 85
3/4 INCH (19 MM)	40 TO 65
NO. 4 (4.75MM)	15 TO 40
NO. 10 (2 MM)	10 TO 30
NO. 40 (425 UM)	5 TO 20
NO. 200 (75 UM)	2 TO 12

A. Coarse Pavement Fill - Type C: Crushed stone, crushed gravel or crushed concrete; washed, free of clay, shale, organic matter (I DOT).

SIEVE SIZE	PERCENT PASSING
1-1/4 INCH (31.5 MM)	95 TO 100
3/4 INCH (19 MM)	70 TO 93
3/8 INCH (9.5 MM)	42 TO 80
NO. 4 (4.75MM)	25 TO 63
NO. 10 (2 MM)	16 TO 48
NO. 40 (425 UM)	8 TO 28
NO. 200 (75 UM)	2 TO 12*
	*4 TO 10 IF >= CRUSHED GRAVEL

A. Fine Pavement Fill - Type D: Crushed stone, crushed gravel or crushed concrete; washed, free of clay, shale, organic matter (WI DOT 310.).

SIEVE SIZE	PERCENT PASSING
1 INCH (25 MM)	90 TO 100
3/8 INCH (9.5 MM)	45 TO 65
NO. 4 (4.75MM)	15 TO 45
NO. 10 (2 MM)	0 TO 20
NO. 40 (425 UM)	0 TO 10
NO. 200 (75 UM)	0 TO 5

A. Drainage Fill - Type E: Crushed stone, crushed gravel or crushed concrete; washed, free of clay, shale, organic matter (I DOT).

SIEVE SIZEPERCENT PASSING	
1 INCH (25 MM)	100
3/4 INCH (19 MM)	95 TO 100
3/8 INCH (9.5 MM)	50 TO 90
NO. 4 (4.75MM)	35 TO 70
NO. 10 (2 MM)	15 TO 55
NO. 40 (425 UM)	10 TO 35
NO. 200 (75 UM)	5 TO 15*
	*8 TO 15 IF >= CRUSHED GRAVEL

A. Pipe Bedding Fill - Type F: Washed gravel conforming with the following:

SIEVE SIZEPERCENT PASSING	
3/4 INCH (19 MM)	80 TO 100
3/8 INCH (9.5 MM)	30 TO 90
NO. 4 (4.75MM)	20 TO 30
NO. 10 (2 MM)	10 TO 20
NO. 40 (425 UM)	8 TO 10

A. General Fill - Fill Type G: Subsoil excavated on-site.
   1. Site-graded, free of lumps larger than 3 inches, rocks larger than 6 inches, organic material, and debris.
   2. Comply with ASTM D2487 Classification SW, SP, or SM

B. Sand - Fill - Type H: ASTM C136, Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.

SIEVE SIZE	**PERCENT PASSING**
NO. 4 (4.75MM)	**100**
NO. 14 (1.4 MM)	**10 TO 100**
NO. 50 (300 UM)	**5 TO 90**
NO. 100 (150 UM)	**4 TO 30**
NO. 200 (75 UM)	**0**

2.02 ACCESSORIES

A. Geotextile Fabric: Non-biodegradable, woven, ; Geotex 200ST manufactured by Propex Geosynthetics, Inc., or approved equal.

B. Stabilization Fabric: Type SAS (Subgrade Aggregate Separation), Subsection 645.2.2 of the Illinois DOT State Specifications, meeting the following criteria:
   1. Test Minimum Requirements
   2. Grab Tensile Strength, ASTM D4632:170 lbs
   3. Puncture Strength, ASTM D4833:70 lbs
   4. Minimum Permittivity, ASTM D4491:0.35 1/s
   5. Apparent Opening Size, ASTM D4751:No. 70 (212 um)
   6. Acceptable Manufacturer and Product:
      a. TenCate Mirafi; Filterweave 700
      b. Propex Fibers Co.; No. 2019
      c. Niles Inc.; NW70
      d. Substitutions: Permitted under Section 01600.

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 31 22 00 for additional requirements.

D. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

3.02 PREPARATION

A. Scarify and proof roll 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 general fill.

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 8 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: Use structural fill Type A or Concrete for Fill, flush to required elevation, compacted to 100 percent of maximum dry density.
   2. Other areas: Use general fill Type G, flush to required elevation, compacted to minimum 95 percent of maximum dry density.

J. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under slabs-on-grade and similar construction: 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.

3.04 FILL AT SPECIFIC LOCATIONS

A. Place fill types at the following locations unless otherwise noted.

B. Structural Fill under footings :
   1. Use Fill Type B - Structural Fill.
   2. Maximum depth per lift: 8 inches, compacted.
   3. Compact to minimum 95 percent of maximum dry density.
   4. Lean Mix Concrete provided under Section 03 30 00 if approved.

C. Pervious Structural Fill from above drainage fill and filter fabric to 6 inches from finish grade:
   1. Use Fill Type E.
   2. Maximum depth per lift: 6 inches, compacted.
   3. Compact to minimum 95 percent of maximum dry density.

D. Under Interior Slabs-On-Grade:
   1. Use Fill Type D.
   2. Depth: 6 inches deep.
   3. Compact to 95 percent of maximum dry density.

E. At Foundation Walls and Footings:
   1. Use Fill Type E.
   2. Fill up to subgrade elevation.
   3. Maximum depth per lift: 12 inches, compacted.
   4. Compact each lift to 95 percent of maximum dry density.
   5. Do not backfill against unsupported foundation walls.
   6. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

F. Over Subdrainage Piping at Foundation Perimeter:
   1. Cover drainage fill with Fill Type E.
   2. Minimum Top and Bottom Coverage: 2 inches
   3. Fill up to 24 inches minimum of underside of slab.
   4. Compact to 95 percent of maximum dry density.

G. Over Buried Utility Piping, Conduits, and Duct Bank in Trenches and D:
   1. Bedding: Use Fill Type F.
   2. Cover with G.
   3. Fill up to subgrade elevation.

4. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

H. Inside Planter Boxes:
   1. Use granular fill, 4 inches deep.
   2. Cover with geotextile fabric.
   3. Cover with sand, 2 inches deep.
   4. Finish with topsoil, to within 2 inches of planter rim, lightly tamped.

I. At Lawn Areas:
   1. Use Type G.
   2. Fill up to 6 inches below finish grade elevations.
   3. Compact to 90 percent of maximum dry density.
   4. See Section 31 22 00 for topsoil placement.

J. At Planting Areas Other Than Lawns :
   1. Use Fill Type G.
   2. Fill up to 12 inches below finish grade elevations.
   3. Compact to 90 percent of maximum dry density.
   4. See Section 31 22 00 for topsoil placement.

3.05 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.06 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor").

C. If tests indicate work does not meet specified requirements, remove work, replace and retest.

D. Frequency of Tests: At each lift and for each 500 cubic yards of material, unless otherwise indicated.

E. Proof roll compacted fill at surfaces that will be under slabs-on-grade.

3.07 CLEANING

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Leave unused materials in a neat, compact stockpile.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 22 0503
PLUMBING PIPING

PART 1 GENERAL

1.01 WORK INCLUDES

A. Section includes piping, valves, fittings, and connections for the following piping systems:
   1. Sanitary Sewer.
   2. Domestic Water.

B. Testing, adjusting, and balancing of domestic hot and domestic tempered water circulating system. Coordinate with Test and Balancing Contractor and Sections 23 0593 and 23 0993 provided under separate cover.

1.02 RELATED WORK

A. Section 22 3400 – Plumbing Equipment.

B. Section 22 4000 – Plumbing Fixtures.

C. Section 22 4001 - Plumbing Specialties.

D. Section 22 0502 – Gages and Meters.

E. Section 23 0529 - Supports and Anchors.

F. Section 23 0553 - Mechanical Identification.

G. Section 22 0593 – Testing and Balancing.

H. Section 23 0701 - Piping Insulation.

I. Section 23 0993 – Sequence of Operations.

J. Section 26 0503 – Equipment Wiring.

K. Section 26 0526 – Grounding and Bonding.

1.03 REFERENCES

A. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800.

B. ASME B16.3 – Malleable Iron Threaded Fittings.

C. ASME B16.4 – Cast Iron Treaded Fittings Class 125 and 250.

D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

E. ASME B16.22 - Wrought Copper and Bronze Solder Joint Pressure Fittings.

F. ASME B16.23 – Cast Copper Alloy Solder Joint Drainage Fittings – DWV.

G. ASME B16.26 - Cast Bronze Fittings for Flared Copper Tubes.

H. ASME B31.1 – Power Piping.

I. ASME B31.9 - Building Service Piping.

J. ASME Sec IX – Welding and Brazing Qualifications.

K. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

L. ASTM A74 – Cast Iron Coil Pipe and Fittings.

M. ASTM B32 - Solder Metal.

N. ASTM B42 - Seamless Copper Pipe.

O. ASTM B88 - Seamless Copper Tube.

P. ASTM B306 - Copper Drainage Tube (DWV).

Q. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

R. ASTM E814 - Fire Tests of Through-Penetration Fire Stops.

S. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

T. ASTM F708 - Design and Installation of Rigid Pipe Hangers.

U. AWS A5.8 - Brazing Filler Metal.

V. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.

W. AWWA C110 - Ductile - Iron and Gray - Iron Fittings 3 in. through 48 in., for Water and Other Liquids.

X. AWWA C111 - Rubber-Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings.

Y. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

Z. AWWA C651 - Disinfecting Water Mains.

AA. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.

BB. CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems.

CC. MSS SP-58 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Materials, Design and Manufacturer.

DD. MSS SP-69 - Pipe Hangers and Supports - Selection and Application.

EE. MSS SP-70 – Cast Iron Gate Valves, Flanged and Threaded Ends.

FF. MSS SP-71 – Cast Iron Swing Check Valves, Flanged and Threaded Ends.

GG. MSS SP-80 – Bronze Gate, Globe, Angle, and Check Valve.

HH. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

II. MSS SP-110 Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

JJ. UL 1479 - Fire Tests of Through-Penetration Firestops.

KK. ASTM D-1784-11 – Standard Specifications for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 01 Specification Sections.

B. Product Data: Provide data on pipe materials; pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Manufacturer's Installation Instructions: Submit installation instructions for pumps, valves and accessories.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Contractor shall review all shop drawings prior to submitting them for Architect/Engineer's review. Contractor shall stamp each shop drawing to certify that he has reviewed it. Engineer will not check any shop drawings that contractor has not stamped with his review certification.

Identify all products that are to be reviewed in the submittal documents. Provide a list of all items to be reviewed at the beginning of the submittal documentation. No obsolete submittal documentation shall be accepted.

F. Submit preliminary valve chart indicating naming/location conventions along with piping shop drawings for preliminary approval.

G. Piping Shop Drawings:

1. Submit 1/8-inch scale drawings for the piping systems, showing the pipe sizes, pipe material, location, elevations, invert elevations, slopes of horizontal runs, ejector basins, manholes, cleanouts, fittings, accessories, piping expansion devices, valves, meters, gauges, offsets, rises, drops, coordination amongst other trade contractors and connections.
2. Piping Shop drawings shall be prepared with building architectural layout in the back-ground.
3. REPRODUCTIONS OF THE CONTRACT DOCUMENTS BY ANY MEANS (ELECTRONIC, MAGNETIC STORAGE MEDIA, PHOTOGRAPHIC, ETC.) WILL NOT BE ACCEPTED FOR REVIEW.
4. CAD (Computer Aided Design) drawing files in AutoCAD Release 2010 *.DWG file format, will be made available to the Awarded Plumbing Contractor for a nominal processing fee of $250.00. This is to cover O'Higgins and Arnold LLC's administrative processing costs of making such files available to the Plumbing Contractor. The Contractor must agree to sign an indemnity waiver eliminating O'Higgins and Arnold LLC from any inaccuracies or harm caused by using these files. This service does not fall under the restrictions of Paragraph No. 3, above.
5. **CONTRACTOR SHALL REVIEW ALL SUBMITTALS PRIOR TO SUBMITTING THEM FOR THE ARCHITECT/ENGINEER'S REVIEW. CONTRACTOR SHALL STAMP EACH DRAWING AND EACH PIECE OF PRODUCT DATA TO CERTIFY THAT HE HAS REVIEWED IT. ARCHITECT/ENGINEER WILL NOT REVIEW ANY SUBMITTAL THAT CONTRACTOR HAS NOT STAMPED WITH HIS REVIEW CERTIFICATION. CONTRACTOR SHALL PROVIDE A LIST OF ITEMS SUBMITTED AT THE BEGINNING OF EACH SUBMTTAL. NO OLD OR OBSOLETE SUBMITTAL DOCUMENTATION WILL BE ACCEPTED.**
6. Submit preliminary valve chart indicating naming/location conventions along with piping shop drawings for preliminary approval.

1.05 PROJECT RECORD DOCUMENTS

A. Submit Project Record Documents under provisions of Division 01 General Requirements.

1. Specification Sections - Execution Requirements, Closeout procedures.

B. Project Record Documents: Record actual locations and sizes of piping, valves, equipment, cleanouts, backflow preventers, drains, wall hydrants etc. Submit final valve chart. Comply with Section 23 0553: Mechanical Identification and identification details on the drawings.

C. Operation and Maintenance Data: Submit spare parts list, exploded assembly views and recommended maintenance intervals.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division 1 General Requirements.

B. Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement parts numbers and availability and location and numbers of service depot.

C. Refer to Part 3. - EXECUTION of this section for Owner training requirements.

1.07 QUALITY ASSURANCE

A. Perform Work in accordance with State of Illinois Plumbing Code (2014). Maintain one copy on site.

1. Provide reports of inspections by State of Illinois Plumbing Inspectors in accordance with Division 1 General Requirements.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Conform to ASME SEC IX and applicable state labor regulations.

D. Welders Certification: In accordance with ASME SEC IX or ANSI/AWS D1.1

E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification and water pressure rating.

F. Maintain one copy of each document on site.

G. All products to comply with State of Illinois Plumbing Code Requirements.

H. Underwriters Laboratory (UL):

1. Products listed for 20/50 resistive construction.

1.08 REGULATORY REQUIREMENTS

A. Perform Work in accordance with State of Illinois Plumbing Code, 2014 Edition.

1.09 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five (5) years of documented experience.

B. Installer: Company specializing in performing Work of this section with minimum five (5) years documented experience.

1.10 PRE-INSTALLATION MEETING

A. Division 01 Specification Sections - Administrative Requirements, Pre-installation meetings.

B. Convene minimum one week prior to commencing Work of this section or as required by Construction Manager.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Division 01 Specification Sections - Product Requirements, Product storage and handling requirements.

B. Accept valves and equipment on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.12 ENVIRONMENTAL REQUIREMENTS

A. Division 01 Specification Sections - Product Requirements.

B. Do not install underground piping when bedding is wet or frozen.

1.13 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.14 WARRANTY

A. Division 01 Specification Sections - Execution Requirements: Product warranties and product bonds.

B. Provide three (3) year manufacturer warranty for domestic water piping.

PART 2 PRODUCTS

2.01 SANITARY SEWER AND VENT PIPING, BURIED

A. Cast Iron Pipe: ASTM A74 service weight.
   1. Fittings: Cast iron.
   2. Joints: Hub-and-spigot with ASTM C564 neoprene gaskets or lead and oakum.

B. Polyvinyl Chloride (PVC) Pipe: ASTM D2665, Schedule 40.
   1. Fittings: Schedule 40, PVC to match pipe.
   2. Joints: Solvent weld with colored primer.

2.02 SANITARY SEWER AND VENT PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, service weight.
   1. Fittings: Cast iron.
   2. Joints: Hub-and-Spigot, with ASTM C564, neoprene gasket system or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hub-less, service weight.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gaskets and stainless-steel clamp-and-shield assemblies.

C. Copper Tube: ASTM B306, DWV.
   1. Fittings: ASME B123, cast bronze, or ASME B129, wrought copper.
   2. Joints: ASTM B32, solder, Grade 50B.

D. Polyvinyl Chloride (PVC) Pipe: ASTM D2665, schedule 40 – Cannot be used in plenum ceilings
   1. Fittings: Schedule 40, PVC to match pipe.
   2. Joints: Solvent weld with colored primer.

2.03 WATER PIPING, BURIED

A. Pipe Sizes Under 3 Inches: Copper Tubing: ASTM B42, Type K, annealed.
   1. Fittings: ASME B16.18 cast copper alloy or ASME B16.22 wrought copper and bronze.
   2. Joints: AWS A5.8, BCuP silver braze.

B. Pipe Sizes 3 Inches & Larger: Ductile Iron Pipe: AWWA C151, Class 52 with AWWA C105 poly-ethylene encasement.
   1. Fittings: AWWA C110, Class 250 ductile iron, standard thickness.
   2. Joints: AWWA C111, Class 250 mechanical joints (MJ) with rubber gasket, retainer gland, bolts and ¾ inch diameter rods.

2.04 WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88, Type L, hard drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

2. Contractor may utilize mechanically formed tee and coupling.
3. Joints: ASTM B32, solder, Grade 95TA, or AWS 5.8, BCuP silver braze for mechanically formed tee connections.

B. Copper Tubing: ASTM B88, L, hard drawn.
1. Fittings: ASME B16.22, grooved wrought copper/
2. Joints: Rigid (0-deflection) grooved mechanical couplings with ASTM D-2000, Grade ‘E’ - EPDM gaskets approved for potable water service.
3. Flanges: Ductile iron grooved type with ANSI bolt pattern for Class 125 or Class 150 flanged components. Provide metal adapter inserts to accept rubber faced surfaces, and wafer/lug design valves.

2.05 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 3 inches and Under:
1. Ferrous pipe: Class 150 malleable iron threaded unions.
2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Pipe Size Over 3 inches:
1. Ferrous pipe: Class 150 forged steel slip-on flanges.
2. Copper tube and pipe: Rigid (0-deflection) Class 150 ductile iron mechanical couplings and flanges for copper piping. Gaskets, ASTM D-2000, Grade ‘E’ - EPDM gaskets approved for potable water service.

C. Pipe Size Over 1 inch:
1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

D. Grooved and Shouldered Pipe End Couplings, to be used on Ferrous pipe 3-inches and over only:
1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
2. Sealing gasket: "C" shape composition sealing- gasket.

E. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.06 PIPE HANGERS AND SUPPORTS

A. Refer to Section 23 0529: Pipe Hangers & Supports.

2.07 GATE VALVES (GV) – ALL VALVES SHALL BE LEAD FREE

A. Manufacturers - (2-1/2 Inches and Larger):
1. Hammond Valve - Model IR-1140.
2. Milwaukee Valve - Model F-2885-M.
3. Nibco Valve – Model F-617-0
4. Stockham - Model G-623.
5. Kitz Corporation – Model 72.
6. Substitutions: Not Permitted.

B. Construction:
   1. MSS SP-70, Class 150, 200 PSI WOG, iron body, bronze trim, outside screw and yoke, hand wheel, solid wedge disc, flanged ends.

2.08 BALL VALVES (BV) – ALL VALVES SHALL BE LEAD FREE

A. Manufacturers (Up to and including 2 Inches):
   1. Hammond Valve - Model UP8513 Lead Free.
   2. Milwaukee Valve - Model UPBA-150S Lead Free.
   3. Nibco Valve - Model S-585-70-66-LF Lead Free.
   4. Kitz Corporation – Model 669 Lead Free.
   5. Jomar – Model JP-100SSG Lead Free.
   6. Or Approved Equal.

B. Construction:
   1. MSS SP-110, Class 150, 600 PSI WOG, bronze, two-piece body, stainless steel ball, full port, Teflon seats and stuffing box ring, blow-out proof stem, lever handle with soldered ends.

2.09 BALANCING FITTINGS (BF) – ALL BALANCE FITTINGS SHALL BE LEAD FREE

A. Up to and Including 2 Inches:
   1. Manufacturers:
      a. Armstrong Pump Co - Model CBV-Lead Free.
      b. Bell & Gossett/ITT - Model CB – Lead Free.
      c. Flow Design, Inc. - Model Flowset-Lead Free.
      d. Or Approved Equal.

B. Construction: 150 psi WOG (minimum), bronze body with bronze disc calibrated and readable balance fittings with readout ports fitted with integral check valves to prevent loss of fluid when attaching monitoring kit.

C. Calibration: Integral pointer indicating degree of valve opening with positive shut-off and memory stop.

D. Accessories: Preformed polyurethane insulation.

2.10 SWING CHECK VALVE (CK) – ALL CHECK VALVES SHALL BE LEAD FREE

A. Up to and Including 2 Inches:
   1. Manufacturers:
      a. Hammond Valve.
      b. Milwaukee Valve.
      c. Nibco Valve.
      d. Stockham.
      e. Or Approved Equal.
   2. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder ends.
   3. Valve shall be lead free model.

2.11 SEALANTS: FIRE STOPPING SYSTEMS, WATER AND THERMAL SEALS

A. Manufacturers:
   1. Hilti – FS-ONE MAX High Performance.
   2. Dow Corning - Model Fire Stop.
   3. 3M Co. - Model Fire Barrier.
   4. Rectorseal – Flamesafe.
   5. Oatley Co.: Flame Barrier.
   6. Or Approved Equal.

B. General Purpose Fire Stopping Sealant: Water based, non-slumping, premixed sealant with intumescent properties, rated for 3 hours per ASTM E814 and UL 1479.

C. General Purpose Vibration Resistant Fire Stopping Sealant: Silicone based, non-slumping, premixed sealant with intumescent properties, vibration, and moisture resistant, rated for 3 hours per ASTM E814 and UL 1479.

D. Fire Seal:
   1. Seal Penetrations of fire-rated walls, floors, or ceilings at piping penetrations for compliance with NEC 300-21.
   2. Fill void around exterior of pipe between sleeve with fiberglass or other fire-proof material approved by Architect/Engineer.
   3. Sleeves: Schedule 40 steel pipe sleeve, anchored to building construction and finished plumb with wall, ceiling to floor line.
   4. Seal remaining void at each end of the pipe penetration through sleeve between pipe and sleeve with fire sealant compound. Seal flush with wall or partition.
   5. Provide chrome plated escutcheon plate at all exposed pipe penetrations.

E. Thermal Seal:
   1. Seal penetrations of thermally insulated equipment or rooms to prevent heat transfer.
   2. Fill void around exterior of raceway between sleeve with fiberglass or other material approved by Architect/Engineer.
   3. Seal interior of raceway with duct sealing compound at entry to equipment or room
   4. Provide chrome plated escutcheon plate at all exposed pipe penetrations.

F. Water Seal:
   1. Seal penetrations of perimeter walls or floor below grade to prevent entry of water; use materials compatible with wall or floor construction and approved by Architect/Engineer.
   2. Seal Penetrations of Room: Sealed with flashings compatible with roof design and approved by roofing system manufacturer and Architect/Engineer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01 Specification Sections - Administrative Requirements, Coordination, and project conditions.

B. Verify that excavations are to required grade, dry, and do not over-excavate.

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. Contractor to employ the services of a Ground Penetrating Radar Specialist to perform x-ray of areas requiring saw-cutting, prior to actual saw-cutting.

3.03 INSTALLATION

A. Install Work in accordance with State of Illinois Plumbing Code (2014).

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals (i.e., copper to steel/iron pipe or flange connections).

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom and to conserve ceiling space without interfering with use of spaces.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.

I. Install vent piping penetrating roofed areas to maintain integrity of roof assembly. Locate vents at a minimum of 15 Ft. away from air intake assemblies. Piping to extend min. 12” above roof.

J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

K. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.

L. Install bell and spigot pipe with bell end upstream.

M. Refer to Section 224001 - Plumbing Specialties for product requirements, placement, and size requirements for cleanouts.

N. Install valves with stems upright or horizontal, not inverted.

O. Install water piping to ASME B31.9.

P. Sleeve pipes passing through partitions, walls, and floors. Provide chrome plated escutcheon plates at all exposed pipe penetrations.

Q. Sizing:

1. Unless otherwise indicated, install all supply piping, including shut-off valves, strainers and accessory fixtures to pumps, fixtures, and other equipment at line size with reduction in size being made only at inlet to control valve, fixture or pump.

R. Install supply piping from outlet of control valve at full size connection to equipment served.

S. Make reduction in water pipes with eccentric reducing fittings installed to provide drainage and venting.

T. Branch Take-Offs:

1. Liquids: From top, bottom or side of mains or headers at either 45 degrees or 90 degrees from horizontal plane.
2. Do not project branch pipes inside main pipe.

U. Pipe Drainage Provision:
   1. Slope water piping 1 inch in 40 feet and arrange to drain at low points.

V. Underground Pipe:
   1. Lay in dry trenches maintained free of accumulated water.
   2. Provide and operate sufficient pumping equipment to maintain excavations, trenches and pits free of water.
   3. Dispose of pumped water so operation areas and other facilities are not flooded.
   4. Pipe laying follows excavating close as possible

W. Interior Sanitary Soil Waste and Vent:
   1. Connect underground sewers to site utilities at point 5 feet outside building walls.
   2. Pitch sewers and branches as follows, unless otherwise indicated on drawings.
      a. Pipe, 3 Inches and smaller: Minimum 1/4 inch per foot.
      b. Pipe, 4 Inches and larger: Minimum 1/8 inch per foot, but no less than 1%.
   3. Continuously bed underground or on-ground piping on minimum 3-inch compacted sand or gravel, with depressions for hubs.
   4. Compact backfilling for 6 inches, sides, and tops; and 3 inches under pipe to 95% proctor.
   5. Complete backfilling to existing grade or to elevation indicated on Drawings, compacted to 95% proctor.

X. Mechanically Formed Tee Connections:
   1. Mechanically extracted collars formed in continuous operation, consisting of drilling a pilot hole and drawing out tube surface to form a branch pipe collar having height of not less than a minimum of three (3) times the tube wall thickness.
      a. Collaring Device: Fully adjustable to ensure proper tolerance and complete uniformity of joint.
   2. Branch: Double notched to conform with inner curve of run tube and mechanically dimpled to ensure penetration of branch tube into collar is of sufficient depth for brazing and that branch tube does not obstruct flow in main tube run.
   3. All joints brazed in accordance with Copper Development Association Copper Tube Handbook using BCuP Series filler material.
      a. Soft soldered joints will not be permitted.

Y. Mechanically Formed Couplings:
   1. Form couplings be first annealing area at end of tube where expansion will occur.
      a. Insert tube expander to die size required and expand tube end to accept tubing of same size.
      b. Resulting joint is minimum three times as long as thickness of tube.
   2. All joints brazed in accordance with Copper Development Association Copper Tube Handbook using BCuP Series filler metal.

Z. Contractor to clean and flush all faucet aerators and strainers at final completion of project.

AA. Contractor to insulate all cold, hot, tempered, and all recirculation domestic water piping in accordance with Section 23 0701.

BB. Inserts:

1. Provide inserts for placement in concrete forms.
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 flush with top of slab.

CC. Pipe Hangers and Supports:

1. Install in accordance with ASTM B31.9 and MSS SP89. Refer to Section 23 0529: Supports and Anchors for additional requirements.
2. Support horizontal piping as schedule
3. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1½-inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every 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. Prime coat exposed steel hangers and supports. Refer to Painting Section.
9. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered expose
10. Provide hangers adjacent to motor driven equipment with vibration isolation.

DD. Install pre-charged water hammer arrestors complete with accessible isolation ball valve. Install air hammer arrestor; size in accordance with PDI WH-210 Water Hammer Arrestor Standards. Water hammer arrestors must be accessible. Provide access panels as required.

3.04 INTERFACE WITH OTHER PRODUCTS(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. Provide balance fittings in hot water recirculating systems where indicated.

D. Provide valve types as designated on plans for shut-off and to isolate equipment, part of systems, or vertical risers. All valves to be full line size of piping.

3.05 FIELD TOLERANCES

A. Division 01 Specification Sections - Quality Requirements: Tolerances.

B. Slope water piping minimum 0.25 percent and arrange to drain at low points.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Division 01 Specification Sections - Execution Requirements: Final cleaning.

B. Prior to starting work, verify system is complete, flushed, and clean.

C. Ensure pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

D. Inject disinfectant, free chlorine in liquid, powder and tablet or gas form, throughout system to obtain a residual from 50 to 80 mg/L.

E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

F. Maintain disinfectant in system for 24 hours.

G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

J. Chlorinate and disinfect to point of new connection. Examine site water valving configuration to determine extent of chlorination. Contact site contractor to verify.

K. Submit reports in accordance with Division 1 General Requirements.

3.07 PIPE TESTING

A. Before final acceptance of piping, test all systems scheduled and prove to be free of leaks.
   1. Perform tests under observation of Architect/Engineer.
   2. Remove, replace or satisfactorily repair defective work revealed by tests.
   3. Make piping repairs with new materials; caulking of screwed joints or pin holes not permit-ted.
   4. Underground systems tested before backfilling.
   5. Furnish test equipment and material for tests.
   6. Owner furnished water for testing and flushing.

B. Testing Medium:
   1. Hydrostatic Testing Medium: Clean pure water.
   2. Pressure Testing Gauges: ANSI B40.1; Grade AA; minimum 6-inch diameter dial with scale divisions equal or less than maximum allowable pressure drop.

C. Waste and Vent System Piping: Test with water and air before fixtures are set. TESTS SHALL TAKE PLACE PRIOR TO POURING CONCRETE FLOOR.
   1. After plumbing fixtures have been set and traps filled with water, subject entire waste and vent systems to final test with smoke or peppermint.

D. Water Test:
   1. Apply to drainage and vent system in accordance or in entirety.
   2. When entire system is tested, tightly close all openings in pipes except highest opening and fill system with water to overflow point.
   3. When system is tested in sections, tightly plug each opening except highest open, fill each section with water and test each section with minimum 10-foot head of water; test each preceding section until entire system has been tested with minimum 10-foot of water, except uppermost 10 feet of system.
   4. Keep water in system, or in portion under test, for minimum 30 minutes before inspection.
   5. System must be tight at all joints.

E. Air Test:

1. When tests are made with air, apply minimum 5 psi with force pump and maintain minimum 1 hour with no leakage apparent.
2. Use mercury-column gauge in making test.

F. Domestic Water System:

1. When rough-in is complete and before fixtures are set, test entire hot and cold-water piping systems as scheduled and prove tight.
2. Where portion of water piping system is concealed before completion, test that portion separately as specified for entire system.

G. Testing Requirements:

1. Hydrostatic tests apply to piping indicated in Schedule in Paragraph G. below.
2. Raise pressure gradually to given value; then block off source.
3. Allowable Pressure Drop: Maximum amount scheduled during corresponding minimum time interval.
4. Visually examine all joints during test.
5. Upon successful completion and test approval, relieve piping of pressure, drain, put into normal operation except for potable water to be sterilized before placing in service.

H. Hydrostatic Testing Schedule:

	Service	Normal Work Pres. psig	Hydrostatic Test Pressure psig	Air Test Pressure psig	Max. Pressure Drop psi	Min. Time Hours
1.	Domestic Water					
	Potable Water	To 125	175	-	2	2
2.	Sanitary	To 4.5	-	5	0	.25

END OF SECTION

SECTION 22 3400
PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDED

A. Domestic Gas Hot Water Heaters.

B. Expansion Tanks.

C. Circulator Pumps.

1.02 RELATED SECTIONS

A. Section 22 0503 - Plumbing Piping.

B. Section 22 4000 – Plumbing Fixtures.

C. Section 22 4001 – Plumbing Specialties.

D. Section 23 0529 - Anchors and Supports.

E. Section 23 0548 – Vibration Isolation.

F. Section 23 0553 - Mechanical Identification.

G. Section 23 0593 – Testing and Balancing.

H. Section 23 0701 - Piping Insulation.

I. Section 26 0523 - Equipment Wiring.

J. Section 26 0526 – Grounding and Bonding.

1.03 REFERENCES

A. IECC (International Energy Conservation Code) – 2021.

B. ASHRAE 90A - Energy Conservation in New Building Design.

C. ASME Section 8D - Pressure Vessels.

D. NFPA 54 - National Fuel Gas Code.

E. NFPA 70 – National Electric Code.

F. State of Illinois Plumbing Code.

1.04 SUBMITTALS

A. Submit under provisions of Division 01 Specification Sections.

B. Product Data:

1. Provide dimension drawings of water heaters, pumps, storage tanks, etc. indicating components and connections to other equipment and piping.
2. Indicate equipment's capacity, connection sizes and power requirements.
3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
4. Provide manufacturer piping diagrams for review and/or modification by the Engineer. Compensate other trades due to system deviations from equipment scheduled.
5. Provide electrical characteristics, connection requirements, and wiring diagrams.

C. Shop Drawings:

1. Indicate location and dimensions of saddles, manways, lining methods, anchors, attachments, lifting points, tappings, and drains.
2. **CONTRACTOR SHALL REVIEW ALL SUBMITTALS PRIOR TO SUBMITTING THEM FOR THE ARCHITECT/ENGINEER'S REVIEW. CONTRACTOR SHALL STAMP EACH DRAWING AND EACH PIECE OF PRODUCT DATA TO CERTIFY THAT HE HAS REVIEWED IT. ARCHITECT/ENGINEER WILL NOT REVIEW ANY SUBMITTAL THAT CONTRACTOR HAS NOT STAMPED WITH HIS REVIEW CERTIFICATION. CONTRACTOR SHALL PROVIDE A LIST OF ITEMS SUBMITTED AT THE BEGINNING**

OF EACH SUBMTTAL. NO OLD OR OBSOLETE SUBMITTAL DOCUMENTATION WILL BE ACCEPTED.

D. Submit manufacturer's installation instructions in accordance with Division 01 Specification Sections.

E. Submit manufacturer's certificate that pressure vessels meet or exceed specified requirements in accordance with Division 01 Specification Sections.

1.05 PROJECT RECORD DOCUMENTS

A. Submit project record documents under provisions of Division 01 Specification Sections.

B. Project Record Documents: Record actual locations of components and equipment.

C. Submit under provisions of Division 01 Specification Sections - Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

D. Submit under provisions of Division 01 Specification Sections - Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

E. Submit ASME certifications for all pressure vessels completed and registered in Owners name.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

B. Perform work in accordance with State of Illinois Plumbing Code.

C. Provide pumps with manufacturer's name, model number, and rating/capacity identified.

D. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:
   1. American Gas Association (AGA).
   2. National Sanitation Foundation (NSF).
   3. American Society of Mechanical Engineers (ASME).
   4. National Electrical Manufacturers' Association (NEMA).
   5. Underwriters Laboratories (UL).

E. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

F. Submit certification of start-up of systems by manufacturer’s authorized agent in accordance with Division 01 Specification Sections.

1.07 REGULATORY REQUIREMENTS

A. Conform to AGA and NFPA 54 requirements for water heaters.

B. Conform to ASME Section 8D for tanks.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.08 DELIVERY, STORAGE, AND PROTECTION

A. Transport, handle, store and protect products to site under provisions of Division 01 Specification Sections.

B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

C. Contractor shall store all materials shipped to the site in a protected area. If material is stored outside of the building, it must be stored off the ground a minimum of six inches set on 6 x 6 planks and/or wood pallets. All material must be completely covered with waterproof tarps or visqueen. All piping and duct openings will have the ends closed to keep out dirt and other debris. No equipment will be allowed to be stored on the site unless it is setting on wood planks and is completely protected with weatherproof covers.

1.09 WARRANTY

A. Submit under provisions of Division 01 Specification Sections.

B. Provide five-year manufacturer warranty against leakage for all ASME constructed domestic water tanks and expansion tanks.

C. Provide manufacturer's standard warranty on all other equipment.

PART 2 PRODUCTS

2.01 DOMESTIC GAS HOT WATER HEATERS

A. Acceptable Manufacturer:
   1. A.O. Smith.
   2. Or Approved Equal.

B. Water heaters shall be of ASME Construction and noted as such.

C. Direct spark ignition, low NOx, natural gas-fired fully modulating sealed combustion, direct vent, high efficiency (95% efficient) boiler, controls piping and valving, 160 psig maximum working pressure, stainless steel heat exchanger with steel jacket.

D. Brass water connections and dip tube, drain valve, high-density magnesium anode and ASME rated temperature / pressure relief and vacuum relief valves, integral condensate charcoal acid dilution basin.

E. Unit approved by AGA as automatic storage water heater and for operating at 180 degrees F.

F. Automatic water thermostat with temperature range adjustable from 120 to 180 degrees F., gas pressure regulator, burner, 100 percent safety shut-off pilot and thermocouple.

G. Vertical venting concentric vent kit – Manufacturer Recommended, through roof.

H. Refer to schedule on Drawings for sizes and capacities.

2.02 WATER HEATER ACCESSORIES

A. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS ¾ with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.

B. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/OESNA 90.1 or ASHRAE 90.2.

C. Heat-Trap Fittings: ASHRAE 90.2.

D. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

E. Pressure Relief Valves: ASME rated and stamped. Include pressure setting less than domestic-water heater working-pressure rating.

F. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.

G. Shock Absorbers: ASSE 1010 or PDI-WH 201, Size A water hammer arrester.

2.03 EXPANSION TANKS

A. Acceptable Manufacturers:
   1. Amtrol, Inc.
   2. Bell & Gossett/ITT.
   3. Wessells Co.
   4. Or Approved Equal.

B. Construction: Welded steel, tested and stamped in accordance with Section 8D of ASME Code; supplied with National Board Form U-1, rated for working pressure of 150 psig, with flexible EPDM diaphragm approved for potable water sealed into tank, and steel base.

C. Accessories: Air-charging fitting, tank drain; pre-charge to 55 psig.

D. Size: Refer to Schedule on drawings.

2.04 IN-LINE CIRCULATOR PUMPS

A. Acceptable Manufacturers:
   1. Bell & Gossett/ITT.
   2. Or Approved Equal.

B. Casing: Stainless Steel, rated for 175 psig working pressure, with stainless steel rotor assembly.

C. Impeller: Stainless Steel.

D. Shaft: AISI 420 Stainless Steel.

E. Bearing: Carbon Sleeve.

F. Gasket / O-Ring: EDPM.

G. Drive: Electronically commutated permanent magnetic motor (ECM Technology).

H. Pump shall be Lead Free for potable water use.

I. Performance: Refer to Schedule on Drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install water heaters in accordance with manufacturer's instructions and to AGA and NFPA 54 requirements.
   1. Provide support on 4-inch-high concrete equipment pad, independent of building structural framing members.
   2. Provide manufacturer approved/authorized start-up and certification. Submit start-up report to Construction Manager in accordance with Division 01 Specification Sections.

B. Coordinate all equipment with plumbing piping and related fuel piping, gas venting and electrical work to achieve proper operating system.

C. Domestic Hot Water Expansion Tanks:
   1. Provide support on 4-inch-high concrete equipment pad, independent of building structural framing members.
   2. Clean and flush after installation. Seal until pipe connections are made.
   3. Provide manufacturer approved/authorized start-up and certification. Submit start-up report to Construction Manager in accordance with Division 01 Specification Sections.

D. In-Line Circulator Pumps:
   1. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and globe valve on discharge.
   2. Ensure pumps 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.
   3. Provide hydronic indicator gauges.
   4. Provide manufacturer approved/authorized start-up and certification. Submit start-up report to Construction Manager in accordance with Division 01 Specification Sections.

3.02 OWNER TRAINING BY INSTALLING CONTRACTOR

A. At the completion of the project, the Installing Contractor shall provide training for all the plumbing equipment for the Owner's staff. Training shall consist of two parts. Part One is a classroom situation which describes the equipment's operation, maintenance and repair requirements. Part Two will be on-site (hands-on) training which will show the location of all devices and the

operation and maintenance of all controls, devices, motors, etc. This training will be in addition to other training specified in the contract. Prior to commencement of training, Contractor shall provide Architect/Engineer with a schedule of dates, times and agenda for each training session. This Contractor shall provide a minimum of eight (8) hours of training for work installed under this section of the contract. Contractor shall furnish a minimum of six (6) equipment manuals, maintenance manuals and repair parts list for all equipment and systems reviewed.

B. Submit Certification of Completion in accordance with Division 01 Specification Sections.

END OF SECTION

SECTION 22 4000

PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water Closets.

B. Lavatories.

C. Sinks.

D. Laundry Tubs.

E. Service Sinks/Mop Basins.

F. Showers.

G. Freeze Proof Wall Hydrants / Hose Valves / Hose Bibs.

H. Stops and Supplies.

I. P-Traps.

J. Sink Trim (Lavatory Guard).

1.02 RELATED WORK

A. Section 22 0503 - Plumbing Piping.

B. Section 22 3400 – Plumbing Equipment.

C. Section 22 4001 - Plumbing Specialties.

D. Section 23 0529 - Anchors and Supports.

1.03 REFERENCES

A. ANSI A112.6.1 – Supports for Off the Floor Plumbing Fixtures for Public Use.

B. ANSI A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.

C. ANSI A112.19.1 - Enameled Cast Iron Plumbing Fixtures.

D. ANSI A112.19.2 – Ceramic Plumbing Fixtures.

E. ANSI A112.19.3 – Stainless Steel Plumbing Fixtures.

F. ANSI A112.19.26 – Hydraulic Performance Requirements for Water Closets and Urinals.

G. ANSI Z124.3 and Z124.6 - Composite Resin Castings.

H. ANSI/ASSE 1011 - Hose Connection Vacuum Breakers.

I. ANSI/ASSE 1017 - Temperature Actuated Mixing Valves.

J. ANSI/ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.

K. ANSI/ASSE 1052 – Performance Requirements for Hose Connection Backflow Preventers.

L. ASSE 1070 – Performance Requirements for Water Temperature Limiting Devices.

M. ASSE 1071 – Performance Requirements for Temperature Actuated Mixing Valves for Plumbed Emergency Equipment.

N. ASME A112.18.1 – Plumbing Supply Fittings.

O. ANSI A112.26.1 - Water Hammer Arresters.

P. PDI WH-201 Water Hammer Arresters

Q. ANSI Z124.3 and Z124.6 - Composite Resin Castings.

R. ARI 1010 - Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers

1.04 QUALITY ASSURANCE

A. Fixtures: By same manufacturer for each product specified throughout.

B. Trim: By same manufacturer for each product specified throughout.

C. Flush Valves: By same manufacturer for each product specified throughout.

D. All exposed fixture trim shall be chrome plated.

1.05 SUBMITTALS

A. Submit product data under provisions of Division 01 Specification Sections.

B. Include fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. **CONTRACTOR SHALL REVIEW ALL SUBMITTALS PRIOR TO SUBMITTING THEM FOR THE ARCHITECT/ENGINEER'S REVIEW. CONTRACTOR SHALL STAMP EACH DRAWING AND EACH PIECE OF PRODUCT DATA TO CERTIFY THAT HE HAS REVIEWED IT. ARCHITECT/ENGINEER WILL NOT REVIEW ANY SUBMITTAL THAT CONTRACTOR HAS NOT STAMPED WITH HIS REVIEW CERTIFICATION. CONTRACTOR SHALL PROVIDE A LIST OF ITEMS SUBMITTED AT THE BEGINNING OF EACH SUBMTTAL. NO OLD OR OBSOLETE SUBMITTAL DOCUMENTATION WILL BE ACCEPTED**.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provision of Division 01 Specification Sections.

B. Include fixture trim exploded view and replacement parts lists.

1.07 WARRANTY

A. Provide manufacturer's warranty under provisions of Division 01 Specification Sections.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 01 Specification Sections.

B. Store, protect and handle products under provisions of Division 01 Specification Sections.

C. Accept specialties on site in original factory packaging. Inspect for damage.

1.09 EXTRA MATERIALS

A. Deliver to Maintenance Department prior to project completion. Submit written verification to Architect/Engineer.

B. Provide the following quantities of the materials listed:
   1. Two (2) faucet repair kits for each faucet type.
   2. Ten (10) quarter turn fixture stops.
   3. Three (3) wall hydrant aluminum loose keys.
   4. Three (3) wall hydrant repair tool T-Handles.
   5. Three (3) wall hydrant repair kits.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Water Closets (WC-1):
   1. American Standard.
   2. Or Approved Equal.

B. Toilet Seats:
   1. Water Closets (WC-1):
      a. Bemis.
      b. Or Approved Equal.

C. Flush Valves:
   1. Water Closets (WC-1):
      a. Sloan.

b. Or Approved Equal.

D. Fixture Carriers:
1. J.R. Smith Mfg. Co.
2. Tyler/Wade Co.
3. Zurn Co.
4. Watts Co.
5. MIFAB Co.
6. Or Approved Equal.

E. Lavatory (L-1):
1. American Standard.
2. Or Approved Equal.

F. Laundry Tub (LT-1):
1. Mustee.
2. Or Approved Equal.

G. Sinks:
1. SK-1:
a. Elkay Manufacturing.
b. Or Approved Equal.

H. Fixture Trim:
1. Chicago Faucet (mop sinks).
2. Other Lavatories and Sinks – (See Plumbing Fixture Schedule).
3. Or Approved Equal.

I. Service Sinks (SSR-1 & SSR-2):
1. Mustee.
2. Or Approved Equal.

J. Stops and Supplies:
1. Brasscraft -- G2 Series.
2. Or Approved Equal.

K. P-Traps:
1. Dearborn Brass 17-gauge chrome plated brass without cleanout.
2. Or Approved Equal.

L. Sink Trim (ADA Lavatory and Sink Guarding)
1. Truebro Lav Guard 2.
2. Or Approved Equal.

M. Wall Hydrants (FPWH-1):
1. Woodford.
2. Or Approved Equal.

N. Emergency Eye / Face Wash (EYE-1):
1. Guardian.
2. Or Approved Equal.

O. Emergency Eyewash/Shower TMV (EYE-1-TMV):
1. Guardian.
2. Or Approved Equal.

2.02 WATER CLOSET (WC-1)

A. Bowl: ANSI A112.19.2; ADA Compliant handicap height, floor mounted; See Plumbing Fixture Schedule.

B. Seat: Anti-microbial solid white plastic, open front, extended, self-sustaining continuous stainless-steel hinge, brass bolts, without cover. See Plumbing Fixture Schedule.

C. Stops: Chrome plated brass quarter turn G2 stop, 1/2-inch O.D. flexible riser and female compression inlet, chrome plated steel wall escutcheons.

2.03 LAVATORY (L-1)

A. See Plumbing Fixture Schedule.

B. Trim: ANSI A112.18.1; Faucet – See Plumbing Fixture Schedule, G2 quarter turn Stops. TMV Watts LFUSG-B-M2, chrome plated 17-gauge brass P-trap (installed parallel with wall) and arm with escutcheon. Provide under sink P-trap, tailpiece, angle valves, supply tubing, and TMV. Provide protective pipe covering Model 103 and Model 105 as manufactured by Truebro, Inc. See Plumbing Fixture Schedule.

C. Stops: Chrome plated brass quarter turn G2 stop, 3/8-inch O.D. flexible riser and female compression inlet.

2.04 LAUNDRY TUB (LT-1)

A. See Plumbing Fixture Schedule.

B. Trim: ANSI A112.18.1; Integral Faucet – See Plumbing Fixture Schedule, G2 quarter turn Stops. TMV Watts LFUSG-B-M2, chrome plated 17-gauge brass P-trap without cleanout. See Plumbing Fixture Schedule.

C. Stops: Chrome plated brass quarter turn G2 stop, 3/8-inch O.D. flexible riser and female compression inlet.

2.05 SINK (SK-1)

A. Bowl: ANSI A112.19.2; 304 stainless-steel, top mount single bowl 30” x 22” x 6-1/2”, ADA Compliant. See Fixture Schedule.

B. Trim: ANSI A112.18.1; Faucet -See Fixture Schedule. Chrome plated 17-gauge brass P-trap without Cleanout and arm with chrome plated steel escutcheon. Provide Dearborn Brass model 816 commercial grade locking cup sink basket strainer if not using Perfect Drain Sink.

C. Stops: Chrome plated brass quarter turn G2 stop, 3/8-inch O.D. flexible riser and female compression inlet.

2.06 SHOWER (SH-1)

A. See Plumbing Fixture Schedule.

2.07 SERVICE SINK RECEPTOR / MOP SINK (SSR-1)

A. Bowl: ANSI Z 124-2107; 24 x 24 x 10 inches deep, molded one-piece high impact resistant Durastone fiberglass sink, with 10-inch-high sides, stainless-steel bumper guard caps, chrome plated strainer, 3” P-trap with adjustable floor flange; Model 63M manufactured by Mustee. No Substitutions.

B. Trim: ASME A112.18.1, ADA ANSI/ICC A117.1; wall mounted 8” body, adjustable arms 7-5/8” – 8-3/8” hot and cold-water sink faucet, rough chrome supply, with 2-3/8” vandal proof lever handles, ceramic 1/4 Turn Operating Cartridge, wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges; Model 897-RCF Manual Service Sink Faucet manufactured by Chicago Faucet Co. No Substitutions.

C. Accessories: Hose Clamp, Hose and Mop Service Hanger: 1/2"-inch plain end reinforced rubber hose with wall mounted hose clamp and stainless-steel wall plate with mop hooks; Model 65.700 and 65.600 manufactured by Mustee Products Corp. Provide two sided 12” high 20-gauge 304 stainless steel Duraguard wall guards and bracket for 24” x 24” corner – part number 67.2424 – as per Mustee. No Substitutions.

2.08 SERVICE SINK RECEPTOR / MOP SINK (SSR-2)

A. Bowl: ANSI Z 124-2107; 24 x 36 x 10 inches deep, molded one-piece high impact resistant Durastone fiberglass sink, with 10-inch-high sides, stainless-steel bumper guard caps, chrome plated strainer, 3" P-trap with adjustable floor flange; Model 65M manufactured by Mustee. No Substitutions.

B. Trim: ASME A112.18.1, ADA ANSI/ICC A117.1; wall mounted 8" body, adjustable arms 7-5/8" – 8-3/8" hot and cold-water sink faucet, rough chrome supply, with 2-3/8" vandal proof lever handles, ceramic 1/4 Turn Operating Cartridge, wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges; Model 897-RCF Manual Service Sink Faucet manufactured by Chicago Faucet Co. No Substitutions.

C. Accessories: Hose Clamp, Hose and Mop Service Hanger: 1/2"-inch plain end reinforced rubber hose with wall mounted hose clamp and stainless-steel wall plate with mop hooks; Model 65.700 and 65.600 manufactured by Mustee Products Corp. Provide two sided 12" high 20-gauge 304 stainless steel Duraguard wall guards and bracket for 24" x 36" corner – part number 67.2436 – as per Mustee. No Substitutions

2.09 WALL HYDRANTS (FPWH-1)

A. Recessed freeze-less wall hydrant box, freeze-proof with wall box, loose key operation, automatic draining with ASSE 1052 double-check backflow preventer. Model B67 as manufactured by Woodford.

B. Or Approved Equal.

2.10 STOPS

A. Stops: ANSI A112.18.1; chrome plated brass quarter-turn stop, 3/8-inch O.D. flexible riser and 3/8-inch female compression inlet; Model G2 Series manufactured by Brasscraft.

2.11 EMERGENCY EYE / FACE WASH (EYE-1)

A. See Plumbing Fixture Schedule.

PART 3 EXECUTION

3.01 INSPECTION

A. Review millwork shop drawings. Confirm location and size of fixtures and existing rough-in before installation.

B. Review millwork shop drawings. Confirm location and size of fixtures and existing rough-in before installation.

3.02 INSTALLATION

A. Install each water closet with neoprene rubber closet gasket; felt or wax rings will not be accepted.

B. Install each fixture with trap, easily removable for servicing and cleaning.

C. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops reducers and escutcheons on each service to fixture.

D. Install components level and plumb.

E. Install and secure fixtures in place with wall carriers and bolts.

F. Seal fixtures to wall and floor surfaces with sealant; color to match fixture.

G. Mount fixtures to the heights as specified on Architectural Drawings.

3.03 ADJUSTING AND CLEANING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise or overflow.

B. At completion, clean plumbing fixtures and equipment.

C. Solidly attach water closets to floor with new lag screws. Lead flashing is not intended hold fixture in place. Adjust closet flange as required.

D. Contractor to remove each aerator or strainer screen and flush piping system at each fixture.

3.04 FIXTURE ROUGH-IN SCHEDULE

A. Rough-in fixture piping connections in accordance with following table of minimum sizes for particular fixtures.

	Hot Water	Tepid Water	Cold Water	Waste	Vent
Water Closet (WC-1)	----	----	3/4-inch	4-inch	2-inch
Lavatory (L-1)	1/2-inch	----	1/2-inch	1-1/4-inch	1-1/4-inch
Laundry Tub (LT-1)	1/2-inch	----	1/2-inch	1-1/2-inch	1-1/2-inch
Sinks (SK-1)	1/2-inch	----	1/2-inch	1-1/2-inch	1-1/2-inch
Showers (SH-1)	1/2-inch		1/2-inch	2-inch	2-inch
Emergency Eye / Face Wash (EYE-1)	----	3/4-inch	----	1-1/2-inch	1-1/2-inch
Mop Sink (SSR-1) & (SSR-2)	3/4- inch	----	3/4-inch	3-inch	2-inch
Wall Hydrants	----	1 inch	----	----	----

END OF SECTION

SECTION 22 4001
PLUMBING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Floor drains.

B. Cleanouts.

C. Roof Drains.

D. Backflow Preventers.

E. Thermostatic Mixing Valves.

F. Water hammer arrestors and air chambers.

G. Shower Drains.

H. Trench Drains.

I. Solids Separator.

1.02 RELATED WORK

A. Section 22 0503 - Plumbing Piping.

B. Section 22 3400 – Plumbing Equipment.

C. Section 22 4000 - Plumbing Fixtures.

D. Section 23 0553 - Mechanical Identification: Product requirements for pipe identification for placement by this section.

E. Section 23 0701 - Piping Insulation.

1.03 REFERENCES

A. ANSI/ASSE 1001 – Performance Requirements for Atmospheric Type Vacuum Breakers.

B. ANSI/ASSE 1011 - Hose Connection Vacuum Breakers.

C. ANSI/ASSE 1013 – Backflow Preventer, Reduced Pressure Principle.

D. ANSI/ASSE 1017 – Temperature Actuated Mixing Valves.

E. ANSI/ASSE 1019 – Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.

F. ANSI.ASSE 1052 – Performance Requirements for Hose Connection Backflow Preventers.

G. ANSI/ASSE 1070 – Devices that Limit Water Temperature to a Fixture.

H. ANSI/ASME A112.21.1 – Floor Drains.

I. ASME A112.6.3 - Floor and Trench Drains.

J. ASME A112.6.4 – Roof, Deck, and Balcony Drains.

K. ANSI A112.26.1 - Water Hammer Arresters.

L. PDI WH-201 Water Hammer Arresters.

M. NFPA 30- Flammable and Combustible Liquids Code.

N. UL-58 – Standard for Safety, Steel Underground Tanks for Flammable and Combustible Liquids.

1.04 REGULATORY REQUIREMENTS

A. Conform to State of Illinois Plumbing Code (2014).

1.05 SUBMITTALS

A. Submit under provisions of Division 01 General Requirements.

B. Shop Drawings: Indicate dimensions, weights and placement of openings and holes.

C. Product Data: Provide component sizes, rough-in requirements, service sizes and finishes.

D. Manufacturer's Installation Instructions: Indicate assembly and support requirements.

E. **CONTRACTOR SHALL REVIEW ALL SUBMITTALS PRIOR TO SUBMITTING THEM FOR THE ARCHITECT/ENGINEER'S REVIEW. CONTRACTOR SHALL STAMP EACH DRAWING AND EACH PIECE OF PRODUCT DATA TO CERTIFY THAT HE HAS REVIEWED IT. ARCHITECT/ENGINEER WILL NOT REVIEW ANY SUBMITTAL THAT CONTRACTOR HAS NOT STAMPED WITH HIS REVIEW CERTIFICATION. CONTRACTOR SHALL PROVIDE A LIST OF ITEMS SUBMITTED AT THE BEGINNING OF EACH SUBMTTAL. NO OLD OR OBSOLETE SUBMITTAL DOCUMENTATION SHALL BE ACCEPTED.**

1.06 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 01 General Requirements.

B. Record actual locations of equipment, cleanouts, backflow preventers and other devices.

1.07 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division 01 General Requirements.

B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 01 General Requirements.

B. Accept specialties on site in original factory packaging. Inspect for damage.

1.09 EXTRA MATERIALS

A. Deliver to maintenance department prior to project completion. Submit written verification to Architect/Engineer.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURER - PLUMBING SPECIALTIES

A. J.R. Smith Co.

B. Mifab. Company.

C. Josam Co.

D. Tyler/Wade Co.

E. Watts Co.

F. Zurn Co.

G. Oatley

H. Or Approved Equal.

2.02 ACCEPTABLE MANUFACTURERS BACKFLOW PREVENTERS

A. Watts.

B. Ames.

C. Zurn.

D. Or Approved Equal.

2.03 ACCEPTABLE MANUFACTURERS THERMOSTATIC MIXING VALVES

A. Leonard Valve.

B. Watts.

C. Powers Co.

D. Symmons Industries.

E. Guardian (Emergency Eye / Face Wash Stations only.)

F. Or Approved Equal.

2.04 FLOOR DRAINS AND AREA DRAINS

A. FD-1: ANSI A112.21.1; lacquered cast iron two-piece body with double drainage flange, 6-inch diameter heavy-duty nickel bronze secured square hole strainer, sediment bucket, vandal resistant fasteners and not flashed; See Fixture Schedule.

B. FD-2: Lacquered cast iron body, 7-inch diameter adjustable ductile iron grate and sediment bucket, not flashed; See Fixture Schedule.

C. FD-HD: Heavy Duty Floor Drain: ASME A112.6.3; lacquered cast iron deep sump floor drain with anchor flange, weep holes, and adjustable color with standard 1" thick, 12" hinged square ductile iron tractor grate. Provide Floor Drain used in warehouses, mechanical rooms, parking garages and other non-membrane finished floor areas. 12" square adjustable tractor grate used with all types of poured finished floors; Model F1440 manufactured by Mifab. This floor Drain is for use in Warehouse Areas where heavy wheel vehicle and fork truck traffic will be present. No Substitutions.

D. FS-1: 12 x 12 x 8 inches deep cast iron body, acid resistant coated interior floor sink, nickel bronze hinged half grate and sediment bucket with rubber feet; See Fixture Schedule.

E. Deep Seal P-Traps: Provide deep seal P-Traps on all floor drains installed in the base slab.

2.05 CLEANOUTS

A. Interior Finished Floor Areas (FCO): Lacquered cast iron, two-piece body with double drainage flange, brass gasketed plug and adjustable nickel-bronze round vandal-proof scoriated cover in unfinished areas and round with depressed cover to accept floor finish or with carpet markers in carpeted floor area; See Fixture Schedule.

B. Heavy Duty Floor Cleanout (FCO-HD): Round Coated Cast Iron Access frame with anchor flanges and heavy duty scoriated cover. For use in finished or unfinished floors subject to heavy wheel traffic such as Parking Lots, Warehouses, or Industrial Areas; Model 58680 manufactured by Josam Co. This floor cleanout is for use in Warehouse Areas where heavy wheel vehicle and fork truck traffic will be present.

C. Interior Finished Wall Areas (WCO): Line type with lacquered cast iron body and round brass gasketed plug and round stainless-steel access cover secured with vandal-proof fastener; See Fixture Schedule.

D. Interior Unfinished Accessible Areas (CO): Cast iron cleanout ferrule with brass tapered plug; See Fixture Schedule.

E. Heavy Duty Yard Cleanout (YCO-HD): Round Coated Cast Iron Access frame with anchor flanges and heavy duty scoriated cover. For use in finished or unfinished floors subject to heavy wheel traffic such as Parking Lots, Warehouses, or Industrial Areas; Model 58680 manufactured by Josam. Secure with vandal proof screws. This floor cleanout is for use outside of building where heavy wheel vehicle traffic will be present.

2.06 BACKFLOW PREVENTERS

A. Reduced Pressure Backflow Preventers (BFP-1): ANSI/ASSE 1013; Lead free Cast Iron with stainless steel internal part, bolt connectors, wheel turn valves, two in-line independent check assemblies and relief valve, test cocks, and funnel drain. Provide Manufacturer's Floor Detection System Option (-FS); manufactured by Watts. Coordinate Floor Detection System with Electrical. No substitutions. Provide Strainer. Provide Air Gap.

B. Reduced Pressure Backflow Preventers (BFP-3): Lead free Watts LF009M3QTS reduced pressure principal backflow assembly for protection to the potable water system. ANSI/ASSE 1013; lead free cast copper silicon alloy, silicon rubber dishes, union connectors, quarter turn valve, two (2) in-line independent check valves, swivel feature, test cocks, and funnel drain. This backflow preventer is for point of use at triple basin sinks for soap/chemical dispenser, and mop sinks for soap dispenser. No substitutions. Provide Strainer. Provide Air Gap.

2.07 THERMOSTATIC MIXING VALVES (TMV):

A. Refer to Plumbing Fixture Schedule.

2.08 WATER HAMMER ARRESTORS AND AIR CHAMBERS

A. Provide PDI rated, pre-charged water hammer arrestors; size in accordance with PDI WH-201 Water Hammer Arrestor Standards. Water hammer arrestors must be accessible. Provide access panels as required.

B. Manufacturers:
   1. Watts – Model LF150A.
   2. Watts – Model LF15M2.
   3. Or Equal.

2.09 SHOWER DRAIN

A. Acceptable Manufacturers:
   1. Just Manufacturing Co.
   2. Or Approved Equal.

2.10 TRENCH DRAIN

A. Acceptable Manufactures:
   1. Zurn Industries, LLC.
   2. Or Approved Equal.

B. Trench Drain and Grate Construction:
   1. Zurn Model Z882-DGE-USA, or Approved Equal.
      a. 12-inch steel frame.
      b. Heavy duty ductile iron slotted grate – Class E.
      c. Modular channel sections, having rebar clips to secure trench sections.
      d. Grate lockdown bars integral to the frame.
      e. Frame to have powder coated finish.
      f. Load ratings for Trench Drains and Catch Basins shall match.

2.11 TRENCH DRAIN CATCH BASIN:

A. Acceptable Manufacturers:
   1. Zurn Industries, LLC, or Approved Equal.

B. Catch Basin and Grate Construction:
   1. Zurn Model Z887-12-HD, or Approved Equal.
      a. 12” wide x 24” long x 24” deep.
      b. No hub connections.
      c. DGE-USA ductile iron slotted grate cover – Class E.
      d. Load ratings for Trench Drains and Catch Basins shall match

2.12 OIL / SAND SEPETATOR (OSS-1):

A. Acceptable Manufacturers.
   1. Highland Tank.
   2. Or Approved Equal.

B. Underground Protected Steel Gravity Based Model HTC Series G Double-wall Oil/Water Separator with Integral Sand Interceptor Compartment, Corella Coalescer Plate System and High Guard Protection System:
   1. The separator shall be designed for gravity separation of free oils (hydrocarbons and other petroleum products) along with some settleable solids from wastewater associated

with vehicle maintenance operations. Separator shall be prefabricated with inclined, parallel, flat/corrugated plate and impingement coalescers. Separator shall be installed underground with top access at or above grade level. The source of the influent to the separator shall be gravity flow from stormwater runoff, hydrocarbon spills, and/or cleaning/maintenance operations.

2. Provide Highland Tank Model HTC-1000 Series-G Underground Double-Wall Parallel Flat/Corrugated Plate Gravity Displacement Oil/Water Separator with Integral 216-gallon Sand Interceptor Compartment. Separator shall be furnished with oil level alarm and leak detection systems having a total volume of 1000 gallons to comply with Spill Prevention Control and Countermeasures (SPCC) plan requirements at the facility. The sizing of this oil/water separator is consistent with industry protocols for complying with the minimum federal spill and discharge regulations. A separator of smaller volume is not permissible.
3. Separator to be furnished with a Corella® inclined parallel flat/corrugated plate coalescer to simultaneously separate free oil droplets and settleable or suspended solids particles from water without clogging of the coalescer.
4. Gravity-based oil/sand interceptor shall be constructed of high-strength, mild carbon steel to ASTM specifications and coated outside with high-solids polyurethane with an interior liner.
5. Interceptor shall be 4'-0" in diameter and 14'-0" long; having a total volume of 1000 gallons minimum and a sludge holding capacity sufficient to comply with the requirements of the plumbing code. The sizing and construction of this interceptor is consistent with industry protocols for complying with the sewer pretreatment regulations, therefore an interceptor of smaller volume or multiple, interconnecting vessel construction is not permissible.
6. Flow to the interceptor shall be by gravity. Interceptor shall retain wastewater long enough to allow sand, grit, and free oil and grease to separate from the water due to their differences in specific gravity. The wastewater will then flow to a sanitary sewer.
7. Interceptor shall be installed underground with top access at or above grade level (as specified on drawings).
8. Interceptor shall have heavy duty covers and manway guarding to allow intermittent vehicle traffic over the interceptor.
9. Interceptor shall have Manufacturer's safety screen installed inside of the manways to protect from accidental falls.

C. Performance:
   1. Influent Characteristics:
      a. Provide separator designed for intermittent and variable flows of water, oil, or any combination of non-emulsified oil-water mixtures ranging from zero to 100 gal/min. Nominal separator retention time shall be 10 minutes, based on total unit volume. (Actual retention time will be less due to air space above fluid level).
      b. Typical operating temperature range of the influent oil in water mixture: 40º F to 80º F.
      c. Typical specific gravity range of the oils at operating temperatures: 0.71 to 0.92.
      d. Typical specific gravity range of the fresh water at operating temperatures: 1.00 to 1.03.
   2. Effluent Characteristics:
      a. The free oil and grease concentration in the effluent from the separator shall not exceed 10 mg/l (10 PPM) to satisfy requirements of the NPDES storm water discharge permit. To achieve this goal, it will be necessary to remove all free oil droplets equal to and greater than 20 microns

D. Design Criteria:

1. Separator shall be designed in accordance with Stokes Law and the American Petroleum Institute Publication 421, "Monographs on Refinery Environmental Control - Management of Water Discharges; Design and Operation of Oil/Water Separators." The total effective surface area of the parallel-corrugated plate coalescer shall be determined by OWS manufacturer for the flow, temperature, and oil specific gravity conditions specified above. The total effective surface area of the polypropylene impingement coalescer shall be determined by OWS manufacturer for the flow, temperature, and oil specific gravity conditions specified above. Calculations, signed and stamped by a Registered Professional Engineer shall be submitted to document specified effluent quality based on complete removal of the specified oil globule. A separator with lower effective surface areas is not permissible
2. Separator capacities, dimensions, construction, and thickness shall be in strict accordance with Underwriters Laboratories, Subject UL-58 Standard for Safety, Steel Underground Tanks for Flammable and Combustible Liquids, Double-wall construction with 360-degree Steel Secondary Containment. Separator shall comply with National Fire Protection Association NFPA 30 Flammable and Combustible Liquids Code. The inner steel tank shall be completely contained within the outer steel tank, enclosing 100% of the tank volume. The tank must have a double steel shell without a defined space between the layers (UL Type I Double-wall). The space between the inner and outer steel walls shall be monitored with an approved electronic leak detection device through a pipe that extends vertically to the top of the tank from the bottom of the shell. Tank construction using thin-walled primary tank with external fiberglass jacket shall not be permissible.
3. Separator shall be the standard patented product of a steel tank manufacturer regularly engaged in the production of such equipment. Manufacturer shall have at least 20-years of experience in manufacturing similar units for identical applications. No subcontracting of tank fabrication shall be permitted.
4. Separator shall be fabricated, inspected, and tested for leakage before shipment from the factory by manufacturer as a completely assembled vessel (to the greatest extend possible with consideration to shipping requirements) ready for installation
5. Separator shall be cylindrical, horizontal, atmospheric-type steel vessel intended for the separation and storage of flammable and combustible liquids. The separator shall have the structural strength to withstand static and dynamic hydraulic loading while empty and during operating conditions. The Oil/Water Separator's dimensions and thickness shall be in strict compliance with Roark's Formulas for Stress and Strain as presented in UL 58. Calculations, signed and stamped by a Registered Professional Engineer shall be submitted to document structural strength under specified overbearing or external pressure. A separator with a reduced shell thickness is not permissible
6. Separator shall have the following oil storage capacities:
    a. High oil level (warning), equal to about 20% of the static vessel volume.
    b. High-high oil (alarm). Equal to about 43% of the static volume.
    c. Emergency oil spill capacity equal to about 80% of the static vessel volume.
7. Separator shall consist of inlet and outlet connections, integral sand interceptor compartment, non-clogging flow distributor and energy dissipater device, stationary under flow baffle, presettling chamber for solids, sludge baffle, oil coalescing chamber with removable parallel flat/corrugated plate coalesce and/or removable plates, and sectionalized removable polypropylene impingement coalescers to optimize separation of free oil from water, effluent downcomer positioned to prevent discharge of free oil that has been separated from the water, access ways for coalescers and each chamber, fittings for vent, oil pump-out, sampling, gauging, leak detection, and lifting lugs.

8. Separator Corrosion Control System shall be in strict accordance with Underwriters Laboratories Inc. Subject UL-1746 Standard for External Corrosion Protection Systems for Steel Underground Storage Tanks and HighGuard External Corrosion Protection Specifications.

E. General Description:

1. The Interceptor shall be cylindrical with construction and thickness in strict accordance with Underwriters Laboratories Subject 58, using flat-flanged heads.

2. The Interceptor shall be a pre-packaged, pre-engineered, ready to install unit consisting of:

   a. A 6-inch flanged influent connection with an internal influent nozzle at the inlet end of the separator. Nozzle discharge point will be located at the furthest diagonal point from the effluent discharge opening. (See Manufacture Quote and Manufacture Drawings.)

   b. A 216-gallon integral sand interceptor compartment containing one (1) 24-inch diameter manhole, UL approved, complete with 26-inch extension, cover, gasket, and bolts. A heavy-duty bulkhead shall retain sand, grit, settleable solids or semisolids and prevent them from entering the separation chamber. Bulkhead shall have 4-inch transfer pipe

   c. A velocity head diffusion baffle at the inlet to:

      1) Reduce horizontal velocity and flow turbulence.

      2) Distribute the flow equally over the separator's cross-sectional area.

      3) Direct the flow in a serpentine path in order to enhance hydraulic characteristics and fully utilize all separator volume.

      4) Completely isolate all inlet turbulence from the separation chamber.

   d. A sediment chamber to disperse flow and collect oily solids and sediments.

   e. A sludge baffle to retain settleable solids and sediment and prevent them from entering the separation chamber.

   f. An Oil / Water Separation Chamber containing removable Corella inclined parallel flat / corrugated plates, sloped downward towards the sediment chamber to:

      1) Shorten the vertical distance that an oil globule or solid particle has to raise for effective removal. Minimum plate gap to be 1-1/4-inches.

      2) Enhance coalescence by generating a slight sinusoidal (wave-like) flow pattern thereby causing smaller, slower rising oil globules to coalesce together on the undersides of the plates forming larger, rabidly rising sheets of oil.

      3) Direct the paths of the separated oil to the surface of the separator.

   g. And a sectionalized removable "Petro-Screen" polypropylene impingement coalescer designed to intercept oil globules of less than 20 microns in diameter. Heavy, one- piece impingement coalesces are not permissible.

   h. An internal effluent downcomer at the outlet end of the separator, to allow for discharge from the bottom of the separation chamber only.

   i. A 6-inch flanges effluent connection. (See Manufacture Quote and Manufacture Drawings.)

   j. Fittings for vent, interface / level sensor, leak detection, waste oil pumped-out, sampling, and gauge.

   k. Two (2) 24-inch diameter manholes, UL approve, complete with 26-inch extensions (length based on burial depth), covers, gasket, and bolts. One manway shall be placed between the inlet and parallel-flat / corrugated plate coalescer to facilitate

access into sediment chamber for solids removal. One manway shall be placed between the parallel flat, corrugated plate coalescer and outlet to facilitate access into the oil water separation chamber for oil removal.

l. Lifting lugs at balance points for handling and installation.

m. Identification plates: Plates to be affixed in prominent location and be durable and legible throughout equipment life.

n. HighGuard Corrosion Protection System consisting of:

1) External surfaces commercial grit blasted and coated with 75 mils DFT HighGuard.

2) Self-reinforcing polyurethane.

3) 10-year Limited Warranty.

o. Accessories & Options

1) Internal surfaces commercial grit blasted and coated with 15 mils DFT heavy duty polyurethane.

2) Separator shall be supplies with an audible and visual alarm system that indicates high oil level (visual only) and a high-high oil level (audible and visual) of storage in the oil / water separator will be provided. An audible and visual leak detection alarm system that indicates hydrocarbon and / or water in the interstice. A silence control shall be provided for the audible alarms. Level sensor(s) to be intrinsically safe. Level sensor flotes to be made of stainless steel. The control panel shall contain both level sensor and leak detection control. The control panel shall be NEMA 4. Power to the control panel is to be 208-volt, 3-phase.

3) Separator shall be supplied with Highland Tank Deadman Anchoring System that includes polyester hold-down straps and concrete deadman anchors.

4) Polyester or steel hold-down straps (10’-6” maximum diameter for polyester straps). (Refer to Manufacturer Highland Industries for additional information on hold down and anchoring requirements for this separator.)

5) Grade Level Manways for vehicle traffic loading (H20).

6) Electronically actuated valves.

7) Leak detection sensors.

8) Influent, effluent and / or oil pumps.

9) Coordinate with Electrical.

3. Quality Assurance

a. Submittals

1) Shop Drawings: Shop drawings for oil water separators shall show principal dimensions and location of all fittings

2) Instructions: Separator installation, operation, and maintenance instructions are available at www.highlandtank.com

3) Quality Control: Quality control, inspection procedures, shall be considered part of the submittal package

b. Warranty

1) The manufacturer shall warrant its products to be free from defects in material and workmanship for a period of one year from the dated of shipment. The warranty shall be limited to repair or replacement of the defective part(s).

2) Highland Tank 10-year limited warranty for external corrosion and structural defects.

3) Approved Manufacturer: Highland Tank and Mfg. Co., One Highland Road, Box 338, Stoystown, PA 15563, Phone (814) 893-5701, FAX (814)-893-6126, shall manufacture the Oil/Water Separator. For additional information, visit us at www.highlandtank.com

4. Testing requirements

a. Interceptor tightness testing to UL-58 requirements shall be performed by the manufacturer at the factory.

b. The Interceptor shall be pressure tested at 3-5 psig and all surfaces soaped and carefully inspected for leaks

5. Electrically Isolating Exterior Protective Coating

a. After testing, all interior and exterior surfaces shall be grit blasted per Steel Structures Painting Council Surface Preparation Specification SSPC-SP-6 Commercial Grit Blast Cleaning with an angular profile of 2.0 mils.

b. Exterior surfaces: Apply HighGuard Corrosion Protection System consisting of:

1) Application of 75 mils DFT self-reinforcing, high-solids polyurethane material complying with the following specifications:

2) Property/Value

a) Hardness (ASTM D 2240): 70 Shore D

b) Temperature Range: 35-120°F (1-49°C)

c) Impact Strength: >40 in. lbs.

d) Flexibility: 15 mils bent 180 over 1/8” (3 mm) mandrel

e) Abrasion Resistance: 110 mg (C17, 1 kg, 100 cycles)

3) A 15,000-volt spark test shall be performed in the factory to ensure coating integrity.

c. Internal surfaces: Apply 15 mils DFT Polyurethane Lining.

1) Lining shall be of a light color to aid in visual inspection of the interior.

6. Interceptor Hold Down Anchoring

a. Interceptor shall be provided with polyester hold down straps and turnbuckles. Number and size as recommended by manufacturer.

b. Provide float out and anchorage calculations, signed and stamped by a registered professional engineer, to document proper burial depth and anchoring to counteract the Interceptor's buoyant forces.

c. Provide Manufacturer recommended number of concrete deadmen anchors as required. Number and size are as recommended by manufacturer.

d. If a reinforced concrete pad is required for anchoring purposes, the pad dimensions are shown on the drawings.

e. Note: An 8” minimum reinforced concrete pad is required on for all interceptors 10’0’” diameter and larger.

7. Labeling

a. Identification plates: Plates to be affixed in prominent location and be durable and legible throughout equipment life.

b. Each Interceptor shall be permanently labeled on the Interceptor head with pertinent handling, safety, and installation instructions.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate cutting and forming of roof and floor construction to receive drains to required invert elevations.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Coordinate floor cleanout cover types and styles with Construction Manager’s floor finish schedule.

E. Install each fixture, HVAC make-up water connection, cooling tower make-up water connection and other devices with air chambers (minimum 3/4-inch x 18 inches long) or water hammer arrestor; size in accordance with PDI WH-201 Standards.

F. Install pre-charged water hammer arrestors complete with accessible isolation ball valve. Install air hammer arrestor; size in accordance with PDI WH-210 Water Hammer Arrestor Standards. Water hammer arrestors must be accessible. Provide access panels as required.

G. Pipe relief from backflow preventers to nearest floor drain. Ensure air gap is in compliance to Illinois Plumbing Code and AHJ.

H. Perform certification of all backflow preventers during substantial completion in accordance with Illinois Plumbing Code and AHJ.

I. Provide side outlet roof drains on canopy roof area.

J. Contractor to adjust yard cleanout covers to coincide with finished grade.

K. Provide deep seal P-traps for all slab-on grade floor drains.

L. All Floor Drains, Floor Cleanouts, and Yard Cleanouts where floors are subject to heavy wheel traffic in the Maintenance Building and in the Dock Building are to be heavy duty rated for heavy wheeled traffic and fork lifts.

M. All Roof Drain Leaders and Roof Drain Storm Piping in Warehouse, Shipping / Receiving Areas, Quarantine Areas, and Areas not inside of an Office Area shall have a protective steel pipe sleeve installed from finished floor to plus 6’ for protection from forklifts. Ensure all Storm Piping is properly protected.

END OF SECTION

SECTION 23 0500
BASIC MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and General Requirement Specification Sections, apply to this and the other sections of Division 22 and Division 23.

1.02 SUMMARY

A. This Section includes general administrative and procedural requirements for mechanical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in the General Requirements:
   1. Submittals.
   2. Coordination drawings.
   3. Record documents.
   4. Maintenance manuals.
   5. Rough-ins.
   6. Mechanical installations.
   7. Cutting and patching.

1.03 DEFINITIONS

A. Furnish: To purchase; fabricate, as applicable; and deliver to designated location on job site.

B. Install: To locate and make all necessary connections for complete and operating system. Installing contractor shall provide all necessary labor and miscellaneous piping, fittings, connectors, ductwork, etc. as required for installation and startup. Installing contractor shall also be responsible for all warranties, including the coordination and implementation of all factory warranties, regardless of whether or not the installing contractor has furnished the equipment.

C. Provide: To furnish and install.

1.04 CODES AND STANDARDS

A. Code Compliance: Comply with all applicable codes pertaining to product materials and installations.

B. All product materials and work shall comply to all local codes, including but not limited to the following codes and standards as applicable, in addition to any codes and standards referenced within individual specification sections. These codes and standards shall apply to all Division 22 and 23 Sections as applicable.
   1. Americans with Disabilities Act (ADA).
   2. American Gas Association (AGA).
   3. American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE).
   4. American Society of Mechanical Engineers (ASME).
   5. Air Moving and Conditioning Associates (AMCA).
   6. American Society for Testing and Materials (ASTM).
   7. American Society of Plumbing Engineers (ASPE).
   8. American National Standard Institute (ANSI).
   9. Air Conditioning and Refrigeration Institute (ARI).
   10. International Building Code.
   11. International 2015 Mechanical Code.
   12. Factory Mutual.
   13. Illinois Administrative Code, including, but not limited to:
      a. Illinois State Plumbing Code
      b. Illinois Accessibility Code.

14. National Electric Code (NEC).
15. National Electric Manufacturers' Association (NEMA).
16. All applicable sections of National Fire Protection Association (NFPA).
17. Underwriters' Laboratories (UL).
18. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
19. International Fuel Gas Code.
20. International Fire Code.
21. International 2018 Energy Conservation Code.

1.05 SUBMITTALS

A. General: Follow the procedures specified in the General Requirements, and additional defined below.

B. Increase by one copy the number of mechanical related shop drawings, product data, and samples submitted. This copy will be retained by the Consulting Engineer.

C. Additional copies may be required by individual sections of these Specifications.

D. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Deviations included within shop drawings shall not be acceptable unless they are clearly identified as deviations. Deviations from the Contract Documents shall only be acceptable subsequent to the deviation being specifically submitted in writing and responded to by the architect and engineer.

1.06 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in the General Requirements and other Division 22 and 23 Sections. In addition to the requirements specified indicate the following installed conditions:
   1. Provide one (1) digital copy (CD) and one (1) full size paper copy of “as-built” drawings with all information and meeting the requirements as described under “Coordination Drawings” in this section. Marked up copies of the design documents are not acceptable.
   2. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
   3. The as-built drawings shall indicate the electrical installations as “installed” and required as described under “Coordination Drawings” and “Record Drawings”.
   4. As-built drawings shall be complete on contractors own “Title Block”.

1.07 MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with the General Requirements. In addition to the requirements, include the following information for equipment items:
   1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
   2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
   3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
   4. Servicing instructions and lubrication charts and schedules.

1.08 WARRANTIES

A. The Contractor shall warrant all Mechanical Work to be free of faults and defects in accordance with the General Conditions and Supplementary Conditions for a minimum period of one (1) year from final acceptance of the work. This shall include all materials and labor. Extended warranties shall be provided as indicated in other sections of these Specifications.

B. The Contractor shall submit signed warranties for installations, equipment and fixtures required by this section and other sections of these Specifications.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

B. Store and protect products under provisions of the General Requirements.

C. Deliver and store material in shipping containers with labeling in place.

D. Contractor shall store all materials shipped to this site in a protected area. If material is stored outside of the building, it must be stored off the ground a minimum of six inches set on 6 x 6 planks and/or wood pallets. All material must be completely covered with waterproof tarps or visqueen. All piping will have the ends closed to keep out dirt and other debris. No equipment will be allowed to be stored on the site unless it is sitting on wood planks and is completely protected with weatherproof covers.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

3.01 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

3.02 MECHANICAL INSTALLATIONS

A. General: Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate mechanical systems, equipment, and materials installation with other building components.
2. Verify all dimensions by field measurements.
3. Confirm and arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.
4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
7. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
9. Install systems, materials, and equipment level and plumb, parallel, and perpendicular to other building systems and components.
10. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location and purge all extended hoses with grease. Use extreme pressure grease to match Owner standards.
11. Install access panel or doors where units are concealed behind finished surfaces. Access panels and doors are specified in Division 23 Section - Ductwork Accessories.
12. Indicate locations and sizes for all access panels or doors where required for service of mechanical devices. Provide this information to the mason and/or drywall contractor before construction of corresponding partition.

13. Access doors shall be required for service of any concealed device such as fire dampers, valves, VAV boxes, fans, controls, and coils. As much as practical, locate these devices in readily accessible locations.
14. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
15. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the systems in a diagrammatic form only. Location and arrangement of pipe, duct, and equipment lay-out shall take into consideration pipe/duct sizing and pressure loss, expansion, pump/fan sizing, and other design considerations. So far as practical, install system as indicated. Refer to individual system specifications for requirements for coordination drawing submittals. Adjust routing and provide all offsets, fittings, etc., as required for coordination with building and all other systems at no additional cost to the owner. All deviations from the design drawings shall be reflected on the shop drawings for review by the architect and engineer before proceeding with fabrication or installation.
16. Where drawings, specifications or notes conflict one another the contractor shall immediately advise the architect of such conflicts. For purposes of bidding and pending written receipt of any direction to the contrary, the contractor shall include in his proposal the more expensive alternate described.

3.03 CUTTING AND PATCHING

A. General: Perform cutting and patching in accordance with the General Requirements. In addition to the requirements specified in the General Requirements, the following requirements apply:
   1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

B. Perform cutting, fitting, and patching of mechanical equipment and materials required to:
   1. Uncover Work to provide for installation of ill-timed Work.
   2. Remove and replace defective Work.
   3. Remove and replace Work not conforming to requirements of the Contract Documents.
   4. Remove samples of installed Work as specified for testing.
   5. Upon written instructions from the Architect, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.

C. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
   1. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

D. All piping penetrations to be by contractor including sleeves and patching. Use coring whenever possible through concrete and masonry.

E. Contractor to fire safe and seal all wall penetrations for ductwork, piping, conduits, etc. in new walls or floors.

END OF SECTION

SECTION 23 0502
GAGES AND METERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Pressure gages and Pressure gage taps.

B. Thermometers and thermometer wells.

C. Static pressure gages.

D. Filter gages.

1.02 RELATED SECTIONS

A. Section 22 0503 - Plumbing Piping.

B. Section 23 1126 – Fuel Piping.

C. Section 23 6100 – Refrigerant Piping and Specialties.

D. Section 23 7413 – Dedicated Outdoor Air Units (Split).

E. Section 23 8201 – Terminal Heat Transfer Units – Electric.

F. Section 23 8310 – Heat Pump Heat Recovery System.

1.03 REFERENCES

A. ASME - B40.1 - Gages - Pressure Indicating Dial Type - Elastic Element.

B. ASTM E1 - Specification for ASTM Thermometers.

C. ASTM E77 - Verification and Calibration of Liquid in Glass Thermometers.

D. AWWA C700 - Cold Water Meters - Displacement Type.

E. UL 393 - Indicating Pressure Gages for Fire and Protection Services.

1.04 SUBMITTALS FOR REVIEW

A. Product Data: Provide list, which indicates use, operating range, total range and location for manufactured components.

B. Submit under provisions of the General Requirements.

1.05 SUBMITTALS AT PROJECT CLOSEOUT

A. Project Record Documents: Record actual locations of components and instrumentation.

B. Submit under provision of the General Requirements.

1.06 INSTALLATION OF CONTROL PRODUCTS

A. Install valves, temperature and pressure sensors and other instrumentation in the locations directed by the BAS contractor.

B. Install BAS valves and sensors in the locations shown on the plans.

C. Failure of this contractor to adequately coordinate his work with the BAS contractor shall not be justification for any request for additional payment.

D. This contractor shall include the cost of coordinating and installing related BAS components in his bid.

PART 2 PRODUCTS

2.01 PRESSURE GAGES

A. Manufacturers:
   1. Terice.
   2. No Substitutions.

B. Gage: ASME B40.1, stainless steel or cast aluminum case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with adjustable pointer, black scale on white background.
   1. Case: Stainless steel or cast aluminum with brass bourdon tube.
   2. Size: 4½-inch diameter (minimum).
   3. Mid-Scale Accuracy: One percent full scale.
   4. Scale: Psi.

2.02 PRESSURE GAGE TAPPINGS

A. Gage Cock: Tee or lever handle, brass for maximum 150 psig.

B. Needle Valve: Brass, ¼-inch NPT for minimum 150 psig.

C. Pulsation Damper: Pressure snubber, brass with ¼-inch connections.

D. Syphon: Steel, Schedule 40, ¼-inch angle or straight pattern.

2.03 STEM TYPE THERMOMETERS

A. Manufacturers:
   1. Miljoco.
   2. Weiss.

B. Thermometer: ASTM E1, adjustable angle, blue organic, lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device.
   1. Size: 9-inch scale.
   2. Window: Clear Lexan.
   3. Stem: ¾ inch NPT brass.
   4. Accuracy: One scale division.
   5. Calibration: Degrees F.

2.04 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.

2.05 TEST PLUGS

A. Test Plug: 1/4 inch or 2-inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 210 degrees F.

B. Test Kit: Carrying case, internally padded and fitted containing one 2½-inch diameter pressure gages, one gage adapters with 1/8-inch probes, two one-inch dial thermometers.

2.06 STATIC PRESSURE GAGES

A. Inclined manometer, red liquid on white background with black figures, front recalibration adjustment, 3 percent of full scale accuracy.

B. Accessories: Static pressure tips with compression fittings for bulkhead mounting, ¼-inch diameter tubing.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install pressure gages with pulsation dampers. Provide gage cock to isolate each gage.

C. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2½-inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

D. Install thermometer sockets and pressure taps as directed by BAS contractor adjacent to controls systems transmitter, or sensor sockets and as required.

E. Coil and conceal excess capillary on remote element instruments.

F. Provide instruments with scale ranges selected according to service with largest appropriate scale.

G. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

H. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

I. Locate test plugs adjacent thermometers and thermometer sockets and adjacent to pressure gages and pressure gage taps.

J. Install all gauges and meters.

3.02 SCHEDULES

A. Pressure Gage Schedule

LOCATION

Pumps

Pressure reducing valves

B. Pressure Gage Tapping Schedule

LOCATION

Pumps

Major coils - inlets and outlets

Control pressure-sensing locations

C. Stem Type Thermometer Schedule

LOCATION

After major coils

Domestic hot water supply and recirculation

D. Static Pressure and Filter Gage Schedule

LOCATION

Unitary filter sections

Dedicated Outdoor Air Units (Split)

Heat Pump Heat Recovery System

END OF SECTION

SECTION 23 0503
TESTING OF HVAC PIPING AND GAS PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Natural Gas Piping.

B. Refrigerant Piping.

1.02 RELATED SECTIONS

A. Section 23 1126 – Fuel Piping.

B. Section 23 6100 – Refrigerant Piping and Specialties.

1.03 REFERENCES

A. NFPA.

B. ARI.

C. International Mechanical Code.

1.04 REGULATORY REQUIREMENTS

A. Conform to 2021 International Mechanical Code.

B. Conform to International Fuel Code.

PART 2 PRODUCTS

(Not Used.)

PART 3 EXECUTION

3.01 GENERAL

A. Before final acceptance of all HVAC and gas piping systems, all systems must be tested in accordance with the schedule and prove to be free of leaks.
   1. Perform tests under observation of Architect/ Engineer.
   2. Remove, replace or satisfactorily repair defective work revealed by tests.
   3. Make piping repairs with new materials; caulking of screwed joints or pin holes is not permitted.
   4. Furnish all test equipment and materials for testing.
   5. Owner to furnish water for testing and flushing.

3.02 TESTING MATERIAL

A. Testing Medium:
   1. Hydrostatic Testing Medium: Clean water.
   2. Pneumatic Testing Medium: Clean compressed air.

B. Pressure Testing Gauges: ANSI B40.1, Grade AA; minimum 6-inch diameter dial with scale divisions equal or less than maximum allowable pressure drop.

3.03 TESTING SYSTEMS

A. All plumbing and fire protection piping to be tested as called for in Section 22 0503.

B. HVAC System Piping:
   1. Test with water and air.
   2. Water Test:
      a. When entire system is tested, tightly close all openings in pipes except highest opening and fill system with water to overflow point.

b. When system is tested in sections, tightly plug each opening except highest opening, fill each section with water and test each section with minimum 10-foot head of water; test each preceding section until entire system has been tested with minimum 10-foot head of water, except uppermost 10 feet of system.

c. Keep water in system or in portion under test, for minimum 30 minutes before inspection.

d. System must be tight at all joints.

3. Air Test:

a. When tests are made with air, apply minimum 30 psi with force pump and maintain for period of time indicated in Paragraph D with no leakage apparent.

b. Use mercury-column in making test.

C. Hydrostatic and Pneumatic Testing Requirements:

1. Hydrostatic and pneumatic tests apply to piping indicate as scheduled is Paragraph D.
2. Pressure to be raised gradually to given value; then block off tight at source.
3. Allowable Pressure Drop: Maximum amount scheduled during corresponding minimum time interval.

a. Visually examine all joints during test.

4. Upon successful completion and test approval, relieve piping of pressure, drain, put into normal operation except for potable water to be sterilized before placing in service.

D. Hydrostatic and Pneumatic Testing Schedule:

Service	Normal Hydrostatic Work Pressure psig	Pneumatic Test Pressure psig	Maximum Allowable Test Pressure psig	Minimum Pressure Drop psi	Test Time Hours
1. Fuel					
Natural Gas	To 10	---	30	0	4
2. Miscellaneous					
Refrigeration	To 290	---	300	0	4

3.04 CLEANING AND ADJUSTING

A. Cleaning: Thoroughly clean all parts of the piping installation at completion of work.

1. Remove grease, metal cutting and sludge from all equipment, pipes, valves all fittings.
2. Repair all stoppages, discoloration or other damage to finish, furnishings or parts of building that are due to Contractor's failure to properly clean piping system.
3. Remove and clean all flow control devices.

B. Adjusting:

1. Adjust all valves and other parts of work for quiet operation.
2. Adjust control devices for proper operation.
3. Demonstrate to Architect/Engineer satisfactory operation following adjustment.
4. Readjust or replace all items not functioning properly.

END OF SECTION

SECTION 23 0529
SUPPORTS AND ANCHORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Pipe and equipment hangers and supports.

B. Inserts.

C. Equipment bases and supports.

D. Sleeves and seals.

E. Flashing and sealing equipment and pipe stacks.

1.02 RELATED SECTIONS

A. Section 22 0503 - Plumbing Piping.

B. Section 23 0548 - Vibration Isolation.

C. Section 23 0701 - Piping Insulation.

D. Section 23 1126 - Fuel Piping.

E. Section 23 3400 - Power Ventilators.

F. Section 23 6100 - Refrigerant Piping and Specialties.

G. Section 23 7413 – Dedicated Outdoor Air Units (Split)

H. Section 23 8201 – Terminal Heat Transfer Units - Electric

I. Section 23 8310 – Heat Pump Heat Recovery System.

1.03 REFERENCES

A. American Society of Mechanical Engineers:
   1. ASME B31.1 – Power Piping.
   2. ASME B31.9 – Building Services Piping.

B. ASTM International:
   1. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.
   2. ASTM E814 – Standard Test Method for Fire Tests of Through Penetration Fire Stops.
   3. ASTM F708 – Standard Practice for Design and Installation of Rigid Pipe Hangers.
   4. ASTM E1966 – Standard Test Method for Fire-Resistive Joint Systems.

C. American Welding Society:
   1. AWS D1.1 – Structural Welding Code – Steel.

D. FM Global:
   1. FM – Approved Guide, A Guide to Equipment, Materials & Services Approved by Factory Mutual Research for Property Conservation.

E. Underwriters Laboratories, Inc.
   1. UL 263 – Fire Tests of Building Construction and Materials.
   2. UL 723 – Tests for Surface Building Characteristics of Building Materials.
   3. UL 1479 – Fire Tests of Through-Penetration Firestops.
   4. UL 2079 – Tests for Fire Resistance of Building Joint Systems.
   5. UL – Fire Resistance Directory.

1.04 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.05 SUBMITTALS

A. Submit under provisions of the General Requirements.

B. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.

C. Product Data: Provide manufacturers catalog data including load capacity.

D. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

E. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

1.06 REGULATORY REQUIREMENTS

A. Conform to 2015 International Mechanical Code for support of plumbing or hydronic piping.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

A. Plumbing Piping - DWV:
   1. Conform to ASME B31.9, ASTM F708.
   2. Hangers for Pipe Sizes 2 to 1 1/2 Inch: 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.

B. Plumbing Piping - Water:
   1. Conform to ASME B31.9, ASTM F708.
   2. Hangers for Pipe Sizes 2 to 1 1/2 Inch: Malleable iron, adjustable swivel, split ring.
   3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   4. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
   5. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
   6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll.
   8. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   9. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
   10. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast-iron roll.
   11. Vertical Support: Steel riser clamp.
   12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   13. 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.
   14. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
   15. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Refrigerant Piping:
   1. Conform to ASME B31.5, ASTM F708.
   2. Hangers for Pipe Sizes to 1-1/2 Inch: 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. Vertical Support: Steel riser clamp.
   7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   8. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

D. Fuel Gas Piping:
   1. Conform to ASME B31.2, ASTM F708.
   2. Hangers for Pipe Sizes 2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.
   3. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
   4. Hangers for Hot Pipe Sizes 6 Inches and Over: 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 Over: 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 Over: Welded steel bracket and wrought steel clamp.
   9. Wall Support for Hot Pipe Sizes 6 Inches and Over: 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 Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   12. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
   13. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.02 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

2.03 INSERTS

A. 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.

2.04 FLASHING

A. Metal Flashing: 26-gauge galvanized steel.

B. Metal Counterflashing: 22-gauge galvanized steel.

C. Lead Flashing:
   1. Waterproofing: 5 lb./sq. ft. sheet lead.
   2. Soundproofing: 1 lb./sq. ft. sheet lead.

D. Flexible Flashing: 47 mil. thick sheet compatible with roofing.

E. Caps: Steel, 22-gauge minimum; 16-gauge at fire resistant elements.

2.05 EQUIPMENT CURBS

A. Manufacturers:
   1. Thycurb.
   2. Pate.
   3. Owner Approved Equal.

B. Fabrication: Welded 18 gage galvanized steel shell and base, mitered 3-inch cant, 1½-inch thick insulation, factory installed wood nailer, 18-inches high, see architectural drawings for additional information.

2.06 SLEEVES

A. Sleeves for Pipes Through Non-Fire Rated Floors: 18 gage galvanized steel.

B. Sleeves for Pipes Through Non-Fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage galvanized steel.

C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.

D. Sleeves for Round Ductwork: Galvanized steel.

E. Sleeves for Rectangular Ductwork: Galvanized steel.

F. Firestopping Insulation: Glass fiber type, non-combustible.

G. Sealant: Acrylic.

2.07 MECHANICAL SLEEVE SEALS

A. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.08 FORMED STEEL CHANNEL

A. Product Description: Galvanized 12-gauge thick steel. With holes 1-1/2 inches on center.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.02 INSERTS

A. Provide inserts for placement in concrete formwork.

B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

3.03 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.

B. Install hangers to provide minimum 2-inch space between finished covering and adjacent work.

C. Place hangers within 12-inches of each horizontal elbow.

D. Use hangers with 1½-inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Provide copper plated hangers and supports for copper piping.

J. Design hangers for pipe movement without disengagement of supported pipe.

3.04 EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 4 inches thick and extending 6 inches beyond supported equipment.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports of steel members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.05 FLASHING

A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and calk, metal counter-flash, and seal.

C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36-inch sheet size. Fasten flashing to drain clamp device.

D. Seal floor, shower and mop sink drains watertight to adjacent materials.

E. Provide curbs for mechanical roof installations 18 inches minimum high above roofing surface. Flash and counter-flash with sheet metal; seal watertight. Attach counterflashing mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints. Roof curbs shall match roof pitch.

F. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.06 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

C. Extend sleeves through floors 1-1/2 inch above finished floor level. Caulk sleeves.

D. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and calk air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

E. Install chrome plated steel escutcheons at finished surfaces.

3.07 SCHEDULES

A. Copper and Steel Pipe Hanger Spacing:

PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	STEEL PIPE MAXIMUM HANGER SPACING Feet	COPPER TUBING HANGER ROD DIAMETER Inches	STEEL PIPE HANGER ROD DIAMETER Inches
1/2	5	7	3/8	3/8
3/4	5	7	3/8	3/8
1	6	7	3/8	3/8
1-1/4	7	7	3/8	3/8
1-1/2	8	9	3/8	3/8
2	8	10	3/8	3/8
2-1/2 (Note 2)	9	11	1/2	1/2
3	10	12	1/2	1/2
4	12	14	1/2	5/8
5	13	16	1/2	5/8
6	14	17	5/8	3/4
8	16	19	3/4	3/4

B. Plastic and Ductile Iron Pipe Hanger Spacing:

PIPE MATERIAL	MAXIMUM HANGER SPACING Feet	HANGER ROD DIAMETER Inches
ABS (All sizes)	4	3/8
FRP (All Sizes)	4	3/8
Ductile Iron (Note 2)		
PVC (All Sizes)	4	3/8

C. Note 1: Refer to manufacturer's recommendations for grooved end piping systems.

D. Note 2: 20 feet maximum spacing, minimum of one hanger for each pipe section close to joint behind bell. Provide hanger at each change of direction and each branch connection. For pipe sizes 6 inches and smaller, subjected to loadings other than weight of pipe and contents, limit span to maximum spacing for water service steel pipe.

END OF SECTION

SECTION 23 0548
VIBRATION ISOLATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Vibration isolation for piping and equipment.

B. Piping flexible connections.

1.02 RELATED EQUIPMENT SECTIONS

A. Section 22 0503 - Plumbing Piping.

B. Section 23 1126 – Fuel Piping.

C. Section 23 3400 - Power Ventilators.

D. Section 23 6100 - Refrigerant Piping and Specialties.

E. Section 23 7413 – Dedicated Outdoor Air Units (Split)

F. Section 23 8201 – Terminal Heat Transfer Units - Electric

G. Section 23 8310 – Heat Pump Heat Recovery System

1.03 REFERENCES

A. ASHRAE – Guide to Average Noise Criteria Curves.

1.04 QUALITY ASSURANCE

A. Maintain ASHRAE criteria for average noise criteria curves for all equipment at full load condition.

B. Provide all vibration isolators and equipment bases for Division 23 work from the product line of a single manufacturer, unless otherwise accepted by the Acoustics Consultant.

C. Select isolators to provide uniform deflections within acceptable tolerances when supporting the equipment approved for this project. Coordinate as required with the equipment manufacturers to accomplish this.

D. Provide engineering, isolator selection, site supervision, and inspection by manufacturer's personnel who shall perform these services directly. Alert the Engineer and Acoustics Consultant of isolator selections that may result in resonances with the equipment and structural systems they are intended to isolate. Replace isolators that upon installation are found to resonate with the supported equipment.

E. Provide complete isolation systems that include all elements recommended by the manufacturer for compliance with project requirements and applicable codes, ordinances, and regulations. Include all incidental products and materials required for a complete installation even if not explicitly described in the Construction Documents.

F. Install vibration isolation systems using skilled workers trained and licensed, as applicable, by the manufacturer for installations of the types used on this project. Upon completion of the Work, provide final inspection by the manufacturer's representative and submit to the Architect and Engineer a written report authored by the manufacturer's representative certifying the correctness of installation and compliance with the approved submittal data. Include tabulation of the static deflection expected under design and operating loads in comparison with the actual static deflection measured in the completed installations.

1.05 UNACCEPTABLE TYPES

A. Do not use housed spring mounts on this project. Mason models C, CI, and CS; Amber-Booth models XI and XK; Kinetics SL and SM; and similar mounts are not acceptable.

B. Do not use captive spring mounts on this project. Provide seismic restraint by means of resilient snubbers at the perimeter of the equipment or equipment base and not by mounts that combine isolation and snubbing functions. Mason model SSLFH, Amber-Booth model SWPQ, and similar mounts are not acceptable.

C. Do not use cork as an isolation material.

D. Do not use braided metallic hose for vibration isolation in piping unless fluid temperatures and pressures are beyond the service range of spherical elastomeric isolators.

1.06 SUBMITTALS

A. Submit manufacturer's data, shop drawings, and product performance certifications in accordance with the General Requirements.

B. Manufacturer's Data: Submit technical product data confirming that products comply with specified requirements:
   1. Illustrations and descriptions of components including, but not limited to isolators, equipment bases, thrust and seismic restraints, anchors, and accessories.
   2. Operation and maintenance instructions.

C. Shop Drawings
   1. Full-size details of isolation systems, including plan and section drawings indicating isolator and flexible connection locations and types, isolator and connector schedules, and installation details.
   2. Indicate substrate construction required of other subcontractors.

D. Color code legend for spring and elastomer capacities.

E. Samples: provide a sample of each type of isolator assembly used in the project. It is not necessary to submit samples of each spring capacity and pad hardness.

F. Calculations: submit manufacturer's engineer's calculations of loads, deflections, and natural frequencies for record only.

G. General Requirements for Vibration Isolation Mounts and Hangers: Provide catalog cut sheets, shop drawings, and other documents as necessary to describe the installation and its components.
   1. Springs:
      a. Equipment name and number
      b. Operating Weight of Equipment
      c. Lowest reciprocating or rotating speed
      d. Isolator type
      e. Weight supported by isolator
      f. Scheduled deflection
      g. Proposed deflection under operating load
      h. Natural Frequency
      i. Spring free height
      j. Spring operating height
      k. Spring solid height at coil bind
      l. Spring diameter
   2. Elastomeric Pads:
      a. Equipment name and number
      b. Operating Weight of Equipment
      c. Isolator type
      d. Weight supported by isolator
      e. Pad bearing area
      f. Pad free height
      g. Pad operating height
      h. Scheduled deflection

i. Proposed deflection under operating load

j. Percent deflection

k. Natural Frequency

l. Hardness and compliance with AASHTO Bridge Bearing Neoprene quality standard

1.07 REGULATORY REQUIREMENTS

A. Conform to International 2015 Mechanical Code.

1.08 MANUFACTURER RESPONSIBILITIES

A. Manufacturer of vibration isolation equipment shall have the following responsibilities:
   1. Determine vibration isolation sizes and locations.
   2. Provide piping and equipment isolation systems as scheduled or specified.
   3. Guarantee specified isolation system deflection.
   4. Provide installation instruction, drawings and field supervision to assure proper installation and performance.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers listed below have demonstrated an ability to comply with specifications for vibration isolation products similar to those required for this project. However, specific products made by the listed manufacturers do not all comply with the requirements of this specification. Subject to the requirement for a single manufacturer and the restrictions regarding unacceptable types of isolators, the products of the following manufacturers are acceptable sources for this project:
   1. Mason Industries, Inc.
   2. Kinetics Noise Control.
   3. Amber-Booth Company, Inc.
   4. PSI-Thunderline/Link-Seal.
   5. Ductmate Industries, Inc.

2.02 SPRING REQUIREMENTS

A. Provide steel springs with static deflections equal to or greater than those shown on the Construction Documents. Submittals based on rated deflections will be rejected.

B. Unless otherwise noted, size springs to provide a natural frequency of not more than 3 Hertz. Where spring deflections called out in the Construction Documents exceed those required to achieve a natural frequency of 3 Hz or less, the greater deflection will govern.

C. Size springs to provide not less than 50 percent additional travel to solid, coil-bind condition beyond the deflection under operating load.

D. Size springs so that diameter is not less than 80 percent of the height of the spring at operating load.

E. Provide springs that do not permanently deflect after loading to a solid, coil-bind condition.

F. Do not weld springs to other components of the isolator assembly unless specifically noted in the Submittals and accepted by the Acoustics Consultant.

G. Color code springs to allow positive identification after installation. Match color coding to the color code legend provided with the submittals.

2.03 ELASTOMER REQUIREMENTS

A. Provide elastomeric elements with static deflections equal to or greater than those shown on the Construction Documents. Submittals based on rated deflections will be rejected.

B. Provide neoprene elements with a maximum hardness of 40 durometer, Shore A rating, where possible, but in no case exceeding 50 durometer. Where deflections called out in the

construction documents exceed those required to achieve the specified natural frequencies, the greater deflection will govern.

C. Meet AASHTO Highway Bridge Specifications for all neoprene products installed in irretrievable locations and as required elsewhere in the Construction Documents.

2.04 ACCEPTABLE PRODUCTS

A. (Type A) Elastomeric Pads: 5/16-inch minimum thickness, waffled or ribbed neoprene. Where multiple layers are required to provide the specified deflections, interleave pads with 16-gauge steel shim plates. Size pads for deflection equal to 10 to 15 percent of unloaded height and provide pads of sufficient thickness to achieve the specified deflection. Provide load-distributing top plates if required for uniform loading. Acceptable products include
   1. Individual pads
      a. Mason W, SW, and Super W
      b. Kinetics NP
      c. Amber-Booth NR
   2. Neoprene/Steel composite pads:
      a. Mason WSW
      b. Amber-Booth SP-NR Style E

B. (Type B) Neoprene-In-Shear Base-Mounted Isolators: Provide double-deflection isolators with steel bottom plates with pre-drilled bolt holes for attachment to floor or base, a threaded steel insert at the top of the isolator for attaching the equipment, and friction surfaces at both top and bottom. Coat all metal surfaces with neoprene. Design isolators for 0.25 to 0.35 inches of deflection. Acceptable products include:
   1. Neoprene-In-Shear Isolators:
      a. Mason ND
      b. Kinetics RD
      c. Amber-Booth RVD

C. (Type D) Restrained Open Spring Base-Mounted Isolators: Provide built-in adjustable spring restraints for equipment with operating weight greater than weight upon installation to prevent equipment from deflecting (or rising) when the additional weight is applied (or removed in the future). Provide isolators as specified for Type C but with restraint studs and adjustable nuts. Provide ½ inch minimum clearance around the restraint studs. Use bridge-bearing quality neoprene for elastomeric friction pads at chillers and cooling towers. Acceptable products include:
   1. Restrained Base Mounted Isolators:
      a. Mason SLR
      b. Kinetics FLS
      c. Amber-Booth CT

D. (Type F) Spring Hangers: Provide spring of the general characteristics specified in Paragraph 2.2, above in a rigid steel hanger box. Seat spring in a molded neoprene cup with steel washer reinforcing. Mold neoprene element with a rod isolation bushing that prevents rigid contact between hanger rod and housing from vertical through an angular deflection of not less than 15 degrees in any direction. For ductwork hung by straps, provide hangers with eyes on the top and bottom to allow for bolting to the straps. Acceptable products include:
   1. Spring hangers:
      a. Mason types 30 and W30

E. (Type G) Spring/Elastomer-in-Series Hangers: Provide neoprene-in-shear element of 1¼-inch minimum thickness and a spring of the general characteristics specified above. Seat spring in a molded neoprene cup with steel washer reinforcing. Mold neoprene element with a rod isolation bushing that prevents rigid contact between hanger rod and housing from vertical through an

angular deflection of not less than 15 degrees in any direction. Design neoprene for .25 to .35-inch minimum static deflection at rated load. Do not directly stack the spring and neoprene isolator elements. For ductwork hung by straps, provide hangers with eyes on the top and bottom to allow for bolting to the straps. Acceptable products include:

1. Spring/Elastomer-in-Series Hangers:
    a. Mason 30N
    b. Kinetics SRH
    c. Amber-Booth BSRA

F. (Type H) Pre-compressed Spring/Elastomer-in-Series Hangers: Provide built-in adjustable spring restraints for equipment with operating weight greater than weight upon installation to prevent equipment from deflecting (or rising) when the additional weight is applied (or removed in the future). Provide isolators pre-compressed with restraint mechanisms that can be released to free the spring when subjected to its operational load. Provide an integral scale to indicate amount of deflection. For ductwork hung by straps, provide hangers with eyes on the top and bottom to allow for bolting to the straps. Acceptable products include:

1. Pre-compressed Spring/Elastomer-in-Series Hangers:
    a. Mason PC30N
    b. Amber-Booth PBSRA

G. (Type N) Isolation Roof Curbs: Provide vibration isolation bases for curb-mounted rooftop equipment. Base assemblies must provide a natural frequency of 3 Hertz or below. Provide laterally-stable springs as otherwise specified above and bearing on ¼ inch neoprene pads. Provide resilient snubbers not less than ¼ inch thick to limit lateral deflection under wind loads. Flashing required to shed water may not affect the performance of the isolation system under any combination of design loads. Use flexible EPDM membrane for closure between isolation base and fixed curb. Acceptable products include:

1. Isolation Roof Curbs:
    a. Mason RSC

H. (Type P) Flexible Neoprene Piping Connectors: Provide flanged twin-sphere or threaded single-sphere isolators with Kevlar cord and peroxide-cured EPDM body with steel rings embedded in flanges to prevent pull-out. Connectors must accept elongation, compression, axial, and transverse motion. Select materials to suit system temperature, pressure, and fluid type. Do not use control rods or cables to limit extension of the isolator. Use twin-sphere isolators for pipes 2 inches to 14 inches in diameter. Single-sphere isolators may be used for pipes less than 2 inches and greater than 14 inches in diameter. Straight-wall flexible connectors are not acceptable except for sewage ejector pumps. Acceptable products include:

1. Flexible Neoprene Piping Connectors:
    a. Mason types SFDEJ, SFDCR, and SFU

I. (Type Q) Flexible Duct Connections: Provide Hypalon-coated, woven fiberglass, flameproof fabric (24 oz. per square yard), serviceable from -40°F to 250°F. Acceptable products include:

1. Ductmate Pro-Flex

J. (Type S) Elastomeric Isolators for Mounting Bolts: Provide neoprene grommets, bushings, and washers for all bolts used to secure isolators to floors and housekeeping slabs and for all snubbers. Size bolt holes and washers to accommodate grommets, sleeves, and bushings and to preclude contact between rigid components that would cause bridging between isolated elements and the building structure. Baseplates for neoprene pads may be rigidly bolted to the floor or housekeeping slab if the bolts secure the baseplates only and do not continue through the neoprene to meet any other rigid material. Do not exceed 40 durometer, Shore A hardness. Acceptable products include:

1. Grommets (Washer Bushings):
    a. Mason HG
    b. E.A.R. Isodamp and C-1000

2. Bushings:
    a. Mason HLB
3. Washers:
    a. Mason HLW

PART 3 EXECUTION

3.01 INSTALLATION

A. General:
1. Install in accordance with manufacturer's written instructions. Vibration isolators must not cause any change of position of equipment or piping resulting in piping stresses or misalignment.
2. Mechanical equipment shall be isolated from the building structure by means of noise and vibration isolators as scheduled on the drawings.
3. All piping and vertical risers shall be isolated from the building structure by means of noise and vibration isolation guides and supports.
4. All piping and ductwork to be isolated shall freely pass through walls and floors without rigid connections. Penetration points shall be sleeved or otherwise formed to allow passage of piping or ductwork and maintain 3/4" to 1 1/4" clearance around the outside surfaces. This clearance space shall be tightly packed with fiberglass and caulked airtight after installation of piping or ductwork.
5. No rigid connections between equipment and building structure shall be made that degrades the noise and vibration isolation system herein specified.
6. Electrical circuit connections to isolated equipment shall be looped to allow free motion of isolated equipment.
7. The Contractor shall not install any equipment, piping or conduit which makes rigid contact with the "building" unless permitted in the Specification. Building includes, but is not limited to slabs, beams, columns, studs and walls.
8. Coordinate work with other trades to avoid rigid contact with the building. Inform other trades following work, such as plastering or electrical, to avoid any contact which would reduce the vibration isolation.
9. Bring to the Architect's attention prior to installation any conflicts with other trades which will result in unavoidable rigid contact with equipment or piping as described herein, due to inadequate space or other unforeseen conditions. Corrective work necessitated by conflicts after installation shall be at the responsible contractor's expense.
10. Bring to the Architect's attention any discrepancies between the specifications and field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated be discrepancies after installation shall be at the contractor's expense.
11. Obtain inspection and approval of any installation to be covered or enclosed, prior to such closure.
12. Correct, at no additional cost, all installation which are deemed defective in workmanship or materials.
13. For all isolated equipment, make connections of piping, ductwork, and conduit using flexible connections specified in this section. Make no connections to isolated equipment in a manner that would compromise the performance of the isolation systems.

3.02 MOUNTS AND HANGERS

A. Align mounts and hangers squarely above or below the equipment mounting holes to avoid introducing lateral loads and deflection.

B. Deflection requirements:
1. Verify installed isolators have deflections equal to or greater than deflections specified on the submittals.
2. Where multiple deflections apply to a single isolator (where a single isolator supports multiple isolated elements), the largest deflection governs.

3. Vary the size and/or hardness of isolators as required to yield equal deflection for all isolators supporting a single piece of equipment or length of pipe or ductwork. Consult manufacturer for direction when specified isolators do not yield required deflection and correct non-compliant isolators at no cost to the Owner.

C. Support equipment, ductwork, conduit and piping independently. Do not hang equipment, ductwork, piping, or conduit from other isolated equipment, ductwork, piping, or conduit.

D. Maintain 2 inches of clearance between isolated elements and walls, ceilings, and other non-isolated building components.

E. Isolate drain piping attached to vibration isolated equipment from rigid components of the building.

F. Limit stops must be inactive and out of contact with the isolator during equipment operation.

G. Adjust leveling bolts and hanger rod lengths so that equipment is level and in alignment with connecting ductwork and piping.

H. Restrained isolators may be substituted for unrestrained isolators at installer's option to simplify installation.

I. Isolate hanger rods passing through barrier ceilings with elastomeric sleeves or grommets or treat as resilient penetrations. Unless noted otherwise, locate equipment, piping, and ductwork below barrier ceilings.

3.03 SUSPENDED EQUIPMENT

A. Centrifugal Fans, Axial Fans, Cabinet/Suspended Unit heaters, Variable Refrigerant Flow Units and Fan Coil Units.
   1. Resiliently hang fans and fan coil units with Type G spring/elastomer-in-series isolators.
   2. Connect ductwork with Type Q flexible duct connections at inlet and discharge. Connect fan coil piping with Type P flexible piping connectors.
   3. Provide flexible electrical connections.

3.04 PIPING AND CONDUIT

A. Isolate all piping 1½ inches and larger in diameter that is connected to rotating or reciprocating equipment. Waste, vent, rainwater, and fire protection piping do not require isolation unless noted otherwise.

B. Select and install isolators in a manner that does not induce stresses in piping connections and does not result in misalignment of shafts and bearings. Maintain equipment and piping in rigid condition during installation. Do not transfer loads to the isolators until the installation is complete and under full operational load.

C. Isolator Types:
   1. For equipment isolated with supports and mounts containing springs, provide Type G or H spring/elastomer-in-series isolators for the first 4 horizontal piping hangers and associated vertical piping. Size these hangers to provide the same static deflection as the isolators for the equipment. For floor-supported piping, use Type D open spring base mount isolators and Type B neoprene-in-shear base mount isolators.
   2. Beyond the 4 hangers nearest the equipment, within the rooms housing the equipment and for a distance of not less than 50 feet from the equipment, provide Type F elastomeric hangers, and provide Type F hangers for all piping of 2-inch and smaller diameter and flow rates of greater than 4 feet per second.
   3. For pipes larger than 2-inch and not greater than 6-inch diameter throughout the building, support entire length on Type F elastomeric hangers, Type B neoprene-in-shear base supports, or Type A elastomeric pads between the piping and all points of contact between piping and non-isolated construction.
   4. For pipes larger than 6-inch diameter, support entire length throughout the building on Type H restrained spring/elastomer-in-series hangers, or Type D restrained spring/elastomer-in-series base mounts if supported from the floor.

D. Position isolators as high as possible in the hanger rod or strap assembly but not in direct contact with the building structure without manufacturer's written authorization. Provide 1-inch minimum clearance between isolator housing and structure above. Provide side clearance for hangers to allow full 360-degree rotation about the rod axis without contacting any object.

E. Parallel pipes can be hung together on a trapeze that is isolated from the structure. Isolator deflections must be equal to or greater than the greatest deflection required for the pipes if isolated individually. Do not mix isolated and non-isolated piping on the same trapeze.

F. Mount flexible connections for piping to equipment on the equipment side of shut-off valves.

G. Provide isolation of expansion tanks, air separators, and other devices similar to that provided for the attached piping.

3.05 DUCTWORK

A. Connect ductwork to equipment using Type Q flexible duct connections. Crimp fabric into duct flanges and seal airtight. Provide minimum separation of 6 inches between duct and equipment. Provide 1½ inch minimum slack or as required to accommodate full range of equipment and duct movement when subjected to maximum operating and lateral loads simultaneously without becoming taut. Utilize Type I thrust restraints to limit horizontal movement so that flexible connections do not become taut under any combination of operational loads. Mount flexible duct connections as close to equipment housings as practical but in no case beyond the first duct hanger.

B. Duct Connections at Rigidly-Mounted Fire Dampers: Provide Type Q flexible duct connections at each side of all fire dampers rigidly connected to the associated partition construction.

C. Isolator Types:
   1. Provide Type G spring/elastomer-in-series hangers for the first 3 duct hangers from the equipment. Provide hangers with minimum static deflection equal to that of the isolators supporting the equipment.
   2. Beyond the first 3 hangers, support all ductwork with short-side dimension less than 24 inches in the following manner:
      a. Support with Type F elastomeric hangers, Type B neoprene-in-shear base mounts, or Type A elastomeric pads at all points of support within 50 feet of the equipment to which the ductwork connects.
      b. Beyond 50 feet from the equipment, no isolation is required unless the ductwork is supported from construction enclosing Acoustically Sensitive or Critical Rooms, in which case provide the isolators described in (a).
   3. Beyond the first 3 hangers, support ductwork with short-side dimension of 24 inches or greater in the following manner:
      a. Support with Type H pre-compressed spring/elastomer-in-series hangers or Type E restrained open spring base mount isolators for a minimum of 50 feet from the equipment.
      b. If air velocities exceed 800 feet per minute, continue the isolators for an additional 50 feet.
      c. In addition to the requirements of (a) and (b), provide isolators for all ductwork with velocities exceeding 800 feet per minute that is supported from Acoustically Sensitive or Acoustically Critical Rooms or that is otherwise indicated on the Drawings to receive isolation.
   4. Vertical Ductwork:
      a. Support vertical ductwork for the 3 supports nearest the equipment with Type D open mount spring isolators with minimum deflections equal to or greater than the isolators supporting the equipment.
      b. Thereafter, support all vertical ductwork with short-side dimension less than 24 inches with Type B neoprene-in-shear isolators for not less than 50 feet from the equipment.

c. Support all vertical ductwork with short-side dimension equal to or greater than 24 inches and all other ductwork indicated on the Drawings to receive isolation on Type D open spring base mount isolators.

3.06 EQUIPMENT SCHEDULE

A. Equipment to be installed on isolators:
   1. Inline Exhaust fans.
   2. Suspended unit heaters.
   3. Air cooled condensing units.
   4. Variable Refrigerant Flow Units.
   5. Supplemental Cooling Units.

3.07 TESTING, EVALUATION AND ACCEPTANCE PROCEDURES

A. If it is found that the construction fails the acoustic test measurements or performance requirements identified in the Contract Documents, make changes necessary to meet the requirements identified in the Contract Documents and be responsible for the costs associated with performing all additional acoustical tests to verify the acoustic performance of the construction. Costs for additional acoustical testing shall include consulting fees at per hour rates in effect at the time of testing along with related expenses including, but not limited to, travel expenses and test equipment use charges.

END OF SECTION

SECTION 23 0553
MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe Markers.

1.02 RELATED SECTIONS

A. Section 22 0503 - Plumbing Piping.

B. Section 23 0700 - Ductwork Insulation.

C. Section 23 0701 - Piping Insulation.

D. Section 23 3100 - Ductwork.

1.03 REFERENCES

A. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.04 SUBMITTALS

A. Submit under provisions of the General Requirements.

B. Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer’s name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of the General Requirements.

B. Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 NAMEPLATES

A. Manufacturers:
   1. Laco.
   2. Seton.
   3. Brady.

B. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.02 TAGS

A. Manufacturers:
   1. Laco.
   2. Seton.
   3. Brady

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1½-inch diameter.

C. Chart: Typewritten letter size list in anodized aluminum frame.

2.03 STENCILS

A. Stencil: Paint for labeling will not be accepted. All labeling will be with manufacturers labels and letters.

2.04 PIPE MARKERS

A. Color: Conform to ASME A13.1.

B. 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.

C. Plastic Tape Duct Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil. thick, manufactured for direct burial service.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install plastic 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 stainless-steel chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in line pumps, may be identified with tags.

E. Identify control panels and major control components outside panels with plastic nameplates.

F. Identify valves in main and branch piping with tags (i.e.: CWS, CWR, HWS, HWR, BWS, BWR, HW, CW, etc.).

G. Identify air terminal units with numbered tags.

H. Tag automatic controls, instruments, and relays. Key to control schematic.

I. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping ¾-inch diameter and smaller. Identify service, flow direction. Install in clear view and align with axis of piping. 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.

J. Identify ductwork with plastic tape markers. Identify type of service i.e., supply, return, fresh air, exhaust relief and direction of flow. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

K. Identify calibrated balancing valves with tags indicating model number, flow rate, service and setting.

3.03 VALVE CHART AND SCHEDULE

A. Provide valve chart and schedule in aluminum frame with clear plastic shield. Install in location directed by Owner.

END OF SECTION

SECTION 23 0593
TESTING, ADJUSTING AND BALANCING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment and balancing of domestic hot water and tempered water circulating system loops for building system and domestic water heaters.

C. Measurement of final operating condition of HVAC systems.

1.02 RELATED SECTIONS

A. General Conditions - Starting of Systems.

B. Division 22 Specifications.

C. Division 23 Specifications.

1.03 REFERENCES

A. AABC - National Standards for Total System Balance.

B. ADC - Test Code for Grilles, Registers, and Diffusers.

C. ASHRAE 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air conditioning, and Refrigeration Systems.

D. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

E. SMACNA - HVAC Systems Testing, Adjusting, and Balancing.

1.04 SUBMITTALS

A. Submit under provisions of the General Requirements.

B. Submit name of adjusting and balancing agency for approval within 30 days after notice of award of Contract.

C. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

D. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.

E. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.

F. Provide reports in soft cover, letter size, 3 ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

G. Test Reports: Indicate data on AABC National Standards for Total System Balance forms.

H. BAS Contractor shall provide to the Test & Balance Company the following minimum information to help expedite the initial review of the HVAC System:
   1. Provide design drawings and specifications for balancing review.
   2. Layout the project on data sheets to further review the design for correct total air flows, pump flows, box sizes, etc.
   3. Provide sheet metal shop drawings.
   4. Provide equipment submittals.
   5. Provide control company submittals.

I. BAS Contractor shall submit complete background experience of his proposed Air and Water Testing and Balancing Contractor for Architect/Engineer’s approval before executing a contract for the work.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of the General Requirements.

B. Record actual locations of flow measuring stations, balancing valves and rough setting.

1.06 QUALITY ASSURANCE

A. The TAB firm shall be a sub-contractor to the Building Automation System (BAS) Contractor and have at least fifteen (15) years successful testing, adjusting and balancing experience on projects with testing and balancing requirements similar to those required for this project.

B. The TAB firm SHALL NOT BE THE ORIGINAL INSTALLER of the systems or equipment to be tested and shall not be related to any of the successful Mechanical Contractors. He shall otherwise act as an independent contractor that specializes in and whose business is limited to testing and balancing.

C. Work shall be done under the direct supervision of a qualified test and balance engineer employed by the TAB contractor. Instruments used by this contractor shall be accurately calibrated and maintained in good working order. If requested, tests shall be conducted in the presence of the Engineer or Owner.

1.07 SEQUENCING AND SCHEDULING

A. Sequence work to commence after completion of each system and schedule completion of work before Substantial Completion of Project. TBS Contractor shall coordinate his work with the Building Automation Contractor's work. Refer to the General Requirements for Sequence of Construction; TAB Contractor shall be required to start and stop work as required to accommodate phase sequence.

PART 2 PRODUCTS

(Not Used.)

PART 3 EXECUTION

3.01 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. Pumps are rotating correctly.
   13. Proper strainer baskets are clean and in place.
   14. Service and balance valves are open.
   15. All automatic and manual dampers are operable and fully open.

B. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.

C. Beginning of work means acceptance of existing conditions.

D. A construction deviation field report must be submitted noting deviation or deficiencies in the above, that would preclude or prevent system balance.

3.02 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

C. All HVAC systems must have manufacturers start-up reports prior to balancing systems.

3.03 INSTALLATION 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.

D. Balance to reduce/eliminate objectionable noise and note on report as required.

3.04 ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.05 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, exhaust fresh air quantities.

B. As a minimum, air system shall be prepared for testing in the following manner:
   1. Using pitot tube transverse, set main line dampers to deliver proper air volumes to zones.
   2. Using pitot tube transverse, set branch line dampers to deliver proper air volumes to air terminal outlets in each zone.
   3. Read CFM at each air terminal outlet and adjust to meet design requirements. Test and record items as listed in the following test procedures.
      a. Test and adjust fan RPM to design requirements.
      b. Test and record fan motor full amperes.
      c. Make pitot tube transverse of main air ducts and obtain design volume at fans.
      d. Test and record system static pressure at fan suction and discharge.
      e. Test and adjust system for design recirculated air volume.
      f. Test and adjust system for design outdoor air volume.
      g. Adjust main duct to proper design volume.
      h. Adjust zones to proper design volume supply and return/exhaust.
      i. Test and adjust each air terminal to within tolerance of 10 percent or as specified on the drawings.
   4. In cooperation with the control manufacturer's representative, who is responsible for setting adjustments of automatically operated dampers to operate as specified, indicated and/or noted, TAB agency shall check controls for proper operation and list controls requiring adjustment by control installer.
   5. Air terminal outlets shall be adjusted to minimize drafts. Adjust air patterns to match plans.

C. Adjust outside air automatic dampers, outside air, return air and exhaust dampers for design conditions.

D. Measure temperature conditions across outside air, return air and exhaust dampers to check leakage.

E. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling and at minimum air flow rate, full heating.

F. Measure building static pressure and adjust supply, return and exhaust air systems to provide required relationship between each to maintain approximately 0.02 inches positive static pressure near the building entries.

G. Provide and install replacement sheaves, belts, pulleys, etc. as required to meet final balancing requirements at 60 HZ on Variable Frequency Drive. Final system operation of units to be at 60HZ.

3.06 DUCT PRESSURE TESTS

A. The system ductwork shall be initially pre-tested by the Installing Contractor prior to certificate test by TAB Agency. Five (5) days advance written notice of these tests shall be given to the TAB Agency and Architect who in turn will notify other parties interested.
   1. Medium pressure ductwork (Above 2" SP) risers and branches shall be individually tested with a blower, orifice section and U-tube gauge board. The blower shall maintain 1-1/2 times system pressure specified by Mechanical Engineer with a loss of more than one percent capacity which are noisy or whistling shall be repaired by the installing contractor and a retest made upon notification of system readiness.
   2. Horizontal mains in the mechanical rooms and corridors shall be tested after all riser tests have been accepted and after risers have been connected to the mains but before the branches have been connected to the risers. Mains shall be tested as described for risers and branches.
   3. After the acceptance of the test by the Architect/Engineer, the branches shall be connected to the risers and the ductwork shall be released for insulation.

3.07 DOMESTIC WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages 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.

G. Verify that all control valves fail to safe position as specified.

H. Test all domestic circulating pumps scheduled and provide complete head sheets for operating conditions.

I. Balance circulating water flow rate through each water heater and storage tank.

J. Provide adequate time in the field for commissioning of the domestic hot water system and balancing of all components to achieve manufacturer’s recommended temperature rise through the heaters.

K. Balance water flow rate through each circuit of the domestic water system to provide instantaneous hot water at each plumbing fixture.

L. Test hot water temperature and flow at three plumbing fixtures (minimum) in each circuit and record water hot supply temperature and a 5 second intervals until final temperature is reached.

M. Make all adjustments to the domestic water system as required to achieve no more than 10 seconds from opening a hot water tap to achieving final water temperature at any fixture.

3.08 SCHEDULES

A. Equipment Requiring Testing, Adjusting, and Balancing (Including but Not Limited to):

Electric Water Coolers

Plumbing Pumps

Terminal Heat Transfer Units

Fans

Air Coils

Air Inlets and Outlets

Air Filters

Terminal Units

Dedicated Outdoor Air Units (Packaged)

Packaged Rooftop Air Conditioning Units

Supplementary Air Conditioning Units – Unitary Ceiling

Desiccant Dehumidifiers

Heat Pump Heat Recovery System

B. Report Forms

1. Title Page:
    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
    e. Project location
    f. Project Architect
    g. Project Engineer
    h. Project Contractor
    i. Project altitude
    j. Report date
2. Summary Comments:
    a. Design versus final performance
    b. Notable characteristics of system
    c. Description of systems operation sequence
    d. Summary of outdoor and exhaust flows to indicate amount of building pressurization
    e. Nomenclature used throughout report
    f. Test conditions

3. Instrument List:
    a. Instrument
    b. Manufacturer
    c. Model number
    d. Serial number
    e. Range
    f. Calibration date
4. Electric Motors:
    a. Manufacturer
    b. Model/Frame
    c. HP/BHP
    d. Phase, voltage, amperage; nameplate, actual, no load
    e. RPM
    f. Service factor
    g. Starter size, rating, heater elements
    h. Sheave Make/Size/Bore
5. V Belt Drive:
    a. Identification/location
    b. Required driven RPM
    c. Driven sheave, diameter and RPM
    d. Belt, size and quantity
    e. Motor sheave diameter and RPM
    f. Center to center distance, maximum, minimum, and actual
6. Cooling Coil Data:
    a. Identification/number
    b. Location
    c. Service
    d. Manufacturer
    e. Air flow, design and actual
    f. Entering air DB temperature, design and actual
    g. Entering air WB temperature, design and actual
    h. Leaving air DB temperature, design and actual
    i. Leaving air WB temperature, design and actual
    j. Air pressure drop, design and actual
7. Water Heating Coil Data:
    a. Identification/number
    b. Location
    c. Service
    d. Manufacturer
    e. Air flow, design and actual
    f. Entering air temperature, design and actual
    g. Leaving air temperature, design and actual
    h. Air pressure drop, design and actual

8. Air Moving Equipment
    a. Location
    b. Manufacturer
    c. Model number
    d. Serial number
    e. Arrangement/Class/Discharge
    f. Air flow, specified and actual
    g. Return air flow, specified and actual
    h. Outside air flow, specified and actual
    i. Total static pressure (total external), specified and actual
    j. Inlet pressure
    k. Discharge pressure
    l. Sheave Make/Size/Bore
    m. Number of Belts/Make/Size
    n. Fan RPM
9. Return Air/Outside Air Data:
    a. Identification/location
    b. Design air flow
    c. Actual air flow
    d. Design return air flow
    e. Actual return air flow
    f. Design outside air flow
    g. Actual outside air flow
    h. Return air temperature
    i. Outside air temperature
    j. Required mixed air temperature
    k. Actual mixed air temperature
    l. Design outside/return air ratio
    m. Actual outside/return air ratio
10. Exhaust Fan Data:
    a. Location
    b. Manufacturer
    c. Model number
    d. Serial number
    e. Air flow, specified and actual
    f. Total static pressure (total external), specified and actual
    g. Inlet pressure
    h. Discharge pressure
    i. Sheave Make/Size/Bore
    j. Number of Belts/Make/Size
    k. Fan RPM

11. Duct Traverse:
    a. System zone/branch
    b. Duct size
    c. Area
    d. Design velocity
    e. Design air flow
    f. Test velocity
    g. Test air flow
    h. Duct static pressure
    i. Air temperature
    j. Air correction factor
12. Duct Leak Test:
    a. Description of ductwork under test
    b. Duct design operating pressure
    c. Duct design test static pressure
    d. Duct capacity, air flow
    e. Maximum allowable leakage duct capacity times leak factor
    f. Test apparatus
        1) Blower
        2) Orifice, tube size
        3) Orifice size
        4) Calibrated
    g. Test static pressure
    h. Test orifice differential pressure
    i. Leakage
13. Terminal Unit Data:
    a. Manufacturer
    b. Type, constant, variable, single, dual duct
    c. Identification/number
    d. Location
    e. Model number
    f. Size
    g. Minimum static pressure
    h. Minimum design air flow
    i. Maximum design air flow
    j. Maximum actual air flow
    k. Inlet static pressure
14. Air Distribution Test Sheet:
    a. Air terminal number
    b. Room number/location
    c. Terminal type
    d. Terminal size

e. Area factor
f. Design velocity
g. Design air flow
h. Test (final) velocity
i. Test (final) air flow
j. Percent of design air flow

15. Domestic Hot Water Circulation Pump:
    a. Identification
    b. Manufacturer
    c. Size/model
    d. Impeller
    e. Service
    f. Design flow rate, pressure drop, BHP
    g. Actual flow rate, pressure drop, BHP
    h. Discharge pressure
    i. Suction pressure
    j. Total operating head
    k. Flow rate of circuit setters or balancing fittings
    l. Pressure drop across circuit setters or balancing fittings

END OF SECTION

SECTION 23 0700
DUCTWORK INSULATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Ductwork insulation.

B. Duct liner.

C. Insulation jackets.

1.02 RELATED WORK

A. Section 23 0553 - Mechanical Identification.

B. Section 23 3100 - Ductwork.

1.03 REFERENCES

A. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

B. ASTM C553 - Mineral Fiber Blanket and Felt Insulation.

C. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

D. ASTM E84 - Surface Burning Characteristics of Building Materials.

E. ASTM E96 - Water Vapor Transmission of Materials.

F. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

1.04 SUBMITTALS

A. Submit under provisions of the General Requirements.

B. Product Data: Provide product description, list of materials and thickness for each service and locations.

C. Contractor shall review all shop drawings prior to submitting them for Architect/Engineer's review. Contractor shall stamp each shop drawing to certify that he has reviewed it. Engineer will not check any shop drawings that contractor has not stamped with his review certification.

1.05 REGULATORY REQUIREMENTS

A. Conform to 2021 International Mechanical Code and Energy Code with all amendments and requirements of the local regulating authority.

1.06 QUALITY ASSURANCE

A. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84.

1.07 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this Section with minimum three years’ experience.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of the General Requirements.

B. Deliver materials to site in original factory packaging, labeled with manufacturer's density and thickness.

C. Contractor shall store all materials shipped to the site in a protected area. If material is stored outside of the building it must be stored off the ground a minimum of 6 inches set on 6 x 6 planks and/or wood pallets. All material must be completely covered with waterproof tarps or visqueen. All ductwork will have the ends closed to keep out dirt and other debris. No equipment will be allowed to be stored on the site unless it is sitting on wood planks and completely protected with weatherproof covers.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics and insulation cements.

PART 2 PRODUCTS

2.01 GLASS FIBER, FLEXIBLE DUCT WRAP (TYPE A)

A. Acceptable Manufacturers:
   1. Owens Corning Corp.
   2. CertainTeed Corp.
   3. Knauf Fiberglass.
   4. Manville.

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. R Value: ASTM C518, 5.7 at 75 degrees F.
   2. Maximum Service Temperature: 250 degrees F.
   3. Maximum Moisture Absorption: 0.20 percent by volume.
   4. Density: 1.0 lb./cu. ft.
   5. Thickness: 1-1/2 inch.

C. Vapor Barrier Jacket:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Transmission: ASTM E96; 0.04 perm.
   3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber-based adhesive.

E. Tie Wire: Annealed steel, 16-gauge.

2.02 GLASS FIBER, RIGID DUCT WRAP (TYPE B)

A. Acceptable Manufacturers:
   1. Owens Corning Corp.
   2. CertainTeed Corp.
   3. Knauf Fiberglass.
   4. Manville.

B. Insulation: ASTM C612; rigid, noncombustible board with ASJ facing and ASJ tape.
   1. K Value: ASTM C518, 0.23 at 75 degrees F.
   2. Maximum Service Temperature: 250 degrees F.
   3. Maximum Moisture Absorption: 0.20 percent by volume.
   4. Density: 3.0 lb./cu. ft.
   5. Thickness: 2-inch.

C. Vapor Barrier Jacket:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Transmission: ASTM E96; 0.04 perm.
   3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber-based adhesive.

2.03 GLASS FIBER DUCT LINER, FLEXIBLE (TYPE C)

A. Acceptable Manufacturers:
   1. Owens Corning Corp.
   2. Knauf Fiberglass.
   3. Manville.
   4. Certain Teed Corp.

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. K Value: ASTM C518, 0.27 at 75 degrees F.
   2. Maximum Service Temperature: 250 degrees F.
   3. Density: 3.0 lb./cu. ft.
   4. EPA registered anti-microbial coating on air side.
   5. Maximum Velocity on Coated Air Side: 4,000 ft./min.

C. Adhesive:
   1. Waterproof fire-retardant type.

D. Mechanical Fasteners: Galvanized steel, self-adhesive pad or impact applied with press on head. Install in accordance with the requirements of SMACNA Standards. Compression of linear surface not to exceed 10% of thickness.

E. Liner shall be attached to sheet metal using adhesive covering 90% of the metal surface.

F. Coat edge of upstream end of liner with adhesive.

OCTAVE BAND CENTER FREQUENCY						
THICKNESS	125	250	500	2000	4000	5000
1 Inch	0.09	0.19	0.48	0.65	0.83	0.9
2 Inch	0.22	0.47	0.76	0.89	0.91	0.95

2.04 EXTERIOR JACKET

A. Thickness: 14 mils (mm).

B. Finish: Natural aluminum, embossed.

C. Equal to Venture Clad.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that ductwork has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed and dry.

3.02 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Insulated ductwork conveying air below ambient temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Continue insulation through walls, sleeves, hangers and other duct penetrations.
   4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections and expansion joints.

C. Insulated ductwork conveying air above ambient temperature:
   1. Provide with standard vapor barrier jacket.
   2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

D. External Duct Insulation Application:
   1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket; vapor tight.
   2. Install without sag on underside of ductwork. Use adhesive and mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
   3. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
   4. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
   5. Supply and return air ductwork routed on exterior roof of building shall be internally and externally insulated. Provide exterior jacket over exterior insulation as indicated above.

6. Exterior Applications: Provide vapor barrier jacket. Insulate fittings and joints with insulation of like materials and thickness as adjoining ductwork and finish with glass mesh reinforced vapor barrier cement. Cover with jacket with seams located on bottom side of horizontal ductwork.

E. Duct and Plenum Liner Applications:
   1. Adhere insulation with adhesive for 90 percent coverage.
   2. Secure insulation with mechanical liner fasteners. Refer to SMACNA Standards for spacing.
   3. Seal and smooth joints.
   4. Seal liner surface penetrations with adhesive.
   5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

F. All insulation shall be installed neatly in a workman like manner in strict accordance with manufacturer's instructions.

3.03 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.04 GLASS FIBER DUCTWORK INSULATION SCHEDULE

TYPE DUCTWORK	THICKNESS INCHES	TYPE
All rectangular supply and return ductwork	1”	C
Relief and transfer ducts	1”	C
Exhaust ducts	1”	C
Outdoor air intake ductwork/plenums	2”	B
All concealed round low pressure rectangular supply and return ducts	1-1/2”	A
Desiccant Dehumidifier System(s): All rectangular and round supply and return ductwork	1-1/2”	A
All ductwork located in exterior of building or uncondi- tioned duct/attic space, supply, and return*.	1” 3”	C B

*Provide exterior jacket for all ductwork located above roof.

END OF SECTION

SECTION 23 0701
PIPE INSULATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. All plumbing piping jackets and accessories.

B. Refrigerant Piping and Accessories.

C. All piping saddles.

1.02 RELATED SECTIONS

A. Section 22 0503 - Plumbing Piping.

B. Section 23 0529 - Supports and Anchors.

C. Section 23 0553 - Mechanical Identification.

D. Section 23 6100 – Refrigerant Piping and Specialties.

1.03 REFERENCES

A. ANSI/ASTM C195 - Mineral Fiber Thermal Insulation Cement.

B. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.

C. ASTM C449 - Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

D. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

E. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

F. ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation.

G. ASTM C585 - Inner and Outer Diameters and Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).

H. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.

I. ASTM D1667 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Closed Cell Foam).

J. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.

K. ASTM E84 - Surface Burning Characteristics of Building Materials.

L. ASTM E96 - Water Vapor Transmission of Materials.

1.04 REGULATORY REQUIREMENTS

A. Conform to 2021 International Mechanical Code and 2021 International Energy Conservation Code.

1.05 SUBMITTALS

A. Submit under provisions of the General Requirements.

B. Product Data: Provide product description, list of materials and thickness for each service and locations.

C. Submit manufacturer's installation instructions under provisions of the General Requirements.

D. Contractor shall review all shop drawings prior to submitting them for Architect/Engineer's review. Contractor shall stamp each shop drawing to certify that he has reviewed it. Engineer will not check any shop drawings that Contractor has not stamped with his review certification.

1.06 QUALITY ASSURANCE

A. Materials: Flame spread/fuel contributed/smoke developed rating of 25/50 or less in accordance with ASTM E84. Material shall not melt or drip when exposed to flame.

1.07 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this Section with minimum five years' experience.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of the General Requirements.

B. Store, protect and handling products under provisions of the General Requirements.

C. Deliver materials to site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Insulation Work:
   1. Maintain ambient temperatures and conditions for installation of insulation as required by manufacturers of insulation adhesives, mastics and insulation cements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Insulation:
   1. Manville Corporation.
   2. Knauf Fiberglass.
   3. CertainTeed Corp.
   4. Owens Corning Fiberglass.

B. Steel and Wood Insulation Protection Saddles:
   1. Acceptable Manufacturers:
      a. Grinnell.
      b. B-Line.
      c. Unistrut.

2.02 INSULATION MATERIALS

A. Glass Fiber Insulation (Type "A"):
   1. Insulation: ASTM C547; rigid molded, noncombustible.
      a. K Value: 0.29 at 75 degrees F.
      b. Minimum Service Temperature: 0 degrees F.
      c. Maximum Service Temperature: 850 degrees F.
      d. Maximum Moisture Absorption: 0.2 percent by volume.
   2. Vapor Barrier Jacket:
      a. ASTM C921; factory applied vapor retarder composed of a white draft facing out reinforced with glass fiber yarn and bonded to aluminized film (ASJ).
      b. Moisture Vapor Transmission: ASTM E96; 0.02 perm inches.
      c. Secure with factory applied self-sealing longitudinal laps and butt strips.
      d. Jacket Temperature Limit: Minus 20 to 150 degrees F.
   3. Vapor Barrier Lap Adhesive:
      a. Compatible with insulation.

4. Fittings (Concealed and Exposed):
    a. Insulate all fittings (plumbing and HVAC) with a minimum of two layers of precut blanket insulation.
    b. Insulation blanket thickness to equal K value of straight sections of insulation.
    c. Tie wire to be 18-gauge stainless steel with twisted ends.
    d. Jacket shall be a one-piece pre-molded high impact fitting 25/50 rated, off-white color, 10 mil. thick, brush on welding adhesive connections.
5. Insulating Cement/Mastic:
    a. Acceptable Manufacturers:
        1) Fibrex.
        2) Pabco.
        3) Manville.
    b. ASTM C195; hydraulic setting on mineral wool.

2.03 ELASTOMERIC CELLULAR FOAM (TYPE B):

A. Manufacturers:
1. Armstrong World Industries - Model AP Armaflex.
2. Halstead.
3. Rubatex.

B. Insulation: ASTM C534; flexible, cellular elastomeric, molded or sheet.
1. K Value: ASTM C177 or C518; 0.27 at 75 degrees F.
2. Minimum Service Temperature: -20 degrees F.
3. Maximum Service Temperature: 220 degrees F.
4. Maximum Moisture Absorption: ASTM D1056; 1.0 percent (pipe) by volume, 1.0 percent (sheet) by volume.
5. Moisture Vapor Transmission: ASTMA E96; 0.20 perm inches.
6. Maximum Flame Spread: ASTM E84; 25.
7. Maximum Smoke Developed: ASTM E84; 50.
8. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive:
1. Acceptable manufacturers:
    a. Armstrong - Model 520.
2. Air dried, contact adhesive, compatible with insulation.

2.04 JACKETS

A. PVC Plastic (Fittings and ALL Exposed Interior Piping – Below 12’-0”)
1. Jacket: ASTM C921, one-piece molded type fitting covers and sheet material, off-white color.
    a. Minimum service temperature: -40 degrees F.
    b. Maximum service temperature: 150 degrees F.
    c. Moisture vapor transmission: ASTM E96; 0.002 perm-inches.
    d. Maximum Flame Spread: ASTM E84; 25.
    e. Maximum Smoke Developed: ASTM E84; 50.
    f. Thickness: 10 mil.
    g. Connections: Brush on welding adhesive.

B. Aluminum Jacket: ASTM B209 (All exterior refrigerant piping serving air cooled condenser(s).
   1. Thickness: 0.016-inch sheet.
   2. Finish: Embossed.
   3. Joining: Longitudinal slip joints and 2-inch laps.
   4. Fittings: 0.016-inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8-inch-wide; 0.010-inch thick stainless steel.

PART 3 EXECUTION

3.01 INSULATION

A. Examination:
   1. Verify that piping has been tested before applying insulation materials.
   2. Verify that surfaces are clean, foreign material removed and dry. Flux to be removed from copper piping.

B. Installation:
   1. Install materials in accordance with manufacturer's instructions.
   2. On exposed piping, locate insulation and cover seams in least visible locations.
   3. All insulation to have a vapor barrier jacket (ASJ) with factory applied self-sealing longitudinal laps and butt strips.
   4. Support all piping with insulation protection saddles.
      a. Plumbing Piping:
         1) 2 Inch Pipe Size: Wood dowel with insulation shields.
         2) 3/4 Inch and Larger: High density pre-molded type with insulation shields or manufactured wood saddles.
      b. HVAC Hot Water Piping:
         1) 2 Inch to 2-1/2 Inch: High density pre-molded type with insulation shields.
         2) 3 Inch and Larger: Manufactured steel saddles welded to the pipe.
      c. HVAC Chilled Water Piping
         1) 3/4 Inch and Larger: Manufactured insulation wood saddles.
   5. Run insulation continuous through walls, floors, sleeves, pipe hangers and other pipe penetrations.
   6. Insulate all piping located behind chases.
   7. Insulate all piping installed inside cabinet unit heaters.
   8. Insulate entire system including fittings, valves, unions, flanges, strainers, expansion joints, pump bodies, chemical feeders, rolairtrols, chemical feed piping from pot feeders and separators.
   9. Insulate all pipe guides and anchors which have chilled water running through the pipe they support.
   10. Finish all insulation at supports, protrusions and interruptions.
   11. Seal all aluminum jackets outdoors air and water tight.
   12. 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.

3.02 INSULATION SCHEDULE

A. Plumbing and Mechanical Systems:

PIPING SYSTEMS	INSULATION TYPE	PIPE SIZES / INSULATION THICKNESS				
		½" to 1"	1¼" to 1½"	2" to 4"	5" & Larger	
A. Plumbing and Mechanical Systems:						
Domestic Hot Water Supply (HW)	A	1"	1"	2"	2"	
Domestic Hot Water Recirc. (HWC)	A	1"	1"	2"	2"	
Domestic Cold	A	1"	1"	2"	2"	
Refrigerant Liquid, Suction and Hot Gas	B	½"	¾"	¾"	---	(1)
Condensate Dew Drain Pipes	A	½"	½"	½"	½"	

(1) All Exterior Refrigerant Piping Shall Include Aluminum Jacket.

NOTE: All Exposed Interior Piping Below 12'-0" Shall Have PVC Jacket as Specified.

END OF SECTION

SECTION 23 0800

MECHANICAL SYSTEMS COMMISSIONING

PART 1 GENERAL

1.01 DESCRIPTION

A. The purpose of this section is to provide a guide for the Contractor/Seller to specify the Division 22 and Division 23 responsibilities in the commissioning process.

B. The systems to be commissioned are listed in the Contract Documents.

C. Commissioning requires the participation of Division 22 and Division 23 to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in Division 01. Division 22 and Division 23 shall be familiar with all parts of Division 01 and the commissioning plan issued by the CA and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

1.02 RELATED SECTIONS

A. Refer to Division 01 for a listing of all sections where commissioning requirements are found.

B. Refer to Division 01 for systems to be commissioned.

C. 22 3400 - PLUMBING EQUIPMENT

D. 22 4000 - PLUMBING FIXTURES

E. 22 4001 - PLUMBING SPECIALTIES

F. 23 0900 - INSTRUMENTATION AND CONTROL FOR HVAC

G. 23 0923 - DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

H. 23 0993 - SEQUENCE OF OPERATION

I. 23 3400 - POWER VENTILATORS

J. 23 3439 - DESTRATIFICATION FANS

K. 23 7413 - DEDICATED OUTDOOR AIR UNITS (SPLIT)

L. 23 8201 - TERMINAL HEAT TRANSFER UNITS – ELECTRIC

M. 23 8310 - HEAT PUMP HEAT RECOVERY SYSTEM

N. 23 8400 - GAS FIRED INFRA-RED HEATING EQUIPMENT

1.03 SUBMITTALS

A. Division 22 and Division 23 shall provide submittal documentation relative to commissioning as required in this Section Part 1.

1.04 RESPONSIBILITIES

A. Mechanical, Controls and TAB Contractors. The commissioning responsibilities applicable to each of the mechanical, controls and TAB Contractors of Division 22 and Division 23 are as follows (all references apply to commissioned equipment only):

1. Construction and Acceptance Phases

a. Include and itemize the cost of commissioning in the contract price.

b. Attend a commissioning scoping meeting and other meetings necessary to facilitate the commissioning process.

c. Contractors shall provide the Commissioning Act (CA) with normal cut sheets and shop drawing submittals of commissioned equipment.

d. Provide additional requested documentation, prior to normal O & M manual submittals, to the CA for development of start-up and functional testing procedures.

   1) Typically, this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up, and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent.

   2) The Commissioning Agent may request further documentation necessary for the commissioning process.

   3) This data request may be made prior to normal submittals.

e. Provide a copy of the O & M manuals and submittals of commissioned equipment, through normal channels, to the CA for review and approval.

f. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

g. Provide limited assistance to the CA in preparing the specific functional performance test procedures required. Sub-Contractors shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.

h. Develop a full start-up and initial check out plan using manufacturers start-up procedures and the pre-functional checklists from the CA for all commissioned equipment. Submit to CA for review and approval prior to startup.

i. During the startup and initial checkout process, execute the mechanical related portions of the pre-functional checklists for all commissioned equipment.

j. Perform and clearly document all completed startup and system operational checkout procedures, proving a copy to the CA.

k. Address current A/E punch list items before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.

l. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem solving.

m. Perform functional performance testing under the direction of the CA for specified equipment. Assist the CA in interpreting the monitoring data, as necessary.

n. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, Engineer and Architect and retest the equipment.

o. Prepare O & M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.

p. Prepare redline as-built drawings for all drawings and final as-builds for Contractor-generated coordination drawings.

q. Provide training of the Owner’s operating personnel as specified.

r. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

2. Warranty Period
    a. Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
    b. Correct deficiencies and make necessary adjustments to O & M manuals and as-built drawings for applicable issues identified in a seasonal testing.

B. Mechanical Contractor. The responsibilities of the HVAC mechanical Contractor, during construction and acceptance phases in addition to those listed in (A) are:
    1. Provide startup for all HVAC equipment.
    2. Assist and cooperate with the TAB Contractor and CA by:
        a. Putting all HVAC equipment and systems into operation and continuing the operation during each working day of TAB and commissioning, as required.
        b. Including costs of sheaves and belts that may be required by TAB.
        c. Providing test holes in ducts and plenums where directed by TAB to allow air measurements and air balancing. Providing an approved plug.
        d. Providing temperature and pressure taps according to the Construction Documents for TAB and commissioning testing.
    3. Install a P/T plug at each water sensor that is an input point to the control system.
    4. List and clearly identify on the as-built drawings the locations of all airflow stations.
    5. Prepare a preliminary schedule for Division 22 and Division 23 pipe and duct system testing, flushing, and cleaning, equipment start-up and TAB start and completion for use by the CA. Update the schedule as appropriate.
    6. Notify the Engineer or CA, depending on protocol, 5 working days prior to the time scheduled when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and TAB will occur. Be responsible to notify the Engineer or CA, ahead of time, when commissioning activities not yet performed or not yet scheduled will delay construction. Be proactive in seeing that commissioning processes are executed and that the CA has the scheduling information needed to efficiently execute the commissioning process.

C. Mechanical Contractor. The responsibilities of the HVAC mechanical Contractor, during construction and acceptance phases in addition to those listed in (A) are:
    1. Controls Contractor. (As Sub-Contractor to the Mechanical Contractor) The commissioning responsibilities of the controls Contractor, during construction and acceptance phases in addition to those listed in (A) are:
        a. Sequence of Operation Submittals. The Controls Contractor’s submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in the specifications. They shall include:
        b. An overview narrative of the system (1 or 2 paragraphs) generally describing its purpose, components, and function.
        c. All interactions and interlocks with other systems.
        d. Detailed delineation of control between any packaged controls and the building automation system, listing what points the BAS monitors only and what BAS points are control points and are adjustable.
        e. Written sequences of control for packaged controlled equipment. (equipment manufacturers’ stock sequences may be included, but will generally require additional narrative).
        f. Start-up sequences.
        g. Warm-up mode sequences.

h. Normal operating mode sequences.

i. Unoccupied mode sequences.

j. Shutdown sequences.

k. Capacity control sequences and equipment staging.

l. Temperature and pressure control: setbacks, setups, resets, etc.

m. Detailed sequences for all control strategies, e.g., economizer control, optimum start/stop, staging, optimization, demand limiting, etc.

n. Effects of power or equipment failure with all standby component functions.

o. Sequences for all alarms and emergency shut downs.

p. Seasonal operational differences and recommendations.

q. Initial and recommended values for all adjustable settings, set-points 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.

r. Schedules, if known.

s. All sequences shall be written in small statements, each with a number for reference. For a given system, numbers will not repeat for different sequence sections, unless the sections are numbered.

2. Control Drawings Submittal

a. The control drawings shall have a key to all abbreviations.

b. The control drawings shall contain graphic schematic depictions of the system and each component.

c. The schematics will include the system and component layout of any equipment that the control system monitors, enables, or controls, even if the equipment is primarily controlled by packaged or integral controls.

d. Provide a full points list with at least the following included in each point:

1) Controlled system.

2) Point abbreviation.

3) Point description.

4) Display unit.

5) Control point or set-point (Yes / No).

6) Monitoring point (Yes / No)

7) Intermediate point (Yes / No)

8) Calculated Point (Yes / No)

3. Key:

a. Point Description: DB temp, airflow, etc.

b. Control or Set-Point: Point that controls equipment and can have its set-point changed (OSA, SAT, etc.)

c. Intermediate Point: Point whose value is used to make a calculation which then controls equipment (space temperatures that are averaged to a virtual point to control reset).

d. Monitoring Point: Point that does not control or contribute to the control of equipment, but is used for operation, maintenance, or performance verification.

e. Calculated Point: “Virtual” point generated from calculations of other point values.

f. The Controls Contractor shall keep the CA informed of all changes to this list during programming and setup.

4. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls O & M manual submittal.

5. Assist and cooperate with the TAB Contractor in the following manner:

   a. Meet with the TAB Contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.)

   b. For a given area, have all required pre-functional checklists, calibrations, start-up and selected functional tests of the system completed and approved by the CA prior to TAB.

   c. Provide a qualified technician to operate the controls to assist the TAB Contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.

6. Assist and cooperate with the CA in the following manner:

   a. Execute the functional testing of the controls system as specified for the controls Contractor.

   b. Assist in the functional testing of all equipment specified to be commissioned.

   c. Execute all control system trend logs.

7. The controls Contractor shall prepare a written plan indicating in a step-by-step manner, the procedures that will be followed to test, checkout and adjust the control system prior to functional performance. At minimum, the plan shall include for each type of equipment controlled by the automatic controls:

   a. System name.

   b. List of devices.

   c. Step-by-step procedures for testing each controller after installation, including:

      1) Process of verifying proper hardware and wiring installation.

      2) Process of downloading programs to local controllers and verifying that they are addressed correctly.

      3) Process of performing operational checks of each controlled component.

      4) Plan and process for calibrating valve and damper actuators and all sensors.

      5) A description of the expected field adjustments for transmitters, controllers, and control actuators should control responses fall outside of expected values.

   d. A copy of the log and field checkout sheets that will document the process. This log must include a place for initial and final read values during calibration of each point and clearly indicate when a sensor or controller has “passed” and is operating within the contract parameters.

   e. A description of the instrumentation required for testing.

   f. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the CA and TAB Contractor for this determination.

8. Provide a signed and dated certification to the CA and Engineer upon completion of the checkout of each controlled device, equipment, and system prior to functional testing for each piece of equipment or system programming is complete as to all respects of the Contract Documents, except functional testing requirements.
9. Beyond the control points necessary to execute all documented control sequences, provide monitoring, control and virtual points as specified.
10. List and clearly identify on the as-built duct and piping drawings the locations of all static and differential pressure sensors (air, water and building pressure).

D. TAB Contractor: The duties of the TAB Contractor, in addition to those listed in (A) are:
1. Six weeks prior to starting TAB, submit to the Engineer the qualifications of the site technician for the project, including the name of the Contractors and facility managers of recent projects the technicians on which was lead. The Engineer will approve the site technician's qualifications for this project.
2. Submit the outline of the TAB plan and approach for each system and component to the CA, Engineer, and the controls Contractor six weeks prior to starting the TAB. This plan will be developed after the TAB has some familiarity with the control system.
3. The submitted plan will include:
    a. Certification that the TAB Contractor has reviewed the construction documents and the systems with the design engineers and Contractors to sufficiently understand the design intent for each system.
    b. An explanation of the intended use of the building control system. The controls Contractor will comment on feasibility of the plan.
    c. All field checkout sheets and logs to be used that list each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
    d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
    e. Final test reports forms to be used.
    f. Detailed step-by-step procedures for TAB work for each system and issue: terminal flow calibration (for each terminal type), diffusers proportioning, branch/sub-main proportioning, total flow calculations, rechecking, diversity issues, expected problems and solutions, etc. Criteria for using airflow straighteners or relocating flow stations and sensors will be discussed. Provide the analogous explanations for the waterside.
    g. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
    h. Details of how total flow will be determined (Air: sum of terminal flows via BAS calibrated readings or via hood readings of all terminal, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations. Water: pump curves, circuit setter, flow station, ultrasonic, etc.)
    i. The identification and types of measurement instruments to be used and their utmost recent calibration date.
    j. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and provide methods to verify this.
    k. Confirmation that TAB understands the outside air ventilation criteria under all conditions.
    l. Details of whether and how minimum outside air cfm will be verified and set, and for what level (total building, zone, etc.)

m. Details of how building static and exhaust fan/relief damper capacity will be checked.

n. Proposed selection points for sound measurements and sound measurement methods.

o. Details of methods for making any specified coil or other system plan capacity measurements.

p. Details of any TAB work to be done in phases (by floor, etc.). or of areas to be built out later.

q. Details regarding specified deferred or seasonal TAB work.

r. Details of any specified false loading of systems to complete TAB work.

s. Details of all exhaust fan balancing and capacity verifications, including any required room pressure differentials.

t. Details of any required interstitial cavity differential pressure measurements and calculations.

u. Plan for hand-written field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).

v. Plan for formal progress reports (scope and frequency).

w. Plan for formal deficiency reports (scope, frequency, and distribution).

4. A running log of events and issues shall be kept by the TAB field technicians. Submit hand-written reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests, and lists of completed tests to the CA and Engineer at least twice a week.

5. Communicate in writing to the controls Contractor all set point and parameter changes made or problems and discrepancies identified during TAB which affect the control system setup and operation.

6. Provide a draft TAB report within two weeks of completion. A copy will be provided to the CA. The report will contain a full explanation of the methodology, assumptions, and the results in a clear format with designations of all uncommon abbreviations and column headings. The report should follow the latest and most rigorous reporting recommendations by AABC, NEBB or ASHRAE Standard 111.

7. Provide the CA with any requested data, gathered, but not shown on the draft reports.

8. Provide a final TAB report for the CA with details, as in the draft.

9. Conduct functional performance tests and checks on the original TAB as specified for TAB in Section 23 05 93.

PART 2 PRODUCTS

2.01 TESTING EQUIPMENT

A. Division 22 and Division 23 shall provide all test equipment necessary to fulfill the testing requirements of this Division.

B. For additional requirements refer to Division 22 and Division 23.

PART 3 EXECUTION

3.01 START UP

A. The HVAC mechanical and controls Contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this section. Division 22 and Division 23 has start-up responsibility and is required to complete systems and subsystems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the commissioning agent or Owner.

B. Functional testing is intended to being upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CA and Engineer. Beginning system testing before full completion, does not relieve the Contractor from fully completing the system, including all pre-functional checklists as soon as possible.

3.02 TESTING, ADJUSTING AND BALANCING (TAB)

A. Refer to the TAB responsibilities in Part 1.2 above.

3.03 FUNCTIONAL PERFORMANCE TESTS

A. Functional Performance Test shall be provided for the following systems to be commissioned:
   1. All exhaust systems
   2. Air Curtains
   3. Destratification Fans
   4. Dedicated Outdoor Air Units (Packaged)
   5. Packaged Rooftop Air Conditioning Units
   6. Supplementary Air Conditioning Units – Unitary Ceiling
   7. Terminal Heat Transfer Units – Electric
   8. Air-Cooled Condensing Units
   9. Desiccant Dehumidifiers
   10. Heat Pump Heat Recovery System
   11. Gas Fired Infra-Red Heating Systems
   12. Domestic hot water heaters, pumps, and thermostatic mixing valves.

3.04 OPERATION AND MAINTENANCE (O & M) MANUALS

A. The following O & M manual requirements do not replace O & M manual documentation requirements elsewhere in these specifications.

B. Division 22 and Division 23 shall compile and prepare documentation for all equipment and systems covered in Division 22 and Division 23 and deliver this documentation to the CONTRACTOR for inclusion in the O & M manuals, according to this section, prior to the training of owner personnel.

C. The CA shall receive a copy of the O & M manuals for review.

D. Special Control System O & M Manual Requirements. In addition to documentation that may be specified elsewhere, the controls Contractor shall compile and organize at minimum the following data on the control system in labeled 3-ring binders with indexed tabs.
   1. Operation and Maintenance Manuals containing:
      a. Specific instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. These instructions shall be step-by-step. Indexes and clear

tabs of contents shall be included. The detailed technical manual for programming and customizing control loops and algorithms shall be included.

b. Full as-built set of control drawings (refer to Submittals section above for details.)

c. Full as-built sequence of operations for each piece of equipment.

d. Full points list. In addition to the updated points list required in the original submittals (Part 1 of this section), a listing of all rooms shall be provided with the following information for each room:

1) Floor.

2) Room number.

3) Room name.

4) Air handler unit ID.

5) Reference drawing number.

6) Air terminal unit tag ID.

7) Heating and/or cooling valve tag ID.

8) Minimum cfm.

9) Maximum cfm.

e. Full print out of all schedules and set points after testing and acceptance of the system.

f. Full as-built print out of software program.

g. Electronic copy on disk of the entire program for this facility.

h. Marking of all system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.

i. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.

j. Control equipment component submittals, parts lists, etc.

k. Warranty requirements.

l. Copies of all checkouts tests and calibrations performed by the Contractor (not commissioning tests).

2. The manual shall be organized and subdivided with permanently labeled tabs for each of the following data in the given order:

a. Sequences of operation.

b. Control drawings.

c. Points lists.

d. Controller / module data.

e. Thermostats and timers.

f. Sensors and DP switches.

g. Valves and valve actuators.

h. Dampers and damper actuators.

i. Program setups (software program printouts).

3. Field checkout sheets and trend logs should be provided to the CA for inclusion in the Commissioning Record Book.

E. Special TAB Documentation Requirements. The TAB will compile and submit the following with other documentation that may be specified elsewhere in the Specifications.

1. Final report containing an explanation of the methodology, assumptions, test conditions and the results in a clear format with designations of all uncommon abbreviations and column headings.
2. The TAB shall mark on the drawings where all traverse and other critical measurements were taken and cross-reference the location in the TAB report.

F. Review and Approvals. Review of the commissioning related sections of the O & M manuals shall be made by the A/E and by the CA.

3.05 TRAINING

A. The Contractor shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.

B. The CA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment or systems.

C. Mechanical Contractor. The mechanical contractor shall have the following training responsibilities:

1. Provide the CA with a training plan two-weeks before the planned training.
2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of HVAC equipment including, but not limited to pumps, boilers, furnaces, chillers, heat rejection equipment, air conditioning units, air handling units, fans, terminal units, controls and water treatment systems, etc.
3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer’s representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing Contractor or manufacturer’s representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment is required. More than one party may be required to execute the training.
6. The controls Contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
7. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O & M manuals for reference.
8. Training shall include:
    a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
    b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shutdown, seasonal changeover, and any emergency procedures.
    c. Discussion of relevant health and safety issues and concerns.

d. Discussion of warranties and guarantees.

e. Common troubleshooting problems and solutions.

f. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.

g. Discussion of any peculiarities of equipment installation or operation.

h. The format and training agenda in The HVAC Commissioning Process, ASHRAE Guideline 1-1989R, 1996 is recommended.

9. Hands-on training shall include start-up, operation in all modes possible, including manual, shutdown and any emergency procedures and preventative maintenance for all pieces of equipment.

10. The mechanical Contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.

11. Training shall occur after functional testing is complete, unless approved otherwise by the Project Manager.

D. Controls Contractor. The controls Contractor shall have the following training responsibilities:

1. Provide the CA with a training plan four-weeks before the planned training.

2. The controls contractor shall provide designated Owner personnel training on the control system in this facility. The intent is to clearly and completely instruct the Owner on all the capabilities of the control system.

3. The training will be tailored to the needs and skill-level of the trainees.

4. The trainers will be knowledgeable on the system and its use in buildings. For the on-site sessions, the most qualified trainer(s) will be used. The Owner shall approve the instructor prior to scheduling the training.

5. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operation, the system will be repaired or adjusted as necessary and the demonstration repeated.

6. The controls Contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

3.06 WRITTEN WORK PRODUCTS

A. Written work products of Contractors will consist of a start-up and initial checkout plan and a completed start-up, initial checkout, and pre-functional checklists.

END OF SECTION

SECTION 23 0900
INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Control panel enclosures.
   2. Thermostats/sensors.
   3. Control air dampers.
   4. Electric damper actuators.
   5. Input/output sensors.

B. Related Sections:
   1. Section 23 0993 - Sequence of Operations for HVAC Controls: Sequences of operation implemented using products specified in this section.
   2. Section 23 3300 - Duct Accessories: Product requirements for duct mounted thermometers. Installation requirements for dampers and other duct mounted products furnished in this section.
   3. Section 26 0503 - Wiring Connections: Execution requirements for electric connections specified by this section.

1.02 REFERENCES

A. Air Movement and Control Association International, Inc.:
   1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
   1. ASHRAE 62 - Ventilation for Acceptable Indoor Air Quality.

C. American Society of Mechanical Engineers:
   1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
   2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

D. ASTM International:
   1. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
   2. ASTM A536 - Standard Specification for Ductile Iron Castings.
   3. ASTM B32 - Standard Specification for Solder Metal.
   4. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
   5. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
   6. ASTM D2737 - Standard Specification for Polyethylene (PE) Plastic Tubing.

E. American Welding Society:
   1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

F. National Electrical Manufacturers Association:
   1. NEMA DC 3 - Residential Controls - Electrical Wall Mounted Room Thermostats.
   2. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

G. National Fire Protection Association:
   1. NFPA 72 - National Fire Alarm Code.
   2. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.

H. Underwriters Laboratories, Inc.:
   1. UL 1820 - Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics.

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Coordinate submittals with information requested in Section 23 09 93.

C. Product Data: Submit description and engineering data for each control system component. Include sizing as required.

D. Manufacturer's Installation Instructions: Submit installation requirements for each control component.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. System Installer Qualifications: The control system installation shall be by the same company as the Control System Manufacturer or a factory authorized installer.

B. Codes and Standards: Meet requirements of the City of Rockford, IL and all applicable standards and codes, except when more detailed or stringent requirements are indicated by the Contract Documents, including requirements of this Section.
   1. Underwriters Laboratories: Products shall be UL-916-PAZX listed.
   2. Federal Communications Commission -- Part J.
   3. ASHRAE/ANSI 135-1995 (BACnet / LonTalk)

C. All products used in this installation shall be new and the latest versions under manufacture provided they have been applied in similar installations for a minimum of 1 year. Spare parts shall be available for at least 7 years after completion of this contract.

D. Manufacturers offering multiple control lines shall use their latest technology and provide systems that natively support open protocols. BACnet MSTP, and/or BACnet IP.

1.05 SUBMITTALS

A. Contractor shall provide shop drawings and manufacturers' standard specification data sheets on all hardware and software to be provided.

B. Testing and Commissioning Reports and Checklists

C. Operating and Maintenance Manual – these shall be as-built versions of the submittal product data.

1.06 WARRANTY

A. Labor & materials for control system specified shall be warranted free from defects for a period of one (1) year after final completion acceptance by the Owner. Control System failures during the warranty period shall be adjusted, repaired, or replaced at no charge or reduction in service to the Owner. The Contractor shall respond to the Owner's request for warranty service within 24 hours during customary business hours.

1.07 SCOPE OF WORK

A. BAS/Control contractor will provide all standalone devices and wiring for a complete operating system.

B. The contractor is the control engineer for the project and shall design all control systems to operate in compliance with local code and in accordance with good control engineering practice.

C. Include all necessary labor and material as required for a complete, safe and stable control system whether specifically indicated in the contract documents or not. The contractor shall install all electrical control wiring and provide power to his controllers per the requirement of Division 26.

D. The control system shall provide complete control for all systems as indicated on the drawings and described in the specifications.

E. The controls contractor will provide all wells, dampers and flow devices for installation by mechanical contractor.

F. Field install all electronic controls on equipment (Exhaust Fans, etc.).

G. Controls for DOAS units and Rooftop units shall be provided with factory installed and wired by the equipment manufacturer, with BACnet MSTP interface. This contractor shall field install and wire all loose shipped control devices that come with the equipment, and include all necessary integration labor for communicating with the equipment to meet the specifications and sequences.

H. The control contractor shall provide complete control design, engineering and installation services for this project including:

   1. Control Engineering drawings for submittal and approval by the engineer, with as-built drawings upon completion.
   2. All controls wiring and installation for a complete and fully operational system.
   3. Wiring of loose controls and interlocks to make mechanical equipment complete and fully operational.
   4. Additional control devices, wiring and interlocks to make packaged equipment operate as described in the control sequences in both control and equipment specifications.
   5. Power to all controller and devices from nearest circuit breaker panel.
   6. Control system adjustments and commissioning to assure proper system performance and temperature control.

I. Provide all control materials installation and wiring as required to achieve the control sequence of operation and other requirements described in compliance with good engineering practice, as required whether specifically indicated or not.

J. Provide programmable controllers and network wiring as required to meet any portions of the specifications that require global control or monitoring”

1.08 COORDINATION

A. Coordinate location of thermostats and other exposed control sensors with plans and room details before installation. Final location approved by architect and/or Owner.

B. Coordinate equipment with Division 26 - Fire Alarm Section to achieve compatibility with equipment that interfaces with that system.

C. Coordinate equipment with Division 26 - Panelboard Section to achieve compatibility with starter control and annunciation devices.

D. Coordinate equipment with Division 26 - Motor Control Center Section to achieve compatibility with motor starters and annunciation devices.

1.09 EXTRA MATERIALS

A. Furnish two of each type of thermostat, humidistat, or exposed sensor.

1.10 REGULATORY REQUIREMENTS

A. Conform to 2021 International Mechanical Code.

B. Conform to 2021 (IECC) International Energy Conservation Code.

C. Conform to 2015 (IFGC) International Fuel Gas Code.

D. Conform to (NFPA) 2021 National Fire Protection Association 70 National Electrical Code.

E. Products: Listed and classified by Underwriter's Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 – PRODUCTS

2.01 CONTROL PANEL ENCLOSURES

A. Furnish for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gages, pilot lights, push buttons, and switches flush on cabinet panel face.

B. Construction: NEMA 250, general purpose utility enclosure with enameled finish face panel.

C. Covers: Continuous hinge, held closed by common key for all panels.

D. Enclosure Finish: Manufacturer's standard enamel.

2.02 THERMOSTATS

A. Room Thermostats/Sensors:

1. Room sensors shall be constructed for either surface or wall box mounting.
2. Room sensors shall be flush mounted stainless-steel plate with 10K Type II thermistor sensor only, setpoint to be adjusted via BAS, no occupancy override.

B. Line Voltage Thermostats:

1. Integral manual On/Off/Auto selector switch, single or two-pole.
2. Dead band: Maximum 2 degrees F.
3. Cover: Locking with concealed setpoint, without thermometer.
4. Load Motor capacity rating.

C. Outdoor Reset Thermostat:

1. Remote bulb or bimetal rod and tube type, proportioning action with adjustable throttling range, adjustable setpoint.
2. Scale range: -10 to 70 degrees F.

D. Immersion Thermostat: Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint and adjustable throttling range.

E. Air-stream Thermostats:
   1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint in middle of range and adjustable throttling range.
   2. Averaging service remote bulb element: 20 feet.
   3. Furnish with flange and shield.

F. Electric Low Limit Duct Thermostat
   1. Snap acting, double pole, single throw snap action contacts rated for 16 amps at 120 vac, manual reset switch which trips if temperature sensed across any 18 inches of bulb length is equal to or below setpoint.
   2. Bulb length: Minimum 20 feet.
   3. Provide one thermostat for every 20 sq. ft. of coil surface.

G. Outside Air Sensors
   1. Outside air sensors shall be designed to withstand the environmental conditions to which they will be exposed. They shall also be provided with a solar shield.
   2. Sensors exposed to wind velocity pressures shall be shielded by a perforated plate that surrounds the sensor element.
   3. Temperature transmitters shall be of NEMA 3R construction and rated for ambient temperatures.

H. Duct Mount Sensors
   1. Duct mount sensors shall mount in an electrical box through a hole in the duct, and be positioned so as to be easily accessible for repair or replacement.
   2. Duct sensors shall be insertion type and constructed as a complete assembly, including lock nut and mounting plate.
   3. For outdoor air duct applications, a weatherproof mounting box with weatherproof cover and gasket shall be used.

I. Averaging Sensors
   1. For ductwork greater in any dimension the 48 inches and/or where air temperature stratification exists, an averaging sensor with multiple sensing points shall be used.
   2. For plenum applications, such as mixed air temperature measurements, a string of sensors mounted across the plenum shall be used to account for stratification and/or air turbulence. The averaging string shall have a minimum of 4 sensing points per 12-foot-long segment.
   3. Capillary supports at the sides of the duct shall be provided to support the sensing strip.

2.03 CONTROL AIR DAMPERS

A. Performance: Test in accordance with AMCA 500.

B. Frames: Galvanized steel, welded or riveted with corner reinforcement.

C. Blades: Galvanized steel, maximum blade size 6 inches wide, 48 inches long, attached to minimum ½-inch shafts with set screws.

D. Blade Seals: Synthetic elastomeric or Neoprene mechanically attached, field replaceable.

E. Jamb Seals: Stainless steel spring.

F. Shaft Bearings: Graphite impregnated nylon sleeve, with thrust washers at bearings or Lubricant free, stainless steel, single row, ground, flanged, radial, anti-friction type with extended inner race.

G. Linkage Bearings: Graphite impregnated nylon.

H. Damper Leakage: Maximum leakage rate of 3.0 cfm per square foot at 1.0 inches wg pressure differential.

I. Maximum Pressure Differential: 6 inches wg.

J. Temperature Limits: - 40 to 200 degrees F.

K. Manufacturers:

1. Ruskin.
2. Greenheck.
3. TAMCO.

2.04 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.

B. Electric Operators:

1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch position potentiometer and 24 VDC, 24va transformer.
2. Manufacturer: Belimo.

C. Number: Sufficient to achieve unrestricted movement throughout damper range. Provide one damper operator for maximum 25 sq. ft damper section.

2.05 INPUT/OUTPUT SENSORS

A. Temperature:

1. Resistance temperature detectors with resistance tolerance of plus or minus 0.1 percent at 70 degrees F, interchangeability less than plus or minus 0.2 percent, time constant of 13 seconds maximum for fluids and 200 seconds maximum for air.
2. Use insertion elements in ducts not affected by temperature stratification or smaller than one square meter. Use averaging elements where larger or prone to stratification sensor length 8 feet or 16 feet as required.
3. Insertion elements for liquids shall be with stainless steel socket with minimum insertion length of 2-1/2 inches.
4. Outside air sensors: Watertight inlet fitting, shielded from direct rays of sun.

B. Static Pressure Sensors:

1. Unidirectional with ranges not exceeding 150 percent of maximum expected input.
2. Temperature compensates 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.

C. Equipment Operation Sensors:

1. Status Inputs for Fans/Pumps: Differential pressure switch with adjustable range of 0 to 5 inches w.g. (0 to 1250 Pa).
2. Status Inputs for Electric Motors: Current sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.

D. Damper Position Indication: Potentiometer mounted in enclosure with adjustable crank arm assembly connected to damper to transmit 0 – 100 percent damper travel

2.06 STATUS AND SAFETY SWITCHES

A. General Requirements.

1. Switches shall be provided to monitor equipment status, safety conditions, and generate alarms at the FMS when a failure or abnormal conditions occurs. Safety switches shall be provided with two sets of contacts and shall be interlock wired to shut down respective equipment.

B. Current Sensing Switches

1. The current sensing switch shall be self-powered with solid state circuitry and a dry contact output. It shall consist of a current transformer, a solid-state current sensing circuit, adjustable trip point, solid state switch, SPDT relay, and an LED indicating the on or off status. A conductor of the load shall be passed through the window of the device. It shall accept over-current up to twice its trip point range.
2. Current sensing switches shall be used for run status for fans, over-current up to twice its trip point range.
3. Current sensing switches shall be calibrated to show a positive run status only when the motor is operating under load. A motor running with a broken belt or coupling shall indicate a negative run status.

C. Air Filter Status Switches

1. Differential pressure switches used to monitor air filter status shall be of the automatic reset type with SPDT contacts rated for 2 amps at 120 VAC.
2. A complete installation kit shall be provided, including: static pressure tops, tubing, fittings, and air filters.
3. Provide appropriate scale range and differential adjustment for intended service.

D. Air pressure Safety Switches

1. Air pressure safety switches shall be of the manual reset type with SPDT contacts rated for 2 amps at 120 VAC.
2. Pressure range shall be adjustable with appropriate scale range and differential adjustment for intended service.

2.07 CABLE

A. Manufacturers:

1. Southwest Wire, 5950 Office Boulevard NE, Albuquerque, New Mexico 87109.
2. Windy City Wire. 832 South Central Avenue, Chicago, Illinois 60644.
3. Owner Approved Equal.

B. Wiring Standard:

1. Cable shall be 18 AWG wire, plenum rated, shield.
2. Color Coding (verify final color coding with Owner).
    a. N2 Bus - Blue
    b. Analog Input Cable - Yellow
    c. Analog Output Cable - Tan
    d. Binary Input Cable - Orange
    e. Binary Output Cable -Violet
    f. N1 Bus -Purple
    g. 24 VAC Cable -Gray
    h. Spare -White

i. Ethernet –CAT 5 -Purple

j. N2 E - Pink

PART 3 – EXECUTION

3.01 EXECUTION

A. Verify that conditioned power supply is available to control units and operator workstation.

B. Verify that duct, pipe, and equipment-mounted devices and wiring are installed before proceeding with installation.

3.02 INSTALLATION

A. Install equipment level and plumb.

B. Connect and configure equipment and software to achieve sequence of operation specified.

C. Verify location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation. Locate all 60 inches above the floor.

1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

D. The control contractor is responsible for making all systems complete and fully operational. Provide and install all transformers, relays, thermostats, and switches as required for a complete system whether specifically indicated on these plans or not.

E. Install automatic dampers according to Division 23 Section "Duct Accessories."

F. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.

G. Install labels and nameplates to identify control components according to Division 15 Section Mechanical Identification.

H. Install duct volume-control dampers according to Division 23 Sections specifying air ducts.

I. Install electronic cables according to Division 26 Section.

J. Install equipment, piping, wiring/conduit parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

K. Install all equipment in readily accessible location as defined by chapter 1 article 100, part A of the NEC. Control panels shall be attached to structural walls unless mounted in equipment enclosure specifically designed for that purpose.

L. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.

M. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

N. All electrical installation shall be in compliance with the NEC and Division 26 of this specification.

O. Install guards on thermostats in public areas, entrances, and as indicated on Drawings.

P. Install control panels adjacent to associated equipment on vibration free walls or freestanding supports. Use one cabinet for each system. Install engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face. Label with appropriate equipment or system designation.

3.03 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to Division 26.

B. Install building wire and cable according to Division 26.

C. Install signal and communication cable according to Division 26 Section.

1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
2. Install exposed cable in raceway.
3. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
4. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
5. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.

D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.04 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

1. Install piping adjacent to machine to allow service and maintenance.

B. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.05 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

1. Leak Test: After installation, charge system, and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove malfunctioning units, replace with new units, and retest.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment, and retest.
4. Calibration test electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.

B. Engage a factory-authorized service representative to perform startup service.

C. Replace damaged or malfunctioning controls and equipment.

1. Start, test, and adjust control systems.
2. Demonstrate compliance with requirements, including calibration and testing, and control sequences.
3. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

D. Verify controls as follows:

1. Verify software including automatic restart, control sequences, scheduling, reset controls, and occupied/unoccupied cycles.
2. Verify local control units including self-diagnostics.

3.06 WARRANTY

A. All components, parts and assemblies guaranteed against defects in material and workmanship for one (1) year in accordance with General Conditions and General Requirements of the Contract:

1. The one-year warranty on the entire control system shall begin after substantial completion, and acceptance by Owner, of the complete project.
2. Warranty response shall be within 24 hours of call and performed during regular working hours. M-F, 7AM-5PM.

B. Warranty services shall be provided by the installing controls contractor at no additional cost to the owner. The owner shall NOT be required to purchase additional services or contracts during the warranty period to receive complete warranty service as described herein.

C. Following procedures govern warranty period:

1. Within 15 days after total BAS acceptance by Owner and Architect/Engineer, BAS Contractor will initiate warranty period by transmitting to Owner and Architect/Engineer commencement notification in writing.
2. Within 30 days of end of warranty period, Control Contractor notifies Owner that one (1) year warranty is almost complete.

D. Control Contractor's warranty covers all service, labor and parts, incidental to contrived proper performance of Control System and devices during warranty period.

E. At completion of warranty, Control Contractor furnishes list of tasks recommended frequency of preventative maintenance and tools to perform tasks recommended.

END OF SECTION

SECTION 23 0923
DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.01 SUMMARY

A. Section includes control equipment and software.

B. Related Sections:

1. Section 23 09 00 - Instrumentation and Control for HVAC: Control system components.
2. Section 23 09 93 - Sequence of Operations for HVAC Controls: Sequences of operation implemented using products specified in this section.
3. Section 26 05 03 - Equipment Wiring Connections: Execution requirements for electric connections specified by this section.

1.02 REFERENCES

A. American National Standards Institute:

1. ANSI MC85.1 - Terminology for Automatic Control.

1.03 SYSTEM DESCRIPTION

A. Acceptable Manufacturers:

1. Distech.
2. Honeywell.
3. Johnson Controls.
4. Schneider Electric.
5. Siemens.

B. Building automation system shall be a Niagra / Tridium platform-based BACnet control system.

C. Automatic temperature controls field monitoring and control system using field programmable microprocessor-based units with communications to Building Automation and Control System.

D. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.

E. Provide computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.

F. Provide controls for air terminals, radiation, reheat coils, unit heaters, fan coils, rooftop units, etc. when directly connected to control units. Individual terminal unit control is specified in Section 23 09 00.

G. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories to operate mechanical systems, and to perform functions specified.

H. Provide installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

1.04 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate the following:
   1. Trunk cable schematic showing programmable control-unit locations and trunk data conductors.
   2. Connected data points, including connected control unit and input device.
   3. System graphics showing monitored systems, data (connected and calculated) point addresses, and operator notations. Submit demonstration diskette containing graphics.
   4. System configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
   5. Description and sequence of operation for operating, user, and application software.
   6. Use terminology in submittals conforming to ASME MC85.1.
   7. Coordinate submittals with information requested in Section 23 0993.

C. Product Data: Submit data for each system component and software module.

D. Manufacturer's Installation Instructions: Submit installation instruction for each control system component.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.05 CLOSEOUT SUBMITTALS

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for submittals.

B. 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. Submit data specified in "Submittals" in final "Record Documents" form.

C. Operation and Maintenance Data:
   1. Submit interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
   2. Submit keyboard illustrations and step-by-step procedures indexed for each operator function.
   3. Submit inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience, and with service facilities within 50 miles of Project.

B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.07 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.08 REGULATORY REQUIREMENTS

A. Conform to 2021 (IMC) International Mechanical C de.

B. Conform to 2021 (IBC) International Building Code.

C. Conform to 2021 (IFC) International Fire Code, excluding Chapter 4.

D. Conform to 2021 (IECC) International Energy Conservation Code.

E. Conform to 2021 (IFGC) International Fuel Gas Code.

F. Conform to (ICC) International Code Council Reference Standards.

G. Conform to (NFPA) 2014 National Fire Protection Association 70 National Electrical Code.

H. Products: Listed and classified by Underwriter's Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 OPERATOR INTERFACE

A. The operator interface shall be accessible via a web browser.

B. BAS Contractor to provide a user operator PC workstation with all required software, modes, Wi-Fi, etc., to be used as a dedicated operator interface.

2.02 CONTROL UNITS

A. Units: Modular in design and consisting of processor board with programmable RAM memory, local operator access and display panel, and integral interface equipment.

B. Control Units Functions:

1. Monitor or control each input/output point.
2. Completely independent with hardware clock/calendar and software to maintain control independently.
3. Acquire, process, and transfer information to operator station or other control units on network.
4. Accept, process, and execute commands from other control unit's or devices or operator stations.
5. Access both data base and control functions simultaneously.
6. Record, evaluate, and report changes of state or value occurring among associated points. Continue to perform associated control functions regardless of status of network.
7. Perform in stand-alone mode:
    a. Start/stop.
    b. Duty cycling.
    c. Automatic Temperature Control.
    d. Demand control via a sliding window, predictive algorithm.
    e. Event initiated control.
    f. Calculated point.
    g. Scanning and alarm processing.
    h. Full direct digital control.
    i. Trend logging.
    j. Global communications.
    k. Maintenance scheduling.

C. Input/output Capability:

1. Discrete/digital input (contact status).
2. Discrete/digital output.
3. Analog input.
4. Analog output.

5. Pulse input (5 pulses/second).
6. Pulse output (0-655 seconds in duration with 0.01-second resolution).

D. Monitor, control, or address data points. Include analog inputs, analog outputs, pulse inputs, pulse outputs, and discrete inputs/outputs. Furnish control units with minimum 30 percent spare capacity.

2.03 LOCAL AREA NETWORKS (LAN):

A. Provide communication between control units (NCU) over local area network (LAN). System must be capable of supporting Ethernet LAN between control units.

B. LAN Capacity: Not less than 60 stations or nodes.

C. Break in Communication Path: Alarm and automatically initiate LAN reconfiguration.

D. LAN Data Speed: Minimum 10 MB as an Ethernet.

E. Communication Techniques: Allow interface into network by multiple operation stations and by auto-answer/auto-dial modems. Support communication over telephone lines utilizing modems.

F. Transmission Median: Fiber optic or single pair of solid 24 gauge twisted, shielded copper cable.

G. Network Support: Time for global point to be received by any station, less than 3 seconds. Furnish automatic reconfiguration when station is added or lost. In event transmission cable is cut, reconfigure two sections with no disruption to system's operation, without operator intervention.

2.04 OPERATING SYSTEM SOFTWARE

A. Input/Output Capability from Operator Station:
1. Request display of current values or status in tabular or graphic format.
2. Command selected equipment to specified state.
3. Initiate logs and reports.
4. Change analog limits.
5. Add, delete, or change points within each control unit or application routine.
6. Change point input/output descriptors, status, alarm descriptors, and unit descriptors.
7. Add new control units to system.
8. Modify and set up maintenance scheduling parameters.
9. Develop, modify, delete, or display full range of color graphic displays.
10. Automatically archive select data even when running third party software.
11. Capability to sort and extract data from archived files and to generate custom reports.
12. Support two printer operations.
13. Alarm printer: Print alarms, operator acknowledgments, action messages, system alarms, operator sign-on and sign-off.
14. Data printer: Print reports, page prints, and data base prints.
15. Select daily, weekly, or monthly as scheduled frequency to synchronize time and date in digital control units. Accommodate daylight savings time adjustments.
16. Print selected control unit database.

B. Operator System Access: Via software password with minimum 30 access levels at work station and minimum 3 access levels at each control unit.

C. Data Base Creation and Support: Use standard procedures for changes. Control unit automatically checks workstation data base files upon connection and verifies data base match. Include the following minimum capabilities:
   1. Add and delete points.
   2. Modify point parameters.
   3. Change, add, or delete English language descriptors.
   4. Add, modify, or delete alarm limits.
   5. Add, modify, or delete points in start/stop programs, trend logs, and other items.
   6. Create custom relationship between points.
   7. Create or modify DDC loops and parameters.
   8. Create or modify override parameters.
   9. Add, modify, and delete applications programs.
   10. Add, delete, develop, or modify dynamic color graphic displays.

D. Dynamic Color Graphic Displays:
   1. Utilizes custom symbols or system supported library of symbols.
   2. Sixteen (16) colors.
   3. Sixty (60) outputs of real-time live dynamic data for each graphic.
   4. Dynamic graphic data.
   5. 1,000 separate graphic pages.
   6. Modify graphic screen refresh rate between 1 and 60 seconds.

E. Operator Station:
   1. Accept data from LAN as needed without scanning entire network for updated point data.
   2. Interrogate LAN for updated point data when requested.
   3. Allow operator command of devices.
   4. Allow operator to place specific control units in or out of service.
   5. Allow parameter editing of control units.
   6. Store duplicate data base for every control unit and allow down loading while system is on line.
   7. Control or modify specific programs.
   8. Develop, store, and modify dynamic color graphics.
   9. Data archiving of assigned points and support overlay graphing of this data using up to four (4) variables.

F. Alarm Processing:
   1. Off normal condition: Cause alarm and appropriate message, including time, system, point descriptor, and alarm condition. Select alarm state or value and alarms causing automatic dial-out.
   2. Critical alarm or change-of-state: Display message, stored on disk for review and sort, or print.
   3. Print on line changeable message, up to 60 characters in length, for each alarm point specified.
   4. Display alarm reports on video. Display multiple alarms in order of occurrence.
   5. Define time delay for equipment start-up or shutdown.
   6. Allow unique routing of specific alarms.

7. Operator specifies when alarm requires acknowledgment.
8. Continue to indicate unacknowledged alarms after return to normal.
9. Alarm notification:
10. Print automatically.
11. Display indicating alarm condition.
12. Selectable audible alarm indication.

G. Event Processing: Automatically initiate commands, user defined messages, take specific control actions or change control strategy and application programs resulting from event condition. Event condition may be value crossing operator defined limit, change of state, specified state, or alarm occurrence or return to normal.

H. Automatic Restart: Automatically start field equipment on restoration of power. Furnish time delay between individual equipment restart and time of day start/stop.

I. Messages:
1. Automatically display or print user-defined message subsequent to occurrence of selected events.
2. Compose, change, or delete message.
3. Display or log message at any time.
4. Assign any message to event.

J. Reports:
1. Manually requested with time and date.
2. Long term data archiving to hard disk.
3. Automatic directives to download to transportable media including floppy diskettes for storage.
4. Data selection methods to include data base search and manipulation.
5. Data extraction with mathematical manipulation.
6. Data reports to allow development of XY curve plotting, tabular reports (both statistical and summary), and multi-point timed based plots with not less than four (4) variables displayed.
7. Generating reports either normally at operator direction, or automatically under workstation direction.
8. Either manually display or print reports. Automatically print reports on daily, weekly, monthly, yearly or scheduled basis.
9. Include capability for statistical data manipulation and extraction.
10. Capability to generate four types of reports: Statistical detail reports, summary reports, trend graphic plots, x-y graphic plots.

K. Parameter Save/Restore: Store most current operating system, parameter changes, and modifications on disk or diskette.

L. Data Collection:
1. Automatically collect and store in disk files.
2. Daily electrical energy consumption, peak demand, and time of peak demand for up to electrical meters over 2-year period.
3. Daily consumption for up to 30 meters over a 2-year period.

4. Daily billable electrical energy consumption and time for up to 1024 zones over a 10-year period.
5. Archiving of stored data for use with system supplied custom reports.

M. Graphic Display: Support graphic development on work station with software features:
1. Page linking.
2. Generate, store, and retrieve library symbols.
3. Single or double height characters.
4. Sixty (60) dynamic points of data for each graphic page.
5. Pixel level resolution.
6. Animated graphics for discrete points.
7. Analog bar graphs.
8. Display real time value of each input or output line diagram fashion.

N. Maintenance Management:
1. Run time monitoring, for each point.
2. Maintenance scheduling targets with automatic annunciation, scheduling and shutdown.
3. Equipment safety targets.
4. Display of maintenance material and estimated labor.
5. Target point reset, for each point.

O. Advisories:
1. Summary containing status of points in locked out condition.
2. Continuous operational or not operational report of interrogation of system hardware and programmable control units for failure.
3. Report of power failure detection, time and date.
4. Report of communication failure with operator device, field interface unit, point and programmable control unit.

2.05 LOAD CONTROL PROGRAMS

A. General: Support inch-pounds and S.I. metric units of measurement.

B. Automatic Time Scheduling:
1. Self-contained programs for automatic start/stop/scheduling of building loads.
2. Support up to seven (7) normal day schedules, seven (7) "special day" schedules and two (2) temporary day schedules.
3. Special day’s schedule supporting up to 30 unique date/duration combinations.
4. Number of loads assigned to time program; with each load having individual time program.
5. Each load assigned at least 16 control actions for each day with 1-minute resolution.
6. Furnish the following time schedule operations:
a. Start.
b. Optimized Start.
c. Stop.
d. Optimized Stop.
e. Cycle.
f. Optimized Cycle.

7. Capable of specifying minimum of 30 holiday periods up to 100 days in length for the year.
8. Create temporary schedules.
9. Broadcast temporary "special day" date and duration.

C. Start/Stop Time Optimization:
1. Perform optimized start/stop as function of outside conditions, inside conditions, or both.
2. Adaptive and self-tuning, adjusting to changing conditions unattended.
3. For each point under control, establish and modify:
a. Occupancy period.
b. Desired temperature at beginning of occupancy period.
c. Desired temperature at end of occupancy period.

D. Night Setback/Setup Program: Reduce heating space temperature set point or raise cooling space temperature set-point during unoccupied hours; in conjunction with scheduled start/stop and optimum start/stop programs.

E. Calculated Points: Define calculations and totals computed from monitored points (analog/digital points), constants, or other calculated points.
1. Employ arithmetic, algebraic, Boolean, and special function operations.
2. Treat calculated values like any other analog value; use for any function where a "hard wired point" might be used.

F. Event Initiated Programming: Any data point capable of initiating event, causing series of controls in a sequence.
1. Define time interval between each control action between 0 to 3600 seconds.
2. Output may be analog value.
3. Provide for "skip" logic.
4. Verify completion of one action before proceeding to next action. When not verified, program capable of skipping to next action.

G. Direct Digital Control: Furnish with each control unit Direct Digital Control software so operator is capable of customizing control strategies and sequences of operation by defining appropriate control loop algorithms and choosing optimum loop parameters.
1. Control loops: Defined using "modules" are analogous to standard control devices.
2. Output: Paired or individual digital outputs for pulse width modulation, and analog outputs.
3. Firmware:
a. PID with analog or pulse-width modulation output.
b. Floating control with pulse-width modulated outputs.
c. Two-position control.
d. Primary and secondary reset schedule selector.
e. Hi/Low signal selector.
f. Single pole double-throw relay.
g. Single pole double throw time delay relay with delay before break, delay before make and interval time capabilities.
4. Direct Digital Control loop: Downloaded upon creation or on operator request. On sensor failure, program executes user defined failsafe output.
5. Display: Value or state of each of lines interconnecting DDC modules.

H. Fine Tuning Direct Digital Control PID or floating loops:
   1. Display information:
      a. Control loop being tuned.
      b. Input (process) variable.
      c. Output (control) variable.
      d. Set-point of loop.
      e. Proportional band.
      f. Integral (reset) Interval.
      g. Derivative (rate) Interval.
   2. Display format: Graphic, with automatic scaling; with input and output variable superimposed on graph of "time" versus "variable".

I. Trend logging:
   1. Each control unit capable of storing samples of control unit's data points.
   2. Update file continuously at operator assigned intervals.
   3. Automatically initiate upload requests and then stores data on hard disk.
   4. Time synchronize sampling at operator specified times and intervals with sample resolution of one minute.
   5. Co-ordinate sampling with specified on/off point- state.
   6. Display trend samples on workstation in graphic format. Automatically scale trend graph with minimum 60 samples of data in plot of time versus data.

2.06 HVAC CONTROL PROGRAMS

A. General:
   1. Support Inch-pounds and S.I. metric units of measurement.
   2. Identify each HVAC Control system.

B. Optimal Run Time:
   1. Control start-up and shutdown times of HVAC equipment for both heating and cooling.
   2. Base on occupancy schedules, outside air temperature, seasonal requirements, and interior room mass temperature.
   3. Start-up systems by using outside air temperature, room mass temperatures, and adaptive model prediction for how long building takes to warm up or cool down under different conditions.
   4. Use outside air temperature to determine early shut down with ventilation override.
   5. Analyze multiple building mass sensors to determine seasonal mode and worse case condition for each day.
   6. Operator commands:
      a. Define term schedule.
      b. Add/delete fan status point.
      c. Add/delete outside air temperature point.
      d. Add/delete mass temperature point.
      e. Define heating/cooling parameters.
      f. Define mass sensor heating/cooling parameters.
      g. Lock/unlock program.
      h. Request optimal run-time control summary.

i. Request optimal run-time mass temperature summary.
j. Request HVAC point summary.
k. Request HVAC saving profile summary.

7. Control Summary:
   a. HVAC Control system begin/end status.
   b. Optimal run time lock/unlock control status.
   c. Heating/cooling mode status.
   d. Optimal run time schedule.
   e. Start/Stop times.
   f. Selected mass temperature point ID.
   g. Optimal run-time system normal start-times.
   h. Occupancy and vacancy times.
   i. Optimal run time system heating/cooling mode parameters.
8. Mass temperature summary:
   a. Mass temperature point type and ID.
   b. Desired and current mass temperature values.
   c. Calculated warm-up/cool-down time for each mass temperature.
   d. Heating/cooling season limits.
   e. Break point temperature for cooling mode analysis.
9. HVAC point summary:
   a. Control system identifier and status.
   b. Point ID and status.
   c. Outside air temperature point ID and status.
   d. Mass temperature point ID and status.
   e. Calculated optimal start and stop times.
   f. Period start.

C. Supply Air Reset:
1. Monitor heating and cooling loads in building spaces, terminal reheat systems, single zone unit discharge temperatures.
2. Adjust discharge temperatures to most energy efficient levels satisfying measured load by:
   a. Raising cooling temperatures to highest possible value.
   b. Reducing heating temperatures to lowest possible level.
3. Operator commands:
   a. Add/delete fan status point.
   b. Lock/unlock program.
   c. Request HVAC point summary.
   d. Add/Delete discharge controller point.
   e. Define discharge controller parameters.
   f. Add/delete air flow rate.
   g. Define space load and load parameters.
   h. Request space load summary.

4. Control summary:
    a. HVAC control system status (begin/end).
    b. Supply air reset system status.
    c. Optimal run time system status.
    d. Heating and cooling loop.
    e. High/low limits.
    f. Deadband.
    g. Response timer.
    h. Reset times.
5. Space load summary:
    a. HVAC system status.
    b. Optimal run time status.
    c. Heating/cooling loop status.
    d. Space load point ID.
    e. Current space load point value.
    f. Control heat/cool limited.
    g. Gain factor.
    h. Calculated reset values.
    i. Fan status point ID and status.
    j. Control discharge temperature point ID and status.
    k. Space load point ID and status.
    l. Airflow rate point ID and status.

2.07 PROGRAMMING APPLICATION FEATURES

A. Trend Point:
    1. Output trend logs as line-graphs or bar graphs. Output graphic on terminal, with each point for line and bar graphs designated with a unique pattern or color, vertical scale either actual values or percent of range, and horizontal scale time base. Print trend logs up to 12 columns of one point/column.

B. Alarm Messages:
    1. Assign alarm messages to system messages including point's alarm condition, point's off-normal condition, totaled point's warning limit, hardware elements advisories.
    2. Output assigned alarm with "message requiring acknowledgment".
    3. Operator commands include define, modify, or delete; output summary listing current alarms and assignments; output summary defining assigned points.

C. Weekly Scheduling:
    1. Automatically initiate equipment or system commands, based on selected time schedule for points specified.
    2. Program times for each day of week, for each point, with one-minute resolution.
    3. Automatically generate alarm output for points not responding to command.
    4. Allow for holidays, minimum of 366 consecutive holidays.

5. Operator commands:
    a. System logs and summaries.
    b. Start of stop point.
    c. Lock or unlock control or alarm input.
    d. Add, delete, or modify analog limits and differentials.
    e. Adjust point operation position.
    f. Change point operational mode.
    g. Open or close point.
    h. Enable/disable, lock/unlock, or execute interlock sequence or computation profile.
    i. Begin or end point totals.
    j. Modify total values and limits.
    k. Access or secure point.
    l. Begin or end HVAC or load control system.
    m. Modify load parameter.
    n. Modify demand limiting and duty cycle targets.
6. Output summary: Listing of programmed function points, associated program times, and respective day of week programmed points by software groups or time of day.

D. Interlocking:
1. Permit events to occur, based on changing condition of one or more associated master points.
2. Binary contact, high/low limit of analog point or computed point capable of being used as master. Master capable of monitoring or commanding multiple slaves.
3. Operator commands:
    a. Define single master/multiple master interlock process.
    b. Define logic interlock process.
    c. Lock/unlock program.
    d. Enable/disable interlock process.
    e. Execute terminate interlock process.
    f. Request interlock type summary.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify conditioned power supply is available to control units and to operator workstation.

B. Verify field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.

3.02 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 workstation. Implement features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 23 09 93.

C. Install with 120 volts alternating current, 15-amp dedicated emergency power circuit to each programmable control unit.

D. Install conduit and electrical wiring in accordance with Section 26 05 03.

E. Install electrical material and installation in accordance with appropriate requirements of Division 26.

3.03 MANUFACTURER'S FIELD SERVICES

A. Start and commission systems. Allow adequate time for start-up and commissioning prior to placing control systems in permanent operation.

B. Furnish service technician employed by system installer to instruct Owner's representative in operation of systems plant and equipment for 2-day period.

C. Contractor’s test and startups shall be scheduled and documented in accordance with the project requirements.

3.04 DEMONSTRATION AND TRAINING

A. Furnish basic operator training for 3 persons on data display, alarm and status descriptors, requesting data, execution commands and log requests. Include a minimum of 16 hours instructor time. Furnish training on site.

B. Demonstrate complete and operating system to Owner.

C. Training of the Owner’s operating and maintenance personnel is required in cooperation with the Owner’s representative, provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems, the instruction shall be scheduled in coordination with the Owner’s representative after submission and approval of formal training plans.

END OF SECTION

SECTION 23 0993
SEQUENCE OF OPERATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. General HVAC alarm sequences.
   1. Exhaust fan control.
   2. Electric cabinet/wall/suspended unit heater control.
   3. Electric ceiling panel control.
   4. Electric duct coil/heater control.
   5. Smoke/fire detector shutdown.
   6. Dedicated Outdoor Air System (Split System).
   7. Heat pump heat recovery system control.
   8. Ceiling fan control.
   9. Gas-fired infra-red heating control.

1.02 RELATED WORK

A. Section 23 0900 – Instrumentation and Control for HVAC.

B. Section 23 0923 – Direct Digital Control System for HVAC.

C. Section 23 3400 – Power Ventilators.

D. Section 23 7413 – Dedicated Outdoor Air System (Split System).

E. Section 23 8201 – Terminal Heat Transfer Units – Electric.

F. Section 23 8310 – Pump Heat Recovery System.

G. Section 23 8400 – Gas-Fired Infra-Red Heating Equipment.

1.03 SYSTEM DESCRIPTION

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 system as specified in other sections.

1.04 SUBMITTALS

A. Submit under provisions of Division 1 General Requirements.

B. Submit diagrams indicating mechanical system controlled and control system components. Label with settings, adjustable range of control and limits. Include written description of control sequence.

C. Include flow diagrams for each control system, graphically depicting control logic.

D. Include draft copies of graphic displays indicating mechanical system components, control system components and controlled function status and value.

E. Contractor shall review shop drawings prior to submitting them for Architect/Engineer's review. Contractor shall stamp each shop drawing to certify that he has reviewed it. Engineer will not check any shop drawings that contractor has not stamped with his review certification.

1.05 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Division 1 General Requirements.

B. Accurately record actual setpoints and setting of controls, including changes to sequences made under submission of shop drawings.

PART 2 PRODUCTS

(Not Used.)

PART 3 EXECUTION

3.01 SCOPE OF WORK

A. This sequence of operation section is inclusive of all requirements of all Division 23 and specified related sections.

B. There is specific information in the other section of this specification that directly affects the scope of work required for this sequence of operation.

C. Any contradictory information/requirements between sections shall be interpreted to mean that the most stringent, safe, or costly requirement shall be included in the scope of work, unless identified by the BAS contractor, in writing, prior to bidding and specifically directed otherwise, in writing, by the Owner/Architect/Engineer.

D. Failure of the contractor to read and understand all sections of this specification and the contract documents shall not be grounds for any additional cost to the Owner for materials and labor required to meet the requirements of the contract documents.

E. BAS/Control contractor will provide all standalone devices and wiring for a complete operating system.

F. The contractor is the control engineer for the project and shall design all control systems to operate in compliance with local code and in accordance with good control engineering practice.

G. Include all necessary labor and material as required for a complete, safe, and stable control system whether specifically indicated in the contract documents or not. The contractor shall install all electrical control wiring and provide power to his controllers per the requirement of Division 26.

H. The control system shall provide complete control for all systems as indicated on the drawings and described in the specifications.

I. The controls contractor will provide all wells, dampers, and flow devices for installation by mechanical contractor.

J. Field install all electronic controls on equipment (Terminal Units, Exhaust Fans, etc.).

K. Controls for Dedicated Outdoor Air units and Package Rooftop units shall be provided with factory installed and wired by the equipment manufacturer, with LonTalk or BACnet MSTP interface. This contractor shall field install and wire all loose shipped control devices that come with the equipment, and include all necessary integration labor for communicating with the equipment to meet the specifications and sequences.

L. The control contractor shall provide complete control design, engineering and installation services for this project including:

   1. Control Engineering drawings for submittal and approval by the engineer, with as-built drawings upon completion.
   2. All controls wiring and installation for a complete and fully operational system.

3. Wiring of loose controls and interlocks to make mechanical equipment complete and fully operational.
4. Additional control devices, wiring and interlocks to make packaged equipment operate as described in the control sequences in both control and equipment specifications.
5. Power to all controller and devices from nearest circuit breaker panel.
6. Control system adjustments and commissioning to assure proper system performance and temperature control.

M. Provide all control materials installation and wiring as required to achieve the control sequence of operation and other requirements described in compliance with good engineering practice, as required whether specifically indicated or not.

N. Provide programmable controllers and network wiring as required to meet any portions of the specifications that require global control or monitoring”

3.02 SEQUENCE OF OPERATION

A. General HVAC Alarm Sequences: The Level One master controller and/or operator workstation shall initiate the following alarm sequence as required by the sequence of operation for each piece of equipment:
   1. Critical Alarm:
      a. Audible/visual alarm initiated at LAN based network master controller and LAN based workstation.
      b. Alarm is logged to history file and printed out at system printer.
      c. LAN based network master controller and/or LAN based workstation dials out to remote site and beings paging sequence of up to five persons pages or voice phone numbers and give a voice, number or alphanumeric message as defined by Owner until the system receives an acknowledgement from the respondent.
   2. Non-Critical Alarm:
      a. Visual alarm is initiated at LAN based network master controller and LAN based workstation.
      b. Alarm is logged to history file and printed out at system printer.
      c. After adjustable time-out (defined by Owner) initiate critical alarm sequences.

3.03 EXHAUST FAN CONTROL

A. Refer to exhaust fan schedule and mechanical/electrical coordination on contract documents for additional control requirements.

B. Controls contractor shall wire integral and/or remote motorized damper, where provided with exhaust fans, to open on fan start and close when fan stops.

C. Sequence with associated remote intake and/or exhaust damper(s).

D. Install and wire all loose devices, sensors, etc.

E. Provide fan status at BAS head end.

3.04 ELECTRIC CABINET/WALL/SUSPENDED UNIT HEATER CONTROL

A. Units’ fans shall cycle according to the wall mounted thermostat with guard. On a drop in temperature, the fan shall cycle on and the electric heating elements will be energized. When the thermostat setpoint is satisfied, the fan shall shut off.

B. Integral thermostat continues fan operation until element temperature falls below 100 degrees F.

C. See Section 23 8201 – Terminal Heat Transfer Units - Electric for additional requirements.

D. Install and wire all loose devices, sensors, etc. provided with equipment.

E. Sequence units with heat pump heat recovery system.

F. Units shall not operate above 65º F. (adj.).

3.05 ELECTRIC CEILING PANEL CONTROL

A. Space sensor modulates to maintain space temperature.

B. Sequence with VRF units when serving common areas. Panel to be “OFF” when VRF unit is in cooling mode.

C. See Section 23 8201 – Terminal Heat Transfer Units – Electric for additional requirements.

D. Install and wire all loose devices, sensors, etc. provided with equipment.

E. Units shall not operate above 65º F. (adj.).

3.06 DOAS ELECTRIC PRE-HEAT DUCT HEATER

A. Discharge air sensor shall modulate the electric coil/heater SCR controller, and fan coil, and supply fan, to maintain adjustable minimum discharge air temperature of 14ºF.

B. See Section 23 8201 – Terminal Heat Transfer Units – Electric for additional requirements.

C. Install and wire all loose devices, sensors, air flow switches, etc. provided with equipment.

D. Continue fan coil operation unit element temperature fall below 100-degrees F.

E. Sequence with DOAS.

3.07 SMOKE/FIRE DETECTOR SHUTDOWN

A. The electrical contractor will provide duct smoke detector in the supply of DOAS unit.

B. The Controls contractor shall wire duct detector to the fan starter and shut down associated fan.

3.08 DEDICATED OUTDOOR AIR SYSTEM (SPLIT SYSTEM)

A. See Section 23 7413 – Dedicated Outdoor Air System (Split System) for additional requirements.

B. Install and wire all loose devices, sensors, etc. provided with equipment.

C. Provide discharge air sensor to control discharge air temperature. Discharge air temperature shall be set at 72 def. F. (adjustable). Make-up air unit to run off its own integral controls/controller to maintain discharge air temperature.

1. Reset discharge air temperature up when outdoor air temperature drops below to 20 deg. F (adj.) or below. Provide user adjustable reset schedule.

D. DOAS unit to run only in “Occupied” mode.

3.09 HEAT PUMP HEAT RECOVERY SYSTEM CONTROL

A. See Section 23 8310– Heat Pump Heat Recovery System for requirements.

B. Install and wire all loose devices, sensors, etc. provided with equipment.

C. Sequence units with remote terminal (electric) unit (ERCP). Remote heating to be first source of heating.

3.10 CEILING FAN CONTROL

A. Install and wire all loose devices, sensors, air flow switches, etc. provided with equipment.

B. Coordinate location of fan controls with Owner.

3.11 GAS-FIRED INFRA-RED HEATING CONTROL

A. See Section 23 8400 – Gas-Fired Infra-Red Heating Equipment for requirement.

B. Provide space sensor to maintain space temperature. Space sensor in Garage to control IRH-1 through IRH-3. Space sensor on Mezzanine to control IRH-4.

C. Install and wire all loose devices, sensors, air flow switches, etc. provided with equipment.

END OF SECTION

SECTION 23 1126
FUEL PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Pipe and pipe fittings.

B. Valves.

C. Gas pressure reducing regulators.

D. Natural gas piping system.

1.02 RELATED SECTIONS

A. Section 22 3400 – Plumbing Equipment.

B. Section 23 0503 – Testing of HVAC Piping.

C. Section 23 0529 – Supports and Anchors.

D. Section 23 8400 – Gas Fired Infra-Red Heating Equipment.

1.03 REGULATORY REQUIREMENTS

A. Illinois State Plumbing Code, ISPC.

B. Building Officials and Code Administrators International, Inc., 2021 International Mechanical Code.

C. National Fire Protection Association, NFPA-54: Installation Code for Natural Gas Burning Appliances and Equipment.

D. National Electric Code, NEC, Spread of Fire Products of Combustion.

1.04 PROJECT RECORD DOCUMENTS

A. Submit under provisions of the General Requirements.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store and protect products under provisions of the General Requirements.

B. Deliver and store valves in shipping containers with labeling in place.

C. Contractor shall store all materials shipped to the site in a protected area. If material is stored outside of the building, it must be stored off the ground a minimum of six inches set on 6 x 6 planks and/or wood pallets. All material must be completely covered with waterproof tarps or visqueen. All piping will have the ends closed to keep out dirt and other debris. No equipment will be allowed to be stored on the site unless it is sitting on wood planks and is completely protected with weatherproof covers.

PART 2 PRODUCTS

2.01 NATURAL GAS PIPING, BURIED OUTSIDE THE BUILDING (UNLESS PROVIDED BY NICOR GAS)

A. Steel Pipe: ASTM A53 or A120, Schedule 40 black. Fitting: ASTM A234, forged steel welding type, with ANSI/AWWA C105 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape. Joints: ANSI/AWS D1.1, welded.

2.02 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53 or A120, Schedule 40 black. Fittings: ANSI/ASME B16.3, malleable iron or ASTM A2434, forged steel welding type. Joints: Screwed for pipe 1-1/2 inches and under (exposed and accessible); ANSI/AWS D1.1, welded, for pipe two inches and over and for 1-1/2 inches and under (concealed and inaccessible; above ceiling).

2.03 FLANGES, UNIONS AND COUPLINGS

A. Pipe Size 1-1/2 Inches and under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.

B. Pipe Size 2 Inches and over: 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping; neoprene gaskets for gas service; 1/16-inch-thick preformed neoprene.

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.04 ACCEPTABLE MANUFACTURERS - GAS COCKS

A. Stockham.

B. Eclipse, Inc.

C. Ladish Co.

2.05 GAS COCKS

A. Up to 2 Inches: Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends.

B. Over 2 Inches: Cast iron body and plug, non-lubricated, Teflon packing, flanged ends.

2.06 BELOW GRADE PIPING PROTECTION

A. Factory applied, ANSI/AWWA C105 polyethylene jacket, bonded to pipe surface with hot-applied thermo-plastic adhesive.

2.07 CONCRETE EQUIPMENT PADS

A. Provide 6-inch concrete pad for mounting new gas meter and service. Verify overall pad dimensions with NICOR.

2.08 FIRE AND SMOKE PENETRATION SEALANTS

A. Fire Seal:
   1. Seal penetrations of fire-rated walls, floors or ceilings by raceways for compliance with NEC 300-21.
      a. Acceptable Manufacturers:
         1) Dow Corning: Fire Stop.
         2) Nelson: Flameseal.
         3) T & B: Flameseal.
         4) 3M Co.: Fire Barrier.
      b. Fill void around raceways.
      c. Sleeves: Heavy wall Schedule 40 steel pipe, anchored to building construction and finished plumb with wall, ceiling or floor lines.

B. Thermal Seal:
   1. Seal penetrations of thermally insulated equipment, walls or rooms to prevent heat transfer.
   2. Dual exterior of raceway with fiberglass or other material compatible to equipment or room and approved by Architect/Engineer.
   3. Seal interior of raceway with duct sealing compound at entry to equipment or room.

C. Water Seal:
   1. Seal penetrations of perimeter walls or floors below grade to prevent entry of water; use materials compatible with wall or floor construction and approved by Architect/Engineer.
   2. Seal Penetrations of Roof: Sealed with flashings compatible with roof design and approved by roofing system manufacturer and Architect/Engineer.

2.09 PRESSURE REDUCING REGULATORS

A. Fisher Type S202
   1. Cast iron body, NPT screwed ends, aluminum spring case, lower diaphragm casing, union ring, seat ring, and disk holders, Nitrile disk, diaphragm, and O-ring, Neoprene closing cap gasket, Nylon stabilizer vent flappers, and internal relief.
   2. Maximum inlet pressure 125 psig, maximum outlet pressure 15 psig; outlet pressure setting 2 to 30-inches W.C.; temperature capabilities –20 deg F to 180 deg F.

B. Fisher Type 299H
   1. Cast iron body, NPT screwed ends, aluminum actuator casing and pilot spring case, Nitrile diaphragms, disks, and O-rings, aluminum orifice, valve stem, and disk holder, copper tubing with brass fittings, and external pressure registration.
   2. Maximum inlet pressure 150 psig, maximum outlet pressure 45 psig; outlet pressure setting 3.5 to 40-inches W.C.; temperature capabilities –20 deg F to 180 deg F.

C. Fisher Type S302
   1. Direct-operated, spring loaded regulators, cast iron body, NPT screwed ends, aluminum casing and spring case, Nitrile diaphragms, disks, and composition closing cap gasket, and internal relief.
   2. Maximum inlet pressure 150 psig, maximum outlet pressure 15 psig; outlet pressure setting 5 to 28-inches W.C.; temperature capabilities –20 deg F to 160 deg F.

D. Fisher Type S402
   1. Direct-operated, spring loaded regulators, cast iron body, NPT screwed ends, aluminum casing and spring case, Dacron-fabric reinforced Nitrile diaphragms, Delrin/nylon/nitrile orifice assembly, Nitrile O-ring, and internal relief.
   2. Maximum inlet pressure 125 psig, maximum outlet pressure 5 psig; outlet pressure setting 4.5 to 13-inches W.C.; temperature capabilities –20 deg F to 160 deg F.

PART 3 EXECUTION

3.01 SERVICE CONNECTIONS

A. Natural gas utility company shall provide new gas service as indicated on contract documents. Utility shall provide a new gas meter and / or regulator(s) on inlet side of meter as required to meet the buildings new pressure and capacity requirements. Contractor to provide all gas regulators on the discharge side of the meter.
   1. Owner will pay all utility connection and installation charges required for new service connection.

B. Contractor shall be responsible for installing from the leaving side of the meter, all gas piping, gas cocks, regulators, regulator vent piping, unions, hangers, supports and final connection to all new gas fired equipment.

C. Support all piping as called for in Section 23 0529, Supports and Anchors.

D. Run a vent line from each gas regulator, including the gas regulator at the gas meter, up through and/or above the roof and terminate with a goose neck a minimum of 18 inches above the roof. Provide insect screen on outlet of each vent pipe.

E. Install exterior gas piping on a minimum 4” sand bed approximately 30” below grade.

F. All gas piping in unfinished (exposed structure) areas to run exposed, tight to ceiling. All gas piping in finished (finished ceiling) areas to be run concealed, tight to structure above.
   1. All piping above inaccessible ceilings (i.e. drywall, plaster, etc.), buried in or under floor slabs or drops in walls or chases shall have welded or brazed joints, regardless of pipe size.
   2. All gas piping run on roof to be welded.

G. Install Schedule 40 steel pipe sleeves through all foundations, floors, walls and roofs. Each sleeve shall be sealed at both ends with one of the following:
   1. Fire Walls: Fire seal.
   2. Floors at Grade: Water seal.
   3. Floors Above Grade: Fire seal.
   4. Foundations and Outside Walls: Water seal.
   5. Walls (Not Fire walls): Thermal seal.

H. Gas piping mounted on roof shall be mounted on adjustable pipe stands. Mount on a maximum center line as called for on drawings.

3.02 PIPING PAINTING

A. General:
   1. Mechanical Contractor shall include painting all gas piping located throughout the building (interior and exterior) with hazard yellow.

B. Inspection:
   1. Inspect surfaces to receive a paint finish. Do not proceed until conditions are acceptable. Application of paint shall be construed as acceptance of the surface conditions.

C. Preparation:
   1. Prepare all surfaces to receive the finishes specified or indicated. Prepare surfaces as follows:
      a. Uninsulated Piping: Thoroughly clean off all oil, grease, dirt and foreign matter. Spot coat field connections, welds, soldered joints and burned and abraded portions with the same

END OF SECTION

SECTION 23 3100
DUCTWORK

PART 1 GENERAL

1.01 WORK INCLUDED

A. Insulated flexible ductwork.

B. Low pressure (rectangular) ductwork.

C. Low pressure (round) ductwork.

D. Installation of all dampers in ductwork.

E. Coordination of building automation system installation.

1.02 RELATED SECTIONS

A. Section 23 0529 - Supports and Anchors: Sleeves.

B. Section 23 0553 - Mechanical Identification

C. Section 23 0700 - Duct Insulation.

D. Section 23 3300 - Ductwork Accessories.

E. Section 23 3700 - Air Inlets and Outlets.

1.03 REFERENCES

A. ASTM A 36 - Structural Steel.

B. ASTM A 90 - Weight of Coating on Zinc Coated (Galvanized) Iron or Steel Articles.

C. ASTM A 366 - Steel, Sheet, Carbon, Cold Rolled, Commercial Quality.

D. ASTM A 525 - General Requirements for Steel Sheet, Zinc Coated (Galvanized) by the Hot Dip Process.

E. ASTM A 527 - Steel Sheet, Zinc Coated (Galvanized) by Hot Dip Process, Lock Forming Quality.

F. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate.

G. AWS D9.1 - Welding of Sheet Metal.

H. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

I. NFPA 91 - Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying.

J. NFPA 96 - Installation of Equipment for the Removal of Smoke and Grease Laden Vapors from Commercial Cooking Equipment.

K. SMACNA - HVAC Air Duct Leakage Test Manual.

L. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

M. UL 181 - Factory Made Air Ducts and Connectors.

1.04 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.05 REGULATORY REQUIREMENTS

A. Construct ductwork to N.F.P.A. 90A standards.

B. Conform to 2021 International Mechanical Code.

1.06 SUBMITTALS

A. Submit under provisions of the General Requirements.

B. Shop Drawings: Submit one-quarter inch shop drawing layouts of all ductwork systems prior to fabrication. Drawings are to be coordinated with other trades.

C. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA HVAC Air Duct Leakage Test Manual.

D. Provide detailed drawings confirming configuration of Fabric Tensioning System (components, support locations, segment lengths) and Textile Dispersion System (diameter, lengths, airflow, pressure, and textile permeability).

E. Provide detailed installation instructions for components to be installed.

F. Provide warranty and maintenance documentation.

1.07 WARRANTY

A. Manufacturer must provide a 15 Year Product Warranty for products supplied for the fabric portion of this system as well as a Design and Performance Warranty.

1.08 PROJECT RECORD DOCUMENTS

A. Submit under provisions of the General Requirements.

B. Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.09 QUALITY ASSURANCE

A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

B. Maintain one copy of document on site.

C. Building Codes and Standards:
   1. Product must be Classified by Underwriter’s Laboratories in accordance with the 25/50 flame spread / smoke developed requirements of NFPA 90-A and UL 2518.
   2. All product sections must be labeled with the logo and classification marking of Underwriter’s Laboratories.

D. Design & Quality Control
   1. Manufacturer must have documented design support information including duct sizing; vent, orifice, and/or nozzle location; vent, orifice, and/or nozzle sizing; length; and suspension. Parameters for design, including maximum air temperature, velocity, pressure and textile permeability, shall be considered and documented.

1.10 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A and NFPA 96 standards.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Non-combustible or conforming to requirements for Class 1 air duct materials or UL 181.

B. All exposed ductwork shall be paint grip galvanized steel ductwork for future painting. ASTM A527 galvanized steel sheet. Lock forming quality G90 zinc coating in conformance with ASTM A90.

C. Steel Ducts: ASTM A525 or ASTM A527 galvanized steel sheet, lock-forming quality, having zinc coating of 1.25 oz. per sq. ft. for each side in conformance with ASTM A90.

D. Stainless Steel Ducts: 316 stainless steel of all welded construction with bolted flanged joints.

E. Aluminum Ducts: ANSI/ASTM B209; aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T6 or of equivalent strength.

F. Fasteners: Rivets, bolts, duct mate (TM) or sheet metal screws.

G. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape or heavy mastic.

H. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end or continuously threaded.

2.02 FLEXIBLE DUCTWORK

A. Acceptable Manufacturers:
   1. Thermaflex - Flexible Technologies.
   2. Flex-Master.
   3. Wiremold.
   4. Technaflax.
   5. No substitutions.

B. Product:
   1. Flexible air ducts for connections between branch low pressure ductwork and diffusers, registers and grilles.
   2. Ductwork shall be Thermaflex Type M-KE air duct listed by Underwriter's Laboratories Standard 181 as a Class 1 flexible air duct and complying NFPA Standards 90A and 90B. Duct shall be factory made and composed of a CPE liner permanently bonded to a coated spring wire helix and supporting a fiberglass insulating blanket. Low permeability outer vapor barrier of fiberglass reinforced film laminate shall complete the composite.
      a. Maximum velocity - 4000 FPM.
      b. Maximum positive pressure through 12-inch diameter - 10 inches.
      c. Maximum positive pressure over 12-inch diameter - 4 inches.
      d. Maximum negative pressure through 12 inches - 1 inch.
      e. Thermal conductance - 0.23 BTU/Hr./sq. ft. at 75 degrees F.
      f. Maximum flamespread 25; maximum smoke developed 50.
   3. Install all flexible ducts to grilles, diffusers, registers and branch ducts with galvanized steel strap, cadmium plated and fastened with a slotted bolt.

2.03 LOW PRESSURE (RECTANGULAR) DUCTWORK

A. Fabricate and support in accordance with SMACNA Low Pressure Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, gauges, reinforcing and sealing for operating pressure indicated.

B. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.

C. Construct T's, bends and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide air foil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.

E. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10 percent duct area, split into two ducts maintaining original duct area.

F. Use crimp joints with or without bead for joining round ducts sizes 8 inch and smaller with crimp in direction of air flow.

G. Use double nuts and lock washers on threaded rod supports.

H. Seal all joints and fittings throughout the low-pressure duct system (supply side) with SMACNA approved sealants. Sealants to have a service temperature range of -30 degrees F. to +175 degrees F.

2.04 LOW PRESSURE (ROUND) DUCTWORK

A. Duct rated for 2" pressure class.

B. Adjustable elbows for all changes of direction.

C. All fittings shall be screwed to duct.

PART 3 INSTALLATION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible.

C. Duct Sizes are inside clear dimensions for lined ducts, maintain sizes inside lining.

D. Provide openings in ductwork where required to accommodate controllers. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

F. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

G. Use double nuts and lock washers on threaded rod supports.

H. Connect terminal units to medium pressure main with spiral duct and welded fittings. Do not use flexible ductwork on medium pressure duct system.

I. Seal all joints in medium pressure ductwork with United duct sealer.

J. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

K. Connect diffusers to low pressure ducts with 3 feet maximum length of flexible duct held in place with strap or clamp.

L. Connect flexible ducts to metal ducts with adhesive plus draw bands. Flexible duct allowed for final connection to diffuser only (3’-0” max. length).

3.02 INSTALLATION OF CONTROL PRODUCTS

A. Install gauges, temperature and pressure sensors and other instrumentation in the locations directed by the BAS contractor.

B. Failure of this contractor to adequately coordinate his work with the BAS contractor shall not be justification for any request for additional payment.

C. This contractor shall include the cost of coordinating and installing related BAS components in his bid.

D. Install duct smoke detectors provided by electrical contractor.

3.03 SCHEDULES

A. DUCTWORK MATERIAL AND PRESSURE CLASS SCHEDULE

SMACNA Air System	Class	Material Pressure
Low Pressure Supply (Heating and Cooling Systems)	Steel	4”
Return and Relief	Steel	4” (Negative)
Locker Room Supply/Return/Exhaust	Aluminum	4”
General Exhaust	Steel (Aluminum if indicated on plan)	2” (Negative)
Outside Air	Steel	4”

END OF SECTION

SECTION 23 3300
DUCTWORK ACCESSORIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Air turning devices/extractors.

B. Duct test holes.

C. Flexible duct connections.

D. Volume control dampers.

1.02 RELATED SECTIONS

A. Section 23 0548 - Vibration Isolation.

B. Section 23 3100 - Ductwork.

C. Section 23 3400 - Power Ventilators.

1.03 REFERENCES

A. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

B. NFPA 70 - National Electrical Code.

C. SMACNA - HVAC Duct Construction Standards Metal and Flexible.

D. UL 33 - Heat Responsive Links for Fire Protection Service.

E. UL 555 - Fire Dampers and Ceiling Dampers.

F. UL 555S - Leakage Rated Dampers for Use in Smoke Control Systems.

1.04 SUBMITTALS

A. Submit under provisions of the General Requirements.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of the General Requirements.

1.06 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories Inc., as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of the General Requirements.

B. Protect dampers from damage to operating linkages and blades.

1.08 EXTRA MATERIALS

A. Provide two of each size and type of fusible link.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

A. Multi blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

2.02 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.03 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible, and as indicated.

B. Connector: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz. per sq. yd.
   2. Net Fabric Width: Approximately 3 inches wide.

C. Leaded Vinyl Sheet: Minimum 0.55-inch-thick, 0.87 lbs. per sq. ft., 10 dB attenuation in 10 to 10,000 Hz range.

2.04 VOLUME CONTROL DAMPERS

A. Manufacturers:
   1. Ruskin.
   2. Air Balance.
   3. Vent Products.
   4. Nailor.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible and as indicated.

C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.

D. Multi Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 4 x 72". Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

E. End Bearings: Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil impregnated nylon or sintered bronze bearings.

F. Quadrants:
   1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
   2. On insulated ducts mount quadrant regulators on standoff mounting brackets, bases, or adapters.
   3. Where rod lengths exceed 30 inches provide regulator at both ends.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.

B. Provide duct test holes where indicated and required for testing and balancing purposes.

C. Provide flexible connections immediately adjacent to equipment in ducts associated with all fans and motorized equipment and supported by vibration isolators.

D. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take off.

E. Provide balancing dampers on duct take off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

F. Install automatic control dampers provided by BAS contractor in the locations indicated on the floor plans.

G. Manual balancing dampers shall be multi blade type for any duct where the dimension perpendicular to the damper blades is greater than 14".

3.02 INSTALLATION OF CONTROL PRODUCTS

A. Install valves, temperature and pressure sensors and other instrumentation in the locations directed by the BAS contractor.

B. Install BAS valves and sensors in the locations shown on the plans.

C. Failure of this contractor to adequately coordinate his work with the BAS contractor shall not be justification for any request for additional payment.

D. This contractor shall include the cost of coordinating and installing related BAS components in his bid.

END OF SECTION

SECTION 23 3350
BREECHING, CHIMNEYS AND STACKS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Manufactured chimneys for gas fired equipment.

1.02 RELATED SECTIONS

A. Section 23 8400 – Gas Fired Infra-Red Heating Equipment.

1.03 REFERENCES

A. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

B. NFPA 54 (ANSI Z223.1) - The National Fuel Gas Code.

C. UL 103 - Standard for Factory Built Low Heat Chimneys.

D. UL 441 - Standard for Gas Vents.

E. UL 641 - Standard for Low Temperature Venting Systems.

1.04 DEFINITIONS

A. Breeching: Vent Connector.

B. Chimney: Primarily vertical shaft enclosing at least one vent for conducting flue gases outdoors.

C. Smoke Pipe: Round, single wall vent connector.

D. Vent: That portion of a venting system designed to convey flue gases directly outdoors from a vent connector or from an appliance when a vent connector is not used.

E. Vent Connector: That part of a venting system that conducts the flue gases from the flue collar of an appliance to a chimney or vent and may include a draft control device.

1.05 SUBMITTALS FOR REVIEW

A. Shop Drawings: Indicate general construction, dimensions, weights, support and layout of breechings. Submit layout drawings indicating plan view and elevations where factory-built units are used.

B. Product Data: Provide data indicating factory-built chimneys, including dimensional details of components and flue caps, dimensions and weights, electrical characteristics and connection requirements.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing the work of the work of this section with minimum five years documented experience, approved by manufacturer.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable code for installation of natural gas burning appliances and equipment.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated.

2.01 SINGLE WALL VENTS – POSITIVE PRESSURE

A. Provide single wall metal stacks, tested to UL 103 and UL listed, for use with building heating equipment, in compliance with NFPA 211 for condensing gas appliances.

B. Construct of AL29-4C stainless steel.

C. Maximum pressure rating 6” W.C.

2.02 ACCEPTABLE MANUFACTURERS:

A. Factory Built Single Wall Stacks (Positive Pressure):

1. Van Packer.
2. Selkirk Metalbestos.
3. AMPCO.
4. Air Management Industries.
5. MetalFab.

2.03 CONSTRUCTION

A. Furnish all items which form a complete assembly including straight sections, tee sections, joint sealant, cleanout door, end capacity drain supports.

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NFPA 54 (ANSI Z223.1), NFPA 31.

C. Assemble and install stack sections in accordance with NFPA 82, industry practices, and in compliance with UL listing. Join sections with acid-resistant joint cement to ASTM C105. Connect base section to foundation using anchor lugs.

D. Level and plumb chimney and stacks.

E. Clean breechings, chimneys and stacks during installation, removing dust and debris.

F. At applications, provide slip joints permitting removal of appliance without removal or dismantling of breechings, breeching insulation, chimneys or stacks.

G. Provide minimum length of breeching to connect appliance to chimney.

END OF SECTION

SECTION 23 3400
POWER VENTILATORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Exhaust fans.

B. Ceiling fan.

1.02 RELATED WORK

A. Section 23 0529 - Supports and Anchors.

B. Section 23 3100 - Ductwork.

C. Section 23 3300 - Ductwork Accessories.

1.03 REFERENCES

A. AMCA 99 - Standards Handbook.

B. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes.

C. AMCA 300 - Test Code for Sound Rating Air Moving Devices.

D. NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

A. Submit under provisions of the General Requirements.

B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, sound power levels at rated capacity and electrical characteristics and connection requirements.

C. Manufacturer's installation instruction.

D. Contractor shall review all shop drawings prior to submitting them for Architect/Engineer's review. Contractor shall stamp each shop drawing to certify that he has reviewed it. Engineer will not check any shop drawings that Contractor has not stamped with his review certification.

1.05 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list and wiring diagrams.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of the General Requirements.

B. Contractor shall store all materials shipped to the site in a protected area. If material is stored outside of the building it must be stored off the ground a minimum of 6 inches set on 6 x 6 planks and/or wood pallets. All material must be completely covered with waterproof tarps or visqueen. All duct openings will have the ends closed to keep out dirt and other debris. No equipment will be allowed to be stored on the site unless it is sitting on wood planks and completely protected with weatherproof covers.

1.07 WARRANTY

A. Equipment manufacturer shall provide a one (1) year warranty (parts and labor) on their equipment. Installing Contractor will provide one (1) year warranty on all parts and labor associated with the installation of the equipment. See the General Requirement Sections for other requirements.

PART 2 PRODUCTS

2.01 POWER EXHAUST FANS

A. Acceptable Manufacturers:
   1. Carnes.
   2. Cook.
   3. Greenheck.
   4. Halton.
   5. Twin City.

2.02 CABINET IN-LINE, DIRECT-DRIVE CENTRIFUGAL EXHAUST VENTILATOR.

A. Certifications: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.

B. The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16-gauge marine alloy aluminum, bolted to a rigid aluminum support structure. The aluminum base shall have continuously welded curb cap corners for maximum leak protection. The discharge baffle shall have stainless steel quick release latches to provide access into the motor compartment without the use of tools. An integral conduit chase shall be provided through the curb cap and into the motor compartment to facilitate wiring connections. The motor, bearings and drives shall be mounted on a minimum 14-gauge steel power assembly, isolated from the unit structure with rubber vibration isolators. These components shall be enclosed in a weather-tight compartment, separated from the exhaust airstream. Lifting lugs shall be provided to help prevent damage from improper lifting. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM, static pressure, and maximum fan RPM. Unit shall be shipped in ISTA certified transit tested packaging.

C. Wheel: Wheel shall be centrifugal backward inclined, constructed of 100 percent aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.

D. Motor: Motor shall be heavy duty type with permanently lubricated sealed ball bearings and furnished at the specified voltage, phase and enclosure.

E. Bearings: Bearings shall be designed and individually tested specifically for use in air handling applications. Construction shall be heavy duty re-greaseable ball type in a cast iron pillow block housing selected for a minimum L50 life in excess of 200,000 hours at maximum catalogued operating speed.

F. Belts & Drives: Belts shall be oil and heat resistant, non-static type. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150 percent of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM.

G. Roof Curbs: 18-inch high galvanized steel with continuously welded seams, one-inch insulation and curb bottom and factory installed door nailer strip. Curb shall be fabricated to accommodate roof pitch so fan is mounted on a horizontal level plain. Provide interior sound baffle for units where scheduled.

H. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

I. Inlet Damper: Motorized backdraft, aluminum multiple parallel blade construction, felt edged with nylon bearings.

2.03 HEAVY DUTY CEILING FAN

A. Acceptable Manufacturers:
   1. Leading Edge.
   2. Engineer / Owner Approved Equal.

B. Product Requirements:
   1. Fans to be UL Listed Standard 507 with matching UL listed solid state controls.
   2. All motors to be direct-drive permanent split capacitor type, with permanently sealed ball bearings.
   3. All motors to have built-in, self-resetting (internal) thermal overload protection TI9700.
   4. Performance shall be certified by AMCA, an independent test laboratory or a University Engineering department with documented testing.
   5. All fans to have factory installed Secondary Support Cable Assembly connected to motor shaft, with minimum 6-feet galvanized cable 1/8-inch 7x7 with rated breaking strength of 1700 lbs. and must comply with CSA std. C22.2 Sept. 1986.
   6. Fan blades to be straight with contoured shaped design for maximum efficiency. Note: Fans installed with blade height less than 10’ from floor must have rolled edge blades minimum 3/8-inch thick in compliance with UL 507.
   7. Fans used with motor speed controls must be labeled in accordance with UL 507 “Suitable for use with solid state motor speed controls”.

C. Factory supplied accessories to include:
   1. Solid state motor speed controls (UL listed).
   2. Special length downrods.
   3. Totally enclosed impact resistant fan guard.
   4. Tilted canopy cover.

D. Electrical Characteristics and Components:
   1. Electrical Characteristics:
      a. See Schedules.
   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.

E. Control:
   1. Coordinate location of fan speed/control switches with Owner.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install flexible connections specified in Section 23 3300 between fan inlet and ductwork (not applicable for roof mounted fans). Ensure metal bands of connectors are parallel with minimum one (1) inch flex between ductwork and fan while running.

C. Do not operate fans for any purpose until ductwork is clean, bearings lubricated and fan has been test-run under observation.

3.02 OWNER TRAINING BY INSTALLING CONTRACTOR

A. At the completion of the project, the Installing Contractor shall provide training of Owner’s staff. Training shall consist of on-site (hands on) training, which will show the location of all devices and the operation of all controls, devices, motors, etc. and maintenance and repair requirements. Prior to commencement of training.

END OF SECTION

SECTION 23 3439
DESTRATIFICATION FANS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Destratification Fans
   2. Accessories

1.02 REFERENCE STANDARDS

A. AMCA 99 – Standards Handbook; Air Movement and Control Association International, Inc.: 2010

B. AMCA 210 – Laboratory Methods of Testing Fans for Aerodynamic Performance Ratings; Air movement and Control Association International, Inc: 2007 (ANSI/AMCA 210, same as ANDI/ASHRAE 51)

C. AMCA 300 – Reverberant Room Method for Sound Testing of Fans; Air Movement and Control Association International, Inc: 2008

D. UL 507 - Underwriters Laboratory Standard for Electric Fans

E. CSA 22.2 – Standard for CAN/CSA 22.2

F. ISO 9001:2008 – ISO 9001:2008 Quality Standards

G. ISO 5801:2007 – ISO 5801:2007 for airflow performance

1.03 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:
   1. Fan performance curves from an AMCA-Certified Lab
   2. Fan sound-power ratings from an AMCA-Certified Lab
   3. Motor ratings and electrical characteristics, plus motor and electrical accessories
   4. Fan speed controllers

B. Shop Drawings
   1. Include dimensions, capacities, materials of construction, weights, wiring diagrams, and appropriate identification for all equipment in this Section
   2. Coordinated Drawings for placement
   3. Wiring Diagrams: For power, signal, and control wiring

C. Manufacturer’s Instructions: Provide Installation Instructions and wiring diagrams

D. Maintenance Data: Include instructions for fan care

1.04 QUALITY ASSURANCE

A. UL Standards: The entire fan assembly, hanging accessories and controllers shall be ETL certified, as a combined unit, for UL Standard 507 and CSA standard 22.2

B. ISO 9001:2008: Assembled under ISO 9001:2008 certified quality management system

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect motors, shafts, and bearings from weather and construction dust

PART 2 DESTRATIFICATION FAN PRODUCTS

2.01 MANUFACTURERS

A. Big Ass Fans.

B. Engineer / Owner Approved Equal.

2.02 DESCRIPTION

A. Complete Unit Certification: The combined fan, hanging accessories, and controller shall be ETL certified as a comprehensive package for UL Standard 507 and CSA Standard 22.2

B. The fan shall incorporate a direct drive system with axial blades that are completely enclosed in a plastic housing. Blades shall not be exposed like paddle fans.

C. All models shall include intake safety grill

D. Motor: The fan motor shall be direct drive externally wound high efficiency PSC motor. The motor shall be 1ph and 50/60hz and available in 115V

E. Mounting System: The fan mounting system shall be designed for quick installation. The mounting system shall include a 200 lb. safe working load cable with quick adjustment and attachment hardware. The mounting system shall also include a 100 lb. safe working load stabilization tether and attachment hardware.

2.03 ACCESSORIES

A. Variable Speed Controllers: Controllers to vary the speed of the fans available in 5A and 10A models for 115V fans

B. Three Prong Plug: Optional 3-prong plug and 6’ cord factory installed available for 115V models

C. Exhaust Safety Grill: Optional Exhaust Safety Grill available to protect personnel and large objects from coming in contact with the fan

PART 3 EXECUTION

3.01 INSTALLTION

A. Install destratification fan according to manufacturer’s instructions

B. Install speed control furnished with the fans flush mounted in location(s) coordinated with Owner.

END OF SECTION

SECTION 23 3700
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Diffusers.

B. Registers/grilles.

C. Louvers.

D. Intake/relief hoods.

1.02 REFERENCES

A. ADC 1062 - Certification, Rating and Test Manual.

B. AMCA 500 - Test Method for Louvers, Dampers and Shutters.

C. ARI 650 - Air Outlets and Inlets.

D. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.

E. SMACNA - HVAC Duct Construction Standard Metal and Flexible.

F. NFPA 70 - National Electrical Code.

G. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

1.03 SUBMITTALS

A. Submit under provisions of the General Requirements.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.04 PROJECT RECORD DOCUMENTS

A. Record actual locations of air outlets and inlets.

1.05 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

B. Test and rate louver performance in accordance with AMCA 500.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carnes.

B. Krueger.

C. Metalaire.

D. Nailor.

E. Price.

F. Titus.

2.02 SQUARE/RECTANGULAR CEILING DIFFUSERS

A. Type: Square, adjustable pattern, stamped, multi core diffuser to discharge air in 360-degree pattern.

B. Frame: Inverted T bar type. In plaster ceilings, provide plaster frame and ceiling frame.

C. Fabrication: Steel with baked enamel finish selected by Architect.

D. Accessories: Radial opposed blade damper and multi louvered equalizing grid with damper adjustable from diffuser face.

2.03 ARCHITECTURAL SQUARE PANEL CEILING DIFFUSERS

A. Architectural square panel ceiling diffusers shall be of the sizes and mounting types shown on the plans and outlet schedule.

B. The diffuser shall have an 18-gauge steel face panel, which shall be a one-piece assembly, removable by means of four positive locking posts. The exposed surface of the face panel shall be smooth, flat and free of visible fasteners. The face panel shall project 1/4" below the outside border of the diffuser back pan. Panels projecting more than 1/4" below the outside border are not acceptable.

C. The back of the face panel shall have an aerodynamically shaped, rolled edge to ensure a tight horizontal discharge pattern. A single metal thickness on the edges of the face panel will not be accepted.

D. Ceiling diffusers with 24" x 24" full face shall have no less than an 18" x 18" face panel size. Ceiling diffusers with a 12" x 12" full face shall have no less than 9" x 9" face panel size.

E. The back pan shall be one-piece precision die-stamped and shall include an integrally drawn inlet (welded-in inlets and corner joints are not acceptable).

F. The diffuser back pan shall be constructed of 22-gauge steel. The diffuser neck shall have a minimum of 1-1/8" depth available for duct connection.

G. The finish shall be aluminum colored paint as selected by the Architect. The finish shall be an anodic acrylic paint baked at 315 degrees F. for 30 minutes.

H. The manufacturer shall provide published performance data for the square panel diffuser. The diffuser shall be tested in accordance with ANSI/ASHRAE Standard 70-1991.

2.04 SUPPLY REGISTERS/GRILLES

A. Type: Aluminum border and individually adjustable blades, ¾ inch blade spacing, single deflection.

B. Frame: 1¼-inch margin with countersunk screw mounting and gasket.

C. Factory baked enamel finish as selected by Architect.

D. Damper: Aluminum opposed blade type, operable from face.

2.05 RETURN GRILLES/REGISTERS

A. Return grilles shall be 1/2" blade spacing with 0-degree fixed deflection blades. Blades shall be parallel to the long dimension of the grille or register.

B. Construction shall be of steel or aluminum as scheduled with a 1-1/4" wide border on all sides. Screw holes shall be countersunk for a neat appearance.

C. Deflection blades shall be contoured to a specifically designed and tested cross-section to meet published test data. Blades shall be firmly held in place by mullions from behind the grille and fixed in place by welding.

D. The grille finish shall be baked anodic acrylic paint as selected by the Architect.

E. Opposed blade volume damper shall be constructed of heavy gauge steel, operable from the face of the register.

2.06 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable air foil blades, 3/4-inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, horizontal face, double deflection.

B. Frame: 1¼-inch margin with countersunk screw mounting and gasket.

C. Fabrication: Steel with 20 gage minimum frame, with factory baked enamel finish selected by Architect.

D. Damper: Integral, gang operated opposed blade type with removable key operator, operable from face.

2.07 LOUVERS

A. Manufacturers:
   1. American Warming.
   2. DowCo.
   3. Greenheck.
   4. Ruskin Mfg.
   5. Vent Products.
   6. Nailor.

B. Type: 4-inch deep, drainable with blades on 37.5-degree slope with a drain gutter in each blade and downspouts in frame jambs and mullions, heavy channel frame, birdscreen with 1/2-inch square mesh for exhaust and 3/4 inch for intake.

C. Fabrication: 12 gage thick extruded aluminum, welded assembly, with factory anodized finish, color to be selected by the Architect. Design shall incorporate structural supports required to withstand a wind load of 20 lbs. per sq. ft.

D. Design Basis Performance (based on 60” x 10” DowCo DWE-04):
   1. Maximum face velocity of free area: 750 fpm.

2.08 ROOF HOODS

A. Manufacturers:
   1. Cook.
   2. Carnes.
   3. Greenheck.
   4. Twin City Fans.

B. Fabricate air inlet or exhaust hoods in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

C. Fabricate of aluminum minimum 14 gage base and 14 gage hood; suitably reinforced; with hinged hood; birdscreen with 1/2 inch square mesh for exhaust and 3/4 inch for intake, and clear anodized finish. All vertical seams shall be continuously welded with lock formed seams on the hood ends. Hoods shall be stressed and sloped for drainage.

D. Fabricate louver penthouses with mitered corners and reinforce with structural angles.

E. Mount unit on minimum 18-inch-high curb base with insulation between duct and curb.

F. Make hood outlet area minimum of twice throat area.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black.

F. Backpaint louver frames with bituminous paint before installation.

G. Secure louvers to wall openings with exposed stainless-steel fasteners 12 in. on center.

H. Caulk louver frames watertight. Entire installation shall be watertight under all weather conditions.

END OF SECTION

SECTION 23 6100
REFRIGERANT PIPING AND SPECIALTIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Piping.
B. Refrigerant.
C. Moisture and liquid indicators.
D. Valves.
E. Strainers.
F. Check valves.
G. Pressure relief valves.
H. Filter driers.
I. Solenoid valves.
J. Expansion valves.
K. Receivers.
L. Flexible connections.

1.02 RELATED SECTIONS

A. Section 23 0701 – Piping Insulation.
B. Section 23 3800 – Air Coils.
C. Section 23 8123 – Supplementary Air Conditioning Units – Unitary Ceiling.
D. Section 23 8210 – Air Cooled Condensing Units.
E. Section 23 8250 – Desiccant Dehumidifiers.
F. Section 23 8310 – Heat Pump Heat Recovery System.

1.03 REFERENCES

A. ANSI/ARI 495 - Refrigerant Liquid Receivers.
B. ANSI/ARI 710 - Liquid Line Dryers.
C. ANSI/ARI 750 - Thermostatic Refrigerant Expansion Valves.
D. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration.
E. ANSI/ASHRAE 34 - Number Designation of Refrigerants.
F. ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
G. ANSI/ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
H. ANSI/ASME B31.5 - Refrigeration Piping.
I. ANSI/ASTM B88 - Seamless Copper Water Tube.
J. ANSI/ASME B32 - Solder Metal.
K. ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
L. ANSI/AWS A5.8 - Brazing Filler Metal.
M. ANSI/AWS D1.1 - Structural Welding Code, Steel.
N. UL 429 - Electrically Operated Valves.

1.04 SYSTEM DESCRIPTION

A. Where more than one piping system's material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with ASTM B31.5 and Section 23 05 29.

C. Liquid Indicators:
   1. Use line size liquid indicators in main liquid line leaving condenser.
   2. If receiver is provided, install in liquid line leaving receiver.
   3. Use line size on leaving side of liquid solenoid valves.

D. Valves
   1. Use service valves on suction and discharge of compressors.
   2. Use gage taps at compressor inlet and outlet.
   3. Use gage taps at hot gas bypass regulators, inlet and outlet.
   4. Use check valves on compressor discharge.
   5. Use check valves on condenser liquid lines on multiple condenser systems.

E. Refrigerant Charging Packed Angle Valve: Use in liquid line between receiver shut off valve and expansion valve.

F. Strainers:
   1. Use line size strainer upstream of each automatic valve.
   2. Where multiple expansion valves with integral strainers are used, use single main liquid line strainer.
   3. On steel piping systems, use strainer in suction line.
   4. Use shut off valve on each side of strainer.

G. Pressure Relief Valves: Use on ASME receivers and pipe to outdoors.

H. Permanent Filter Driers:
   1. Use in low temperature systems.
   2. Use in systems utilizing hermetic compressors.
   3. Use filter driers for each solenoid valve.

I. Replaceable Cartridge Filter Driers:
   1. Use vertically in liquid line adjacent to receivers.
   2. Use filter driers for each solenoid valve.

J. Solenoid Valves:
   1. Use in liquid line of systems operating with single pump out or pump down compressor control.
   2. Use in liquid line of single or multiple evaporator systems.
   3. Use in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

K. Receivers:
   1. Use on systems 5 tons and larger, sized to accommodate pump down charge.
   2. Use on systems with long piping runs.

L. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

1.05 SUBMITTALS

A. Submit under provisions of the General Requirements.

B. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.

C. Contractor shall review all shop drawings prior to submitting them for Architect/ Engineer's review. Contractor shall stamp each shop drawing to certify that he has reviewed it. Engineer will not check any shop drawings that contractor has not stamped with his review certification.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of the General Requirements.

B. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

1.07 REGULATORY REQUIREMENTS

A. Conform to ANSI/ASME B31.5 for installation of piping system.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under the General Requirements.

B. Deliver and store piping and specialties in shipping containers with labeling in place.

C. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

D. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.01 PIPING

A. Copper Tubing: ASTM B280, Type ACR hard drawn or annealed.
   1. Fittings: ANSI/ASME B16.22 wrought copper.
   2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480-degree F.

B. Copper Tubing to 7/8-inch OD: ANSI/ASTM B88, Type K, annealed.
   1. Fittings: ANSI/ASME B16.26 cast copper.
   2. Joints: Flared.

2.02 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum working pressure of 500 psig, and maximum temperature of 200 degrees F.

2.03 VALVES

A. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless-steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, solder or flared ends, with positive backseating; for maximum working pressure of 500 psig and maximum temperature of 275 degrees F.

B. Packed Angle Valves:
   1. Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, solder or flared ends; for maximum working pressure of 500 psig and maximum temperature of 275 degrees F.

C. Service Valves:
   1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psig.

2.04 FILTER DRIERS

A. Replaceable Cartridge Angle Type:
   1. Shell: ARI 710, UL listed, brass, removable cap, for maximum working pressure of 350 psig.

2.05 SOLENOID VALVES

A. Valve: ARI 760, pilot operated, copper or brass body and internal parts, synthetic seat, stainless steel stem and plunger assembly, with flared, solder, or threaded ends; for maximum working pressure of 500 psig. Stem shall permit manual operation in case of coil failure.

B. Coil Assembly: UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color-coded lead wires, integral junction box.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install refrigeration piping and specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Inserts: Refer to Section 23 0529.

G. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

H. Provide clearance for installation of insulation and access to valves and fittings.

I. Provide access to concealed valves and fittings.

J. Flood piping system with nitrogen when brazing.

K. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.

L. Prepare unfinished pipe, fittings, supports, and accessories ready for finish painting.

M. Insulate piping and equipment; refer to Section 23 0701.

N. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.

O. Provide replaceable cartridge filter driers, with isolation valves and valved bypass.

P. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

Q. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.

R. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

S. Fully charge completed system with refrigerant after testing.

T. Provide electrical connection to solenoid valves.

3.03 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME B31.5.

B. Pressure test system with dry nitrogen to 300 psig. Perform final tests at 27 inches vacuum and 300 psig using electronic leak detector. Test to no leakage.

3.04 REFRIGERATION PIPING DESIGN

A. All refrigeration piping shall be designed by the mechanical contractor based on ASHRAE recommended guidelines and the following:
   1. Size liquid piping for a maximum 6.0 PSI pressure drop and maximum velocity of 360 FPM.
   2. Size suction lines for maximum 2.0 PSI pressure drop at full load. At the lowest stage of unloading/compressor operation; design to minimum velocities of 500 FPM in horizontal lines and 1000 FPM in vertical lines: Install traps at the base of all suction risers and provide double suction risers if required.
   3. Size hot gas lines for maximum 6.0 PSI pressure drop at full load. At the lowest stage of unloading/compressor operation; design to minimum velocities of 500 FPM in horizontal lines and 1000 FPM in vertical lines: Install traps at the base of all hot gas risers and provide double risers if required.

B. Submit dimensioned shop drawings of all refrigeration piping to the engineer for review prior to fabrication.

3.05 REQUIRED COMPONENTS

A. Furnish and install a minimum of the following components for each refrigeration circuit:
   1. Filter Dryer
   2. Sight Glass / Moisture Indicator
   3. Pressure relief valve.
   4. Isolation valves and flexible connections at indoor and outdoor units.

B. Verify all requirements with equipment manufacturers.

END OF SECTION

SECTION 23 7413
DEDICATED OUTDOOR AIR SYSTEM (SPLIT)

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide outside air unit as follows:

1. Project is based on the specified equipment. Any additional costs associated with using alternate manufacturer's equipment shall be borne by the installing contractor or equipment provider.
2. This section includes units connectable to remote condensing units for heating/cooling/dehumidification and for outdoor installation.
    a. Heat source shall be from remote heat pump condenser. Electric pre-heat coil to be provided to maintain minimum entering air temperature in heating to 14F.
    b. Cooling source shall be split system remote condenser with invertor compressors.
    c. Airflow arrangement shall be Outdoor Air only.

B. Each unit shall be constructed in a horizontal configuration and shall incorporate additional product requirements as listed in this specification.

1.02 RELATED SECTIONS

A. Section 23 0503 – Testing of HVAC Piping and Gas Piping.

B. Section 23 0513 – Motors.

C. Section 23 0548 – Vibration Isolation.

D. Section 23 0593 – Testing, Adjusting and Balancing.

E. Section 23 0700 – Ductwork Insulation.

F. Section 23 3100 – Ductwork.

G. Section 23 3300 – Ductwork Accessories.

1.03 REFERENCES

A. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration. (All.)

B. ANSI/ASHRAE/IESNA 90.1-2013 - Energy Standard for New Buildings Except Low-Rise Residential Buildings.

C. ANSI Z21.47/UL1995 - Unitary Air Conditioning Standard for safety requirements.

D. ANSI/NFPA 70-1995 - National Electric Code. (all)

E. International Fuel Gas Code (g/e)

F. NFPA 90 A & B - Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems. (all)

1.04 SYSTEM DESCRIPTION

A. The contractor shall furnish and install outdoor split system air unit as shown and scheduled on the contract documents. The unit shall be installed in accordance with this specification and perform at the specified conditions as scheduled.

1.05 SUBMITTALS

A. Product Data:

1. Submit unit performance data including: capacity, nominal and operating performance.

2. In compliance with ASHRAE Std 920, performance values for Moisture Removal Efficiency (MRE) and Integrated Seasonal Moisture Removal Efficiency (ISMRE) must be submitted without exception. Value must meet or exceed scheduled values.
3. Submit Mechanical Specifications for unit and accessories describing construction, components and options.
4. Submit drawings indicating overall dimensions as well as installation, operation and services clearances. Indicate lift points and recommendations and center of gravity. Indicate unit shipping, installation and operating weights including dimensions.
5. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.
6. Drawings submitted for approval shall be accompanied by a copy of the purchase agreement between the Contractor and an authorized service representative of the manufacturer for check, test and start up and first year service.

B. Certifications:
1. Unit shall conform to the appropriate standards listed in Section 103 as well as be listed and labeled by a Nationally Recognized Testing Laboratory (NRTL) for compliance with the following applicable standards.
2. Standard for Safety Heating and Cooling Equipment-Fourth Edition, UL 1995/CSA C22.2#236 Issue: 2011/10/14
3. Standard for Gas Unit Heaters And Gas-Fired Duct Furnaces ANSI Z83.8-2013, CSA 2.6-2013, Third Edition – 2006 (indirect gas-fired/e)
4. Standard for Non-Recirculating Direct Gas-Fired Industrial Air Heaters, ANSI Z83.4 / CSA 3.7 - Issued: 2013/03/01 Ed: 3
5. In the event the unit is not approved by an NRTL for compliance with the appropriate standards, the manufacturer shall, at manufacturer's expense, provide for a field certification and labeling of unit by an NRTL to the appropriate standards. Manufacturer shall, at manufacturer's cost, complete any and all modifications required by NRTL prior to certification and field labeling. Manufacturer shall include coverage of all modifications in unit warranty.

C. Closeout Submittals:
1. Provide electronic copy of IOM for product and any associated field furnished devices.

1.06 MAINTENANCE MATERIAL SUBMITTALS

A. Spare Parts:
1. Provide three sets of filters.
2. Provide one set of extra belts (if required).

1.07 QUALITY ASSURANCE

A. Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.

B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Manufacturers
1. LG.
2. Trane/Mitsubishi.
3. No Substitutions.

B. General:
1. Casing

a. Exterior wall supplied using SGCC Z22 galvanized steel with internal closed cell Polyethylene foam insulation

2. Cabinet Assembly
   a. All the internal assemblies shall use SGCC galvanized steel.
   b. All specified components and internal accessories factory installed shall be tested and prepared for single-point high voltage connection.
   c. Unit shall be fully assembled at the factory and consists of the following:
   d. An insulated single wall metal cabinet
3. Electric Pre-Heta Coil Section, with casing and control.
4. DX Main coil
   a. Hot gas reheat coil
   b. Condensate drain pan
   c. Condensate drain pump
   d. Integrated Heat Recovery Box
   e. Sensors
   f. Supply air blower assembly
   g. Filter assembly for DX Main coil with 2” Thick MERV 8 filters
   h. Electrical control center.
5. Main DX (Evaporator) Coil
   a. Evaporator coil shall be (silver) soldered or brazed into the refrigerant system. Coil shall be constructed of copper tubing, permanently bonded to aluminum fins and enclosed in a SGCC steel frame.
6. Hot Gas Reheat Coil
   a. Reheat coil shall be (silver) soldered or brazed into the refrigerant system with factory installed modulating valve. Coil shall be constructed of copper tubing, permanently bonded to aluminum fins and enclosed in a SGCC steel frame.
7. Control panel / connections
   a. Units shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections.
8. Condensate drain pan:
   a. Drain Pan shall be an integral part of the unit. Pan shall be formed of welded 18-gauge SGCC galvanized sheet material with proprietary pre-painted (Dawn Gray-RAL 7037) and provided with a drain connection for a field provided P trap.
   b. Drain pan shall be sloped in two directions to provide positive draining and drain connector shall be sealed at penetration through cabinet wall.
9. Condensate drain pump
   a. Integrated condensate drain pump with overflow switch shall operate when unit is in cooling or dehumidification modes
10. Control and Diagnostics
    a. The DOAS system shall be controlled by an onboard digital controller (DDC) that indicates both owner-supplied settings and fault conditions that may occur.
    b. The DDC shall be programmed to indicate the following faults:
       1) Global alarm condition (active when there is at least one alarm)
       2) Supply Air Proving alarm

3) Outdoor Unit (condenser) Error Alarm
4) Supply Air Temperature Low Limit Alarm
a) Sensor #1 Out of Range (outside air temperature)
b) Sensor #2 Out of Range (supply air temperature)
c) Sensor #3 Out of Range (cold coil leaving air temperature)

c. Sensors are considered to be part of various optional operational modes or device controllers and are to be factory supplied and installed as specified by the design engineer.
1) Factory install sensors:
a) Supply Air Temperature Sensor
b) Outdoor Air Temperature Sensor
c) Outdoor Air Humidity Sensor
2) Field Supplied and Installed Sensors (Optional)
a) Supply Duct Air Temperature Sensor
b) Supply Duct Air Humidity Sensor
c) Space Temperature Sensor
d) Space Humidity Sensor
e) Space CO2 Sensor

11. Blower/Motor Assembly
a. Blower section construction Supply Air
1) Direct drive motor(s) and blower(s) shall be assembled on a 13-gauge galvanized steel platform
2) Blower assemblies shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.
3) Fan: Direct drive, LG 3D Plug fan with painted steel wheels statically and dynamically balanced and AMCA certified for air and sound performance.
4) Blower section motor source quality control
a) Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed, and efficiency.
b) Ratings are to be established in accordance with AMCA 210, “Laboratory Methods of Testing Fans for Rating.”

b. Motors
1) General
a) Blower Motors shall be BLDC motors, Supply fan motor shall have Auto CFM modulation control or RPM control. Auto CEM Control is enabled with factory mounted differential pressure sensor. Microprocessor controller shall set CFM value and supply fan motor will modulate to maintain target CFM value even as external static pressure changes

12. Filter Assembly
a. Units shall have supply final air filter shall be of 2-inch MERV 8

13. Unit Controls
a. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by factory-supplied controllers and sensors, or it can be

operated as a heating and cooling system controlled by a Building Management System (BMS).

b. This unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to various optional sensors.

c. Supply fan shall be configured for Constant Volume

1) Capacity Control: Control air volume by RPM percentage

2) CFM Control: Fan to follow target CFM set by user and automatically adjust for external static pressure changes

14. Operating protocol

a. The DDC shall be factory-programmed for Bacnet IP and Modbus RTU standard.

b. Must be compatible with LG AC Smart Controller.

c. Graphical Web UI required.

1) Embedded web page with complete web user interface to allow full remote control and monitoring of unit.

2) Alarm Recording: Controller shall store all alarm events

3) Alarm Operating Snapshot Controller shall store operating inputs and outputs at time of alarm

C. Submittals

1. Product Data: For each type or model include the following:

a. Complete fan performance curves for Supply Air.

b. Sound performance data for Supply Air.

c. Motor ratings, electrical characteristics, motor and fan accessories.

d. Performance ratings for all coils.

e. Dimensioned drawings for each type of installation to include location of attached ductwork and service clearance requirements.

f. Estimated gross weight of each installed unit.

g. Installation, Operation and Maintenance manual (IOM) for each model.

h. Microprocessor Controller (DDC) specifications to include available options and operating protocols. Include complete data on all factory-supplied input devices. Modbus RTU and BACnet IP are standard protocols. They must be compatible with LG AC Smart Controller.

PART 3 EXECUTION

3.01 INSTALLATION

A. Examination

1. Prior to start of installation, examine area and conditions to verify correct location for compliance with installation tolerances and other conditions affecting unit performance. See unit IOM.

2. Examine roughing-in of plumbing, electrical and HVAC services to verify actual location and compliance with unit requirements. See unit IOM.

3. Proceed with installation only after all unsatisfactory conditions have been corrected.

B. Installation

1. Installation shall be accomplished in accordance with these written specifications, project drawings, manufacturer's installation instructions as documented in manufacturer's IOM, Best Practices, and all applicable building codes.

C. Coordination

1. Coordinate size and location of all building penetrations required for installation of each unit and associated plumbing and electrical systems.
2. Coordinate location of water system fittings to ensure correct positioning for condensate drain pipe.
3. Coordinate sequencing of construction of associated plumbing, HVAC, electrical supply, and sheet metal contractor.

D. Connections

1. In all cases, industry Best Practices shall be incorporated. Connections are to be made subject to the installation requirements shown above.
    a. Piping installation requirements are specified in Division 23. Drawings indicate general arrangement of piping, fittings, and specialties.
    b. Duct installation and connection requirements are specified in Division 23 of this document.
    c. Electrical installation requirements are specified in Division 26 of this document.

E. Quality Assurance

1. Source Limitations: Obtain unit with all appurtenant components or accessories from a single manufacturer.
2. For the actual fabrication, installations, and testing of work under this section, use only thoroughly trained and experienced workers completely familiar with the items required and with the manufacturer's current recommended methods of installation.
3. Product Options: Drawings must indicate size, profiles, and dimensional requirements and are to be based on the specific system indicated. Refer to Division 1 Section "Product Requirements".
4. Certifications
    a. Blower shall be AMCA Certified for airflow.
    b. Entire unit shall be ETL Certified per U.L. 1995 and bear an ETL sticker.

F. Field Quality Control

1. Manufacturer's Field Service
    a. Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections.
2. Reports results to A/E in writing
    a. Inspection must include a complete startup checklist to include (as a minimum) the following: Completed Start-Up Checklists as found in manufacturer's IOM.

END OF SECTION

SECTION 23 8201

TERMINAL HEAT TRANSFER UNITS - ELECTRIC

PART 1 GENERAL

1.01 WORK INCLUDED

A. Electric suspended unit heater.

B. Electric wall heater.

C. Electric radiant ceiling panel.

1.02 RELATED SECTIONS

A. Division 26: Wiring

1.03 REFERENCES

A. NFPA 70 - National Electrical Code.

1.04 SUBMITTALS FOR REVIEW

A. Product Data: Provide typical catalog of information including arrangements.

B. Shop Drawings:
   1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
   2. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.
   3. Indicate mechanical and electrical service locations and requirements.

C. Submit under provisions of Division 1 General Requirements.

D. Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

E. Submit manufacturer’s installation instructions. Indicate assembly, support details, connection requirements, and include start-up instructions.

F. Contractor shall review all shop drawings prior to submitting them for Architect/ Engineer’s review. Contractor shall stamp each shop drawing to certify that he has reviewed it. Engineer will not check shop drawings that contractor has not stamped with his review certification.

1.05 SUBMITTALS AT PROJECT CLOSEOUT

A. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access or valving.

B. Operation and Maintenance Data: Include manufacturer’s descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owners name and registered with manufacturer.

1.06 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

B. International Mechanical Code.

1.07 WARRANTY

A. Equipment manufacturer shall provide one (1) year warranty (parts and labor) on their equipment. Installing Contractor will provide one (1) year warranty on all parts and labor associated with the installation of the equipment. See Division 1 Sections for other requirements.

1.08 DELIVERY, STORAGE AND HANDLING

A. Store and protect products under provisions of Division 1 General Requirements.

B. Deliver and store material in shipping containers with labeling in place.

C. Contractor shall store all materials shipped to the site in a protected area. If material is stored outside of the building, it must be stored off the ground a minimum of six inches set on 6 x 6 planks and/or wood pallets. All material must be completely covered with waterproof tarps or visqueen. All piping will have the ends closed to keep out dirt and other debris. No equipment will be allowed to be stored on the site unless it is sitting on wood planks and is completely protected with weatherproof covers.

1.09 PROJECT RECORD DOCUMENTS

A. Submit record documents under provisions of Division 1 General Requirements.

1.10 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1 General Requirements.

B. Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data and parts listings.

PART 2 PRODUCTS

2.01 ELECTRIC SUSPENDED UNIT HEATERS

A. Acceptable Manufacturers:
   1. Berko/Marley.
   2. Indeeco.
   3. Markel.
   4. Ouellet.

B. Fabrication:
   1. Casing: The cabinet shall be made of 18-gauge die formed furniture grade steel. Heaters shall be of the draw-through air flow design to eliminate the element hot spots and extend design life. Individual adjustable louvers with 30 degrees downward stops shall be furnished to provide desired control of discharge air. All metal surfaces of the enclosure shall be phosphate coated to resist corrosion and finished in a durable polyester powder coat finish. Mounting brackets designed for either ceiling or wall swivel mounting shall be furnished as shown on the heating schedule.
   2. Elements: Elements shall be aluminum-finned, copper clad steel sheath.
   3. Motors: Motors shall be totally enclosed, all angle industrial rated. All units will utilize sealed bearings to assure permanent lubrication.
   4. Fan Blades: Fan blades shall be of the axial flow-type designed for quiet efficient operation. Fan speed does not exceed 1,600 rpm.
   5. Wiring: Heaters designed for a single circuit, with elements, motor and control circuits subdivided with factory wired fuses to conform to the National Electrical Code and Underwriter's Laboratory, Inc., Standard 1025. All three-phase heaters shall have balanced phases.
   6. Thermostat with remote fan switch shall be provided by unit manufacturer for installation by BAS contractor. Thermostat shall be wall mounted with adjustable setpoint.

2.02 ELECTRIC WALL UNIT HEATERS

A. Acceptable Manufacturers:
   1. Berko – Model FRC / Marley.
   2. Reddi.
   3. Markel.
   4. Q-Mark.
   5. Trane

B. General: The heating equipment shall include an electric, automatic fan forced electric air heater. The heater shall be designed for wall recess or surface mounting. Heaters shall be UL listed.

C. Heater Assembly: The heater assembly which fits into the back box shall consist of a fan panel upon which is mounted all of the operational parts of the heater.

D. Heating Element: The heating element shall be of the non-glowing design consisting of a special resistance wire enclosed in a steel sheath to which steel plate fins are copper brazed. It shall be warranted for 5 years.

E. Fan and Motor: Fan shall be five-bladed aluminum. Fan motor shall be totally enclosed.

F. Fan Delay Switch: Fan control shall be of bi-metallic, snap-action type and shall activate fan after heating element reaches operating temperature. The fan shall continue to operate after the thermostat is satisfied and until the heating element is cool.

G. Thermostat: The tamper-proof thermostat shall be of the bi-metallic snap-action type with enclosed contacts. It shall be completely concealed behind the front cover to become tamper proof.

H. Thermal Cutout: A thermal cutout shall be built into the system to shut off the heater in the event of overheating.

I. Disconnect Switch: A double-pole, single throw disconnect switch shall be mounted on the back box for positive disconnect of power supply. It will be completely concealed behind the front grille panel.

J. Low Voltage Relays: 24-volt and 120-volt low voltage relays shall be available as optional equipment to control 208, 240 or 277 volt heaters in conjunction with central energy control systems. The built-in thermostat can then be used as one of the thermostats in an automatic night set back operation.

K. Back Box: The back box shall be designed for duty as a recessed rough-in box in either masonry frame installations, and is also used with the surface mounting frame in surface mounted installations. The back box shall be 20-gauge galvanized steel and shall contain knockouts through which power leads are brought.

L. Front Panel: The front panel shall be of the bar grille type and shall be constructed of 16-gauge cold-rolled steel, welded into uniform grille to direct the warmed air toward the floor. The front grille shall be surrounded by a decorative satin-finish aluminum “Picture” frame.

M. Three Piece Design: The heater shall be made up of a back box, a heater assembly and front panel.

2.03 ELECTRIC RADIANT CEILING PANELS

A. Acceptable Manufacturers:
   1. Berko/Marley.
   2. Indeeco.
   3. Markel.
   4. Trane.
   5. Vulcan Radiator Corporation.

B. Fabrication:
   1. Description: Sheet-metal enclosed panel with powdered-graphite heating element sandwiched between sheets of dielectric insulation, suitable for lay-in installation flush with T-bar ceiling grid or recess mounting.
   2. Copper Coil: Rating per drawings.
   3. Furnish with non-heating leads factory connected to embedded heating cables.
   4. Factory applied silk-screened finish to match architectural pattern of acoustical ceiling tiles.
   5. Factory apply two coats of flat polyester paint, manufacturer’s standard color as selected by Architect.
   6. Thermostat shall be provided by unit manufacturer for installation by BAS contractor.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work and opening dimensions are as indicated on shop drawings.

B. Verify that required utilities are available, in proper location and ready for use.

C. Beginning of installation means installer accepts existing surfaces.

3.02 INSTALLATION

A. Electric Suspended Unit Heater:
   1. Install in accordance with manufacturer’s instructions.
   2. Hang units from building structure with steel hanger rods. Mount as high above the floor as possible to maintain greatest headroom.
   3. Provide and install remote thermostat with guard.

B. Electric Wall Heaters:
   1. Install in accordance with manufacturer’s instructions.
   2. Install a construction filter during construction. Install a permanent filter after building has been accepted as substantially complete.
   3. Protect finished surfaces during construction.

C. Electric Radiant Ceiling Panel:
   1. Install in accordance with manufacturer’s instructions.

3.03 CLEANING

A. Clean work under provisions of the General Requirements.

B. After construction is completed, include painting, clean exposed surfaces of units. Vacuum clean coils and inside cabinets.

C. Touch-up marred or scratched surfaces of factory finished cabinets, using finish materials furnished by manufacturer.

3.04 OWNER TRAINING BY INSTALLING CONTRACTOR

A. At the completion of the project, the Installing Contractor shall provide training of Owner's staff. Training shall consist of two parts. Part One will be a classroom situation which describes the equipment’s operation, maintenance and repair requirements. Part Two will be on-site (hands-on) training which will show the location of all devices and the operation of all controls, devices, motors, etc. Prior to commencement of training, Contractor shall provide Architect/Engineer with a schedule of dates, times and agenda for each training session. This Contractor shall provide a minimum of two (2) hours of training for work installed under this Section of the contract.

END OF SECTION

SECTION 23 8310
HEAT PUMP HEAT RECOVERY SYSTEM

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

A. The variable capacity, heat pump heat recovery air conditioning system. The systems shall be simultaneous cooling and heating split system heat pumps.

B. The system shall consist of outdoor unit(s), Branch Circuit Controller, multiple indoor units and Direct Digital Controls.

C. Each indoor unit shall be independently controlled.

1.02 QUALITY ASSURANCE

A. The units shall be listed by Electrical Laboratories (ETL) and bear the ETL label.

B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

C. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

D. A full charge of refrigerant for the condensing unit only shall be provided in the condensing unit.

1.03 RELATED SECTIONS

A. Section 23 0548 – Vibration Isolation.

B. Section 23 0993 – Sequence of Operation.

C. Section 23 3100 – Ductwork.

D. Section 23 6100 – Refrigerant Piping and Specialties.

1.04 SUBMITTALS

A. Submit under provisions of the Division 00 General Requirements.

B. Submittals shall be provided and shall include: Single-Line Diagrams; Dimensional, Electrical, and Capacity data; Piping and Electrical Connection Drawings.

C. Include manufacturer installation instructions.

D. Contractor shall review all shop drawings prior to submitting them for Architect/Engineer's review. Contractor shall stamp each shop drawing to certify that he has reviewed it. Engineer will not check any shop drawings that Contractor has not stamped with his review certification.

1.05 QUALITY ASSURANCE

A. Manufacturers Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.06 OPERATION AND MAINTENANCE DATA

A. Include instructions for lubrication, motor and drive replacement, spare parts list and wiring diagrams under provisions of the General Requirements for inclusion into close-out documents.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 00 General Requirements.

B. Contractor shall store all materials shipped to the site in a protected area. If material is stored outside of the building it must be stored off the ground a minimum of 6 inches set on 6 x 6 planks and/or wood pallets. All material must be completely covered with waterproof tarps or visqueen. All duct openings will have the ends closed to keep out dirt and other debris. No equipment will be allowed to be stored on the site unless it is sitting on wood planks and completely protected with weatherproof covers.

1.08 WARRANTY

A. Equipment manufacturer shall provide a two (2) year warranty (parts and labor) on their equipment. Installing Contractor will provide one (1) year warranty on all parts and labor associated with the installation of the equipment. See the General Requirements for other requirements.

B. Provide seven-year warranty (parts) for compressor only.

1.09 EXTRA MATERIALS

A. Provide three sets of filters per unit.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. LG.

B. Trane/Mitsubishi.

C. No substitutions.

2.02 GENERAL VRF SYSTEM DESCRIPTION

A. All components of the VRF System shall be by one manufacturer. The equipment shall include all required components required for a fully functional system.

B. All components on the VRF System controls shall be addressable.

C. Each fan / refrigerant coil unit shall be capable of operating in any mode independently of other indoor units or groups. Each unit shall be independently controlled unless otherwise indicated on the Drawings. The sum of the connected capacity to a compressor unit shall range from 50% to 130% of the compressor unit capacity.

D. The system shall be capable of performing continuous operation when an individual indoor unit is being serviced or power to indoor unit is disconnected.

E. Refrigerant: R-32, or equal.

F. Operating Temperature:

1. Cooling: 14F DB to 122F DB
2. Heating: -22F WB to 61F WB

2.03 EQUIPMENT MANUFACTURER TO PROVIDE CERTIFIED DOCUMENTATION FOR APPROVAL BY ENGINEER OF UNIT TESTED HEATING CAPACITY AT -13º F. (DESIGN CONDITION)

A. Refrigerant Lines:

1. All refrigerant lines from the air-source unit to the control valve box and to the fan / refrigerant coil units shall be insulated in accordance with insulation specifications.
2. Provide pre-insulated line sets constructed of ACR copper for piping between control box and fan units or hard pipe and insulation in accordance to specifications, manufacturer's recommendations, and local codes.

3. Provide hard copper pipe in accordance to specifications, manufacturer's recommendations, and local codes to control boxes from compressor units.
4. The outdoor unit shall be capable of operating with up to 3280 equivalent length feet of interconnecting liquid line refrigerant pipe in the network.
5. The outdoor unit shall be capable of operating with up to 656 actual feet or 738 equivalent length feet of liquid line refrigerant pipe spanning between outdoor unit and furthest indoor unit.

2.04 AIR-SOURCE HEAT RECOVERY CONDENSING UNIT

A. Description: Air-source module with cabinet, compressors, controller, heat exchangers, pipe connections, condensate drain pipe connections, and refrigerant pipe connections.

B. Sound: Each compressor module shall have a sound level no higher than 60 dBA.

C. Defrost Operation
1. The outdoor unit(s) shall be capable of auto defrost operation to melt accumulated frost off the outdoor unit heat exchanger. The defrost cycle control shall be based on outdoor ambient temperatures and outdoor unit heat exchanger temperatures.
    a. Continuous heating defrost
        1) During first two defrost cycles the unit shall allow heating mode indoor unit fans to stay "on" in low speed continuing to heat.
        2) Complete Defrost
        3) The third defrost cycle shall switch all outdoor units to defrost mode to fully melt and clear frost, snow or ice accumulations off the outdoor coil while turning "off" heating mode indoor unit fans to maintain efficient performance.

D. Cabinet and Frame: Welded steel, braced for rigidity, and supporting compressors and other mechanical equipment and fittings.
1. Doors and Access Panels: Galvanized steel with polyurethane gaskets, hinges, and concealed fastening devices.
2. Finish of Exterior Surfaces: Baked-on, textured vinyl enamel; or powder coat.
3. Base: Welded tubular steel, with adjustable legs and vibration isolation pads.
4. Unit Frames: Condensing unit frame quantity shall match what is shown on drawings.
5. Unit Capacity: Condensing unit tonnage shall match what is shown in schedule.

E. Oil Management
1. The system shall have a Hi-POR (High Pressure Oil Return) to ensure a consistent film of oil on all moving parts at low speed. Oil is returned to compressor through a separate oil injection pipe.
    a. The system shall be provided with a centrifugal oil separator designed to extract oil from the oil/refrigerant gas stream leaving the compressor and return the extracted oil to the compressor oil sump.
    b. The system shall have an oil level sensor in the compressor to provide direct oil level sensing.
    c. The system shall only initiate an oil return cycle if the oil level is too low.

F. Refrigeration System:
1. Compressors: ALL Inverter-driven, Hermetic scroll; internal motor overload protection, crankcase heater, manual-reset high-pressure switch, and phase failure/reversal.
2. There shall be an accumulator with refrigerant level sensors and controls.
3. The Compressor shall use a factory charge of Polyvinyl Ether (PVE) oil.

4. Air-Source Heat Exchanger Coil:
    a. Construction: The outdoor unit shall have a factory-built coil comprised of aluminum fins mechanical bonded on copper tubing.
    b. Maximum pressure rating: Min. 551 psig
    c. Cabinet shall have coil guard.
    d. The unit shall have a 3-row heat exchanger.

G. Electrical:
    1. Power supply: 208 volt/3-phase/ 60 Hz or 480 volts / 3-phase / 60 Hz. See drawings.

2.05 HEAT RECOVERY UNIT (HRU)

A. HR unit shall be designed and manufactured by the same manufacturer of VRF indoor units and Air source units.

B. HR unit casing shall be made with galvanized steel.

C. HR unit shall require 208-230V/1-phase/60Hz power supply.

D. HR Unit shall be an intermediate refrigerant control device between the water source unit and the indoor units to control the systems simultaneous cooling and heating operation.

E. HR unit shall be engineered to work with a have a three pipe VRF system comprising of:
    1. High Pressure Vapor Pipe
    2. Low Pressure Vapor Pipe
    3. Liquid Pipe

F. HR unit shall be designed to be piped in series with the use of Y-branch or header fittings.

G. Each port shall be capable of operating in cooling or heating independently regardless of the operating mode of any other port on the HR unit or in the system.

H. Each port shall be capable of connecting from 2, 3 or 4 indoor units to a maximum nominal capacity of 54MBh.

I. Maximum nominal capacity per HR unit shall not exceed 16 tons.

J. HR unit shall be internally piped, wired, assembled, and run tested at the factory.

K. HR unit shall be designed for installation in a conditioned environment.

L. HR unit shall have a liquid bypass valve.

M. HR unit shall have (2) two-position solenoid valves per port.

N. HR unit shall have a balancing valve to control the pressure between the high pressure and low-pressure pipe during mode switching.

O. HR unit shall have an electronic expansion valve for subcooling.

P. HR unit shall not require a condensate drain. The contractor is responsible for any additional costs for provision and installation of the condensate management system if required.

Q. HR unit shall be internally insulated.

R. All field refrigerant lines between water source unit and HR unit and from HR unit to indoor unit shall be field insulated.

S. The HR unit shall not exceed a net weight of 53 lbs.

T. The system shall be designed to accommodate 16 HR units connected to Heat Recovery units piped in single series string.

U. A single series pipe string of 1 to 16 HR units shall be capable of serving indoor units with a total nominal capacity of 192 MBH

V. Physical size of the HR boxes shall not exceed what is shown on plans.

2.06 INDOOR UNIT (4-WAY CASSETTE WITH GRILLE)

A. General:

1. The unit shall be a cassette style indoor unit that recesses into the ceiling with a ceiling grille and shall have a modulating linear expansion device. The unit shall be used with the outdoor unit and BC Controller. The unit shall support individual control using DDC controllers.
2. Performance shall be based on 67º FWB, 80º FDB for the indoor unit and 95ºFDB, 75ºFWB for the outdoor unit.

B. Indoor Unit: The indoor unit shall be factory assembled, wired, and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board, and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function, and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

C. Unit Cabinet:

1. The cabinet shall be space saving ceiling-recessed cassette.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.
3. Branch ducting shall be allowed from cabinet.
4. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

D. Fan:

1. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. The indoor fan shall consist of four (4) speeds, Low, Mid1, Mid2, and High, two of which may be selected by the room controller.
4. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
5. The auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution.

E. Filter:

1. Return air shall be filtered by means of a long-life washable permanent filter.

F. Coil:

1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The condensate lift mechanism shall be able to raise drain water 33 inches above the condensate pan.
7. Both refrigerant lines to the indoor units shall be insulated.

G. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.
2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz).

H. Controls:

1. This unit shall use controls provided by the manufacturer to perform functions necessary to operate the system. Please refer to 2.8 of this guide specification for details on controllers and other control options.

2.07 CONTROLS

A. Physical characteristics:

1. General: The physical controllers shall be plastic material with a neutral color. Each remote controller, at a minimum, shall have a LCD (Liquid Crystal Display) that shows room temperature, set point, and fan speed.

B. Electrical Characteristics

1. General: The electrical voltage from each circuit board to the controls shall be 12 volts DC. The voltage may fluctuate up or down depending on communication packets being sent and received.
2. Wiring: Control wiring shall be installed in a daisy chain configuration from indoor unit to indoor unit then to the BC controller and outdoor unit. Control wiring shall run from the indoor unit terminal block to the controller associated with that unit.
3. Wiring size: Wiring shall be 2-conductor 16 AWG or 18 AWG stranded wire with a shield, as defined by the Design Tool AutoCAD output.
4. Shielding the cable: The wire shall be 2-conductor, twisted pair shielded and connected to the appropriate terminals within the indoor units and outdoor unit as well as the BC controller.

C. Remote Controllers

1. The remote controllers shall operate indoor units. The wiring for the remote controllers shall be simple, non-polar, two-wire connections. All remote controllers shall be wall-mounted and contain a microprocessor that constantly monitors operation to maintain smooth indoor unit operation. Set temperature shall be adjusted in increments of 1°F or 2°F, depending on the systems and controllers. In the event of an abnormality, the remote controller shall display a four-digit error code and the indoor unit address.

D. System to have BACnet interface.

PART 3 EXECUTION

3.01 INSTALLATION OF UNITS

A. General

1. Install air conditioning unit in accordance with manufacturer’s installation instructions. Install unit plumb and level, firmly anchored in location indicated, and maintain manufacturer’s recommended clearances.

B. Electrical Wiring

1. Install and connect electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturers electrical connection diagram submittal to electrical contractor.

C. Piping Connections

1. Install and connect devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturers piping connection diagram submittal to piping contractor.

D. Drain Water Piping

1. Connect drains to air conditioning unit. Provide pitch and trap as manufacturer’s instructions and local codes require.

E. Examination

1. Verify that proper power supply is available.

F. Installation

1. Install in accordance with manufacturer's instructions.
2. Install in accordance with NFPA 90A.
3. Mount condensing units on 18” high platform curb or concrete base. See Section 230548 – Vibration Isolation for additional requirements.
4. See Section 230548 – Vibration Isolation for additional requirements for hanging fan coil / heat pump.
5. Provide additional unistrut structural as required by field conditions.

G. Manufacturer's Field Services

1. Prepare and provide initial start-up of systems.

3.02 OWNER TRAINING BY EQUIPMENT MANUFACTURER

A. At the completion of the project, the Installing Contractor shall provide training for the Owner's staff. Training shall consist of two parts. Part One is a classroom situation which describes the equipment's operation, maintenance, and repair requirements. Part Two will be on-site (hands-on) training which will show the location of all devices and the operation and maintenance of all controls, devices, etc.

END OF SECTION

SECTION 23 8400

GAS FIRED INFRA-RED HEATING EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

A. An infrared radiant gas heating system.
   1. Burner.
   2. Burner Control.
   3. Radiant Piping – Heat Exchanger.
   4. Reflectors.
   5. Vent Assembly.
   6. Vacuum Pump.
   7. Control Panel.

1.02 RELATED SECTIONS

A. Section 23 1126 – Fuel Piping.

B. Section 23 3350 – Breeching, Chimneys and Stacks.

1.03 REFERENCES

A. American National Standards Institute/American Society of Heating, Refrigerating and Air Conditioning Engineers, ANSI/ASHRAE.
   1. ANSI/ASHRAE 90A; Energy Conservation in New Building Design.

B. American National Standards Institute/National Fire Protection Association; ASNI/NFPA.
   1. ANSI/NFPA: National Fuel Gas Code.

C. National Fire Protection Association, NFPA:
   1. NFPA 90A: Installation of Air Conditioning and Ventilating Systems.

D. Unit(s) assembly shall be tested in accordance with Standard, ANSI Z83.8-2006 and CSA 2.6-2006 and shall bear the ETL label. The heater shall be certified by the American Gas Association and approved by the Canadian Gas Association.

E. Design certified by the American Gas Association per American National Standard Z83.6-1982 “vented infrared radiant heater.”

F. International Mechanical Code 2015.

1.04 SUBMITTALS FOR REVIEW

A. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements.

B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements.

C. Submit manufacturer’s installation instructions. Indicate assembly, support details, connection requirements, and include start-up instructions.

1.05 OPERATION AND MAINTENANCE DATA

A. Include manufacturer’s descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

B. The equipment manufacturer’s bid/proposal shall include start-up services, Owner’s schooling, operating manuals and warranty for parts and labor on equipment only. All other warranty services are by the installing contractor.

1.06 WARRANTY

A. Provide three (3) year warranty on all parts associated with infrared heating system and one (1) year labor warranty for period after substantial completion.

1.07 CONTRACTOR'S RESPONSIBILITY TO VERIFY ELECTRICAL REQUIREMENTS

A. The mechanical and electrical drawings are coordinated based on the equipment scheduled on the drawings. The mechanical contractor shall verify and determine if electrical requirements for equal or substituted equipment are compatible with the electrical system shown on the plans. The mechanical contractor shall coordinate and pay for any electrical design and installation modifications required for the substituted equipment at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS – INFRARED RADIANT HEATING SYSTEM

A. Roberts – Gordon LLC.

B. Engineer / Owner Approved Equal.

2.02 INFRARED RADIANT HEATING SYSTEM

A. Burner Units:
   1. Each firing unit shall consist of an integral burner control installed in a factory furnished combustion chamber and shall have a maximum gas input rating as indicated on the drawing. Burner assembly shall consist of heavy duty cast iron burner head, pre-wired electronic gas controls with electronic ignition and combustion air filter.
   2. Burners shall be designed for firing in tandem without adverse effects from combustion gases from upstream burners.
   3. The combustion system shall be capable of being the combustion condensing type in which the products of combustion are exhausted below the dew point of the moisture in the flue gases (140oF - 180oF).
   4. Design firing rate for the burners shall be as scheduled on drawings.
   5. The design of the burners supplied shall provide for maintaining a constant proportion of fuel gas to filtered combustion air. These conditions are met for burners in which the pressure of both the fuel gas and the combustion air are both introduced at zero (atmospheric) pressure and the flow of each is established by a vacuum on the downstream side of the flow metering orifices.
   6. Outside Air: The system shall be capable of supplying air from outside to each burner and end vent for the support of combustion in contaminated environments.

B. Burner Control
   1. All burners shall be factory wired for 110 volts with transformer for 24-volt DSI operation as supplied with a grounded 18" three wire pigtail located at rear of burner.
   2. To assure a high degree of fail-safe operation, the design shall preclude main flow of gas if any or all of the following abnormal conditions occur:
      a. Main valve fails in open position
      b. Vacuum pump motor fails (vacuum proving switch cuts power to burners.)
      c. Power fails (gas valves in burners close in safe position.)
   3. All gas vacuum-firing burner units shall be equipped with a Direct Spark Ignition Module (DSI). The DSI module shall have a 15 second flame response time before lockout occurs. The spark shall shut off when the burner flame is established.
   4. All units to be supplied with outside air for combustion and any excess air required by system if inside air contains contaminants.

C. Radiant Piping - Heat Exchanger
   1. Provide Heat Treated Aluminized pipe throughout system. Minimum heat exchanger surface to be 75 sq. ft. for each 100,000 BTU/HR input. Connections to be made between pipe sections using stainless steel coupling assemblies.
   2. Hanging materials: All system pipe must be supported in accordance with acceptable practices, local codes, seismic requirements, applicable standards and as shown on plans. Pipe shall pitch down at least 1” in 20’ toward vacuum pump.

D. Reflectors:
   1. All reflectors shall be deep dish of a highly infrared reflective material such as aluminum.
   2. Standard reflector shall be installed on all radiant pipe, manifold pipe, and tail pipe as indicated on system layout furnished.
   3. System to have perimeter side extension reflector in certain areas of layout as shown on plan when specified. Side reflector permanently attaches to side of top reflector and is secured to the pipe by three side reflector supports and two “Z” clips for each 8 ft section of side reflector.

E. End Vent Assembly:
   1. Each open-end combustion chamber shall have an approved end vent and the reflector in this area shall have an end cap and be installed according to manufacturer’s installation instructions and as shown on plans.

F. Vacuum Pump:
   1. The system shall vent all products of combustion outdoors by means of the vacuum pump.
   2. Vacuum pump shall be equipped with a maximum of 3/4 HP, 60 Hertz, 120 Volt, 3450 RPM, single phase T.E.F.C. motor. This motor shall have thermal overload protection, ball bearings, and shall be constructed in accordance with electric motor industry standards.
   3. The scroll of this pump shall be cast iron with a minimum metal thickness of approximately 3/16 inch. The impeller wheel shall be cast 319 alloy aluminum with a minimum metal thickness of approximately 3/32 inch.
   4. Provide low voltage (24 volt) two wire circuit from the vacuum proving switch (located at the inlet to the vacuum pump) to the control panel.
   5. Provide connection between the pump inlet and tail pipe with an acoustic boot and clamps. Provide discharge connection with a 4.5-inch acoustic boot and 4” porcelain coated tail pipe.
   6. System will be under negative pressure at all times during operation to preclude the possibility of the escape of combustion gases inside the building.
   7. Vacuum pump motor requires a 1-wire grounded circuit 115 volts, single phase, 60 hertz for a total of 10 full load amps. Motor must have the same rotation to match the direction of the arrow on the fan scroll.
   8. The vacuum pump shall be acoustically isolated from the system with a flexible connector with a temperature rating of 350oF minimum. The motor in the vacuum pump shall be secured with rubber mounts for acoustical isolation.
   9. Provide stainless steel venting materials.

G. Control Panel:
   1. Provide pre-wired solid-state system control panel as furnished by the system manufacturer for each vacuum pump. The control panel shall provide all relays, controls, terminals, lights, etc. to control up to four temperature zones with individual thermostats. Controls shall include a pre-purge sequence of at least 20 seconds prior to initiation of firing and post-purge sequence of at least 20 seconds after shutdown of the last burner. An interlock shall be provided to ensure that no burner may be fired without the vacuum pump operating, indicator lights shall appear on outside of panel cover to show Vacuum Pump Operation, Power On and Zone On.
   2. Connect power wiring to burners and vacuum pumps. Connect control wiring between vacuum pumps, control panels and thermostats in accordance with manufacturer’s wiring diagrams.

H. Thermostats:
   1. Provide, where indicated, 24-volt thermostat(s) connected to control system. Mount thermostat(s) 48” above finished floor, if not otherwise indicated. Supply number of thermostats as shown on drawing. Provide locking guard.

I. System Controls
   1. Prewired system control circuits shall be supplied in a control panel with each vacuum pump. The control panel for the control of the burners shall provide relays & terminals to accommodate up to four temperature zones with a thermostat and associated control circuits for the burners for each temperature zone. The control panel shall have indicator lights showing Power On, Vacuum Pump On and 3-Zones in Operation.
   2. All control circuits must be properly polarized. All burner units located on one radiant pipe line must be on the same zone. All burner units using the same tail pipe also must be on the same zone (except last 10’ into pump).
   3. All combustion chamber and heat exchanger pipes connected to vacuum pump shall be pre-purged with air for a period of at least 20 seconds (10 air changes minimum) prior to initiation of firing sequence.
   4. All combustion chamber and heat exchanger pipes connected to a vacuum pump shall be post-purged with air for a period of at least 20 seconds (10 air changes minimum) after shut down of the last burner firing into the vacuum pump.
   5. All vacuum pumps shall be provided with vacuum proving switches to prevent opening of gas valves until vacuum in the pipe is proven.
   6. Pre-purge of the system is obtained from the solid-state timer relay located in the furnished panel. The first zone thermostat calling for heat will activate this relay. The pump motor will start and the vacuum proving switch, after sensing a minus pressure of 2” water column, completes the circuit to begin pre-purge. After approximately 45 seconds, the 110-volt control circuits will be activated and burners will light automatically. The burners will remain on until the thermostat is satisfied. At that time, the gas valve and DSI will drop out, but the pump will continue to run to give a post-purge. This post-purge period on the last zone thermostat to be satisfied (internally provided in panel box).
   7. The infrared heating system zones to be controlled by the Building Automation System. See drawings for sequence of operation requirements.
   8. The system wiring diagram shall conform to wiring diagrams furnished with installation and service sheets furnished with the units and as on plans.
   9. All thermostats are low voltage bimetal action with heat anticipator. Low voltage thermostats shall be numbered instead of marked in degrees and shall not have thermometers. Low voltage fittings must follow local codes.

J. Gas Piping:
   1. Gas supply piping must meet local codes and fuel supplier requirements and be sized in accordance with BTU demand, available pressure, and the total equivalent length of pipe required (fittings included).
   2. Connection from gas supply line to burner unit must be made in accordance with installation details on plans. Special connections are used to allow for expansion and contraction of radiant piping.
   3. Gas shut-off cock, as supplied with unit, and controls in unit must not be subjected to more than 1/2# or 14 inches water column (W.C.) pressure. If high pressure testing of gas supply line is required, this test must be made with a plug in the 1/2 inch branch line to each burner. Never test the gas line with the 1/2 inch IPS x 3/4” SAB shut-off cock installed or with the burner unit connected.

K. Electrical:
   1. Wiring must conform to National Electric Code and local ordinances in accordance with submitted manufacturers’ diagrams.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions at the site prior to bidding or beginning work.

B. Verify that space is ready to receive work.

C. Verify that proper power supply is available.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with International Mechanical Code 2015.

C. Radiant vacuum gas heating system must be vacuum vented to atmosphere and be under negative pressure at all times during operation.

D. Clearances to combustible materials shall not exceed those outlined and printed on the burner nameplate and on manufacturer's specification sheet.

E. Installation of all equipment and materials shall conform to the practices of good workmanship in accordance with applicable requirements. The combustion chambers, pipe work, gas lines and electrical conduit shall be attached to or suspended from the building structure in a manner suitable to meet standards of durability and safety.

3.03 MANUFACTURER'S FIELD SERVICE

A. Prepare and start systems.

3.04 FACTORY TESTED

A. Unit(s) shall be operated, tested and set at the factory using job-site conditions for electrical and gas input. All operating and safety controls shall be tested and set at the factory. Gas-pressure regulator shall be set for specified burning rate at specified inlet pressure.

3.05 SERVICE AND PARTS

A. The supplier shall furnish gas piping schematics, as-built wiring connection and control-circuit diagrams, dimension sheets and a full description of the unit. Service manuals, showing service and maintenance requirements, shall be provided with unit.

3.06 OWNER TRAINING BY INSTALLING CONTRACTOR

A. At the completion of the project, the Installing Contractor shall provide training of Owner's staff. Training shall consist of on-site (hands on) training, which will show the location of all devices and the operation of all controls, devices, motors, etc. and maintenance and repair requirements. Contractor shall provide a minimum of four (4) hours of training for equipment provided under this Section of the contract.

END OF SECTION

SECTION 260500

BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and the General Requirement Specification, apply to this and the other sections of Division 23.

B. The Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.02 SECTION INCLUDES

A. Descriptions.

B. Quality assurance.

C. Codes.

D. Approvals.

E. Permits and inspections.

F. Fees.

G. Submittals.

H. Instruction.

I. Overtime

J. Alternates

K. Guarantees.

L. Warranty.

M. Products

N. Execution.

1.03 RELATED SECTIONS

A. Substitutions: Refer to the General Requirements and 26 Sections.

B. Shop Drawings: Refer to the General Requirements and 26 Sections.

C. Operation and Maintenance Data: Refer to the General Requirements and 26 Sections.

D. Coordination with Other Trades: Refer to the General Requirements, 22, 23, and 26 Sections.

1.04 DEFINITIONS

A. Provide all required products and execution for a complete and fully operational Electrical System. Such work includes, but is not limited to, that which is identified on the contract documents. For the purpose of this specification, the following terms are defined:

1. “Contract documents” include the most current project drawings and specification.
2. “Provide” includes furnishing and installation.
3. “Furnish” includes purchasing and transporting new equipment, as specified, to the job site.
4. “Install” includes mounting or setting equipment in place, in specified location, making all required electrical connections for a working product.

5. “Electrical System” includes all distribution of power, lighting, fire protection, life safety, communications, security, special systems, and any other information, electrical in nature, identified on the Contract Documents, from the point(s) of service to utilization device(s).
6. “Connecting” means providing a power source, overcurrent devices, raceways, conductors, terminations, insulation supports, and other materials and equipment required for the operation and control of the relevant operation.

B. Provide materials, equipment, installation or testing identified on the drawings but not specified herein; or that which is specified herein, but not identified on the drawings shall be provided at no additional cost to the Owner.

C. Provide materials or equipment including minor items, accessories, or devices reasonably inferable as necessary for the completion and proper operation of any systems or products identified on the Contract Documents.

1.05 QUALITY ASSURANCE

A. Discovery of any conflicting design information or any design intentions which are not readily interpreted shall be referred to the Architect/Engineer for further description or illustration prior to any product selection or execution of work.

B. Discovery of any materials or equipment which is damaged, unsuitable, incompatible, or non-compliant with any applicable codes, laws, ordinances, or other regulations shall be brought to the direct attention of the Architect/Engineer.

C. Generally, the Drawings establish the location, quantity and relationship of the parts of the work, and the specifications define the type and quality of materials and workmanship. Work shown in the drawings and not mentioned in the specifications or required by the specifications and not shown on the drawings, shall be provided as if fully provided for in both. In the case of conflicts between the drawings and specifications, or within either document, the Architect/Engineer shall determine the intent. In such cases, in general, the more stringent requirement concerning greater quantity, quality, and/or resulting in a higher cost shall govern without further cost to the Owner.

D. The equipment list contained in this specification includes only the major equipment requirements. Verify the completeness and suitability of device to meet the intent of the specifications. Any additional equipment required, even if not specifically mentioned herein, shall be provided without claim for additional payment; it being understood that a complete operating system, satisfactory to the Engineer and the Owner, is required in all cases.

1.06 REGULATORY REQUIREMENTS

A. Where governing codes indicate the Drawings and Specifications do not comply with the minimum requirements of applicable codes, the Contractor shall either notify the Architect/Engineer in writing during the bidding period identifying the revisions required to meet code requirements or provide an installation which will comply with the code requirements.

B. All material, equipment, installation and testing should be in accordance with all applicable codes, laws, and ordinances of Federal, State and local governing bodies having jurisdiction.

C. In case of differences between building codes, Federal and State laws, local ordinances and utility company regulations and the Contract Documents, the most stringent shall govern.

D. Where any materials, equipment or installation is not in compliance with the more stringent of the applicable codes, laws, ordinances, regulations and contract documents, they shall be entirely removed, replaced, modified or otherwise corrected at no additional cost to the Owner.

E. Materials, equipment, installation and testing shall conform to the latest editions of the following applicable codes:

1. NEC - National Electrical Code.
2. State of Illinois Building Code.

3. NFPA 72 - National Fire Protection Association.
4. IBC - International Building Code 2021.
5. IECC – International Energy Conservation Code 2021.
6. Local Amendments to Aforementioned Codes by the City of Rockford, IL.

F. All products, materials, and work shall comply with all codes having jurisdiction, including but not limited to the following codes and standards as applicable, in addition to any codes and standards referenced within individual specification sections. These codes and standards shall apply to all Division 26 Sections as applicable.
1. ANSI - American National Standards Institute.
2. ASTM - American Society for Testing Materials.
3. CBM - Certified Ballast Manufacturers.
4. ETL - Electrical Testing Laboratories.
5. IEEE - Institute of Electrical and Electronic Engineers.
6. NBS - National Bureau of Standards.
7. NEMA - National Electrical Manufacturer's Association.
8. NFPA - National Fire Protection Association.
9. OSHA - Occupation Safety and Health Act.
10. UL - Underwriters Laboratories.
11. ADA - Americans with Disabilities Act.
12. BOCA - National Building Code (1996).
13. NEC - National Electrical Code.
14. IBC - International Building Code.
15. IEC - International Electrical Code.
16. IFC - International Fire Code.

G. Where a UL standard is available, the equipment supplied for the project shall be UL listed and shall bear the UL label.

H. Notify the Architect/Engineer of any materials or apparatus believed to be inadequate, unsuitable, in violation of laws, ordinances, rules or regulations of authorities having jurisdiction.

I. In every installation where regulations of electric utility, telephone and cable TV companies apply, conformance with their regulations is mandatory and any costs involved shall be included in the Contract, with the exception of extra facility and other charges which are directly paid by the Owner.

1.07 APPROVALS

A. Prepare shop drawings and obtain approvals from inspection authorities for emergency and exit lighting, fire alarm and life safety systems, and other electrical installations requiring specific approval.

B. Prepare shop drawings and obtain approvals from governmental agencies and utility companies for applicable electrical installations requiring approval.

C. Copies of the final approved drawings shall be delivered to the Architect/Engineer. Approvals shall be obtained before commencement of related work.

1.08 PERMIT AND INSPECTION

A. Permit: Obtain and pay for all permits, bonds, license, tap-in fees, etc. required by the City, State, or other authority having jurisdiction over the work.

B. Inspections: Arrange and pay for all inspections required by the above when they become due as part of the work of sections affected. Conceal no work until approved by these governing authorities.

C. Engineer inspections include one above-ceiling review and report before ceiling installation conceals work, one substantial review report, and one final review report. All additional review reports required due to incomplete or non-acceptance of substantial or final conditions will require the contractor to pay the engineer $650.00 per additional inspection review and report.

1.09 FEES

A. Pay fees and other charges incidental to electrical work and obtain and pay for required insurance, permits, licenses, inspections and taxes. Arrange for required inspections and delivery certificates and approvals for same to the Architect/Engineer.

1.10 SUBMITTALS

A. Shop Drawings: As soon as practical and before any material or equipment is purchased, the Contractor shall submit shop drawings. A complete list in one category (example: all fixtures) of all shop drawings catalog cuts, material lists, etc. are to be submitted by this Contractor at one time. No consideration will be given to partial shop drawings submitted from time to time.

1. Extended time for submitting special shop drawings may be requested; however, any extension of time approved does not relieve this Contractor of his responsibility of executing his work in accordance with this contract.
2. Any listed materials, fixtures, apparatus, or equipment that are not in accordance with specifications requirements can and will be rejected for use in this installation and construction. Substitutions will not be permitted.
3. Any materials, fixtures, apparatus or equipment installed without stamped or written approval shall be removed by the Contractor and replaced with specified equipment at the direction of the Architect/Engineer and without recourse for additional compensation.
4. Review of shop drawings does not relieve the Contractor from any responsibility for deviation from the Contract Documents unless the deviation is specifically identified on the shop drawings.
5. Contractor shall review and coordinate all shop drawings prior to submitting them for Architects/ Engineer's review. Contractor shall stamp each shop drawing to certify that all MEP related contractors have coordinated and reviewed it. Engineer will not check any shop drawings that Contractor has not stamped with his review certification. Shop drawings will be reviewed once. If a second or third review is required, the contractor will pay the engineer $500.00 per review.
6. Prior to ordering any switchboard, distribution panels, panelboards, or transformers, the contractor shall submit dimension drawings showing the switchboard will fit in the location shown on the drawings. In the event of conflicts, the contractor shall request a written clarification from the Architect/Engineer.

B. Coordination and Installation Drawings:

1. Record drawings shall closely indicate the electrical installation as constructed and shall be periodically revised to reflect all changes, including those required by the Architect/Engineer, those which are or have been found necessary in the field and those which may be suggested by the Contractor and accepted by the Architect/Engineer. Drawings shall be revised when considered necessary by the Architect/Engineer or the Contractor in order to facilitate proper coordination.
2. Provide "as-built" drawings.

C. Operation and Maintenance Data: Refer to the General Requirements and Division 26 Sections. Submit four copies of maintenance manuals in hardbound covers containing approved shop drawings and manufacturer's repair manuals, guarantees, operating instructions, wiring diagram and part lists.

1.11 OPERATION AND MAINTENANCE INSTRUCTION

A. Provide operation and maintenance instruction for equipment and systems.

B. Allow for 40 man-hours of instruction time for electrical distribution system, emergency system, fire alarm system, communication systems, etc.

1.12 OVERTIME WORK

A. All construction work shall be done on regular working hours and days, unless otherwise specified. If overtime work, other than specified, is required on the project, it shall be performed as indicated.

B. System shutdown shall occur during off business hours and shall be done on over-time basis.

C. The base bid shall include overtime work specified. No compensation shall be made for other work done on overtime basis, unless authorized.

1.13 ALTERNATES

A. Accepted alternates, if any, may affect portions of the Base Bid Work.

B. Acceptance of alternates shall include provisions necessary to alter, adjust or otherwise modify work affected by the alteration.

C. Shop drawings shall include alternate work and shall reflect changes necessitated to other work.

1.14 GUARANTEE

A. Electrical work shall be guaranteed for both materials and labor for a period of one year.

B. On the premises maintenance shall be provided at no cost to the purchaser for one year from the date of an operational and accepted installation unless damage is caused by misuse or abuse.

C. Guarantee all wiring and equipment to be free from inherent and mechanical defects due to workmanship and materials used for the period of one full year from date of operational and accepted installation. Replacement of all or part of the equipment and/or correction of such defects, including labor, shall be rendered without cost to the Owner with the guarantee period.

D. Manufacturer's equipment guarantees or warranties for periods of more than one year shall be included in the Operation and Maintenance Data.

1.15 WARRANTY

A. Warranty period shall be one year after final acceptance of the system. Repairs or replacements made under the warranty shall bear an additional 1-year warranty dated from final acceptance of the repair or replacement. The Owner shall receive the benefit of all warranties furnished by manufacturers.

1.16 PROJECT/SITE CONDITIONS

A. Carefully examine the contract documents, visit the site, and thoroughly become familiar with the local conditions relating to the work prior to bidding. Failure to do so will not relieve the contractor of the obligations of the Contract.

B. Install Work in locations shown on Drawings, unless prevented by Project conditions.

C. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

1.17 CONTRACTOR'S RESPONSIBILITY TO VERIFY EQUIPMENT DIMENSIONS

A. The drawings, schedules and specifications have been prepared using one manufacturer for each piece of equipment as the basis for dimensional design. If the Contractor purchases equipment listed as a specified Acceptable Manufacturer but is not the scheduled manufacturer used for the base design, the Contractor shall be responsible for checking all the dimensions of the equipment to verify that it will fit in the space shown on the Drawings. Minor deviations in dimensions will be permitted, provided the ratings meet what was shown on the drawings and equipment will physically fit into the space allocated with suitable access around equipment for operation and maintenance on the equipment.

B. Contractor and/or manufacturer shall verify that the capacity and duty specified meets the characteristics of the equipment he submits for review.

C. If equipment is submitted for review and does not meet the physical size or arrangement of what was scheduled and specified, Contractor shall pay for all alternations required to accommodate such equipment at no additional cost to the Owner. Contractor shall also pay all costs for additional work required by other Contractors, Owner, Architect or Engineer to make changes which would allow the equipment to fit in the space.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Proposal shall be based upon the furnishing of all materials and equipment as specified, which in every case shall be new and, where not specifically referred to by manufacturer's name, of the best grade and quality available.

B. Equipment and material shall be without blemish or defect and shall not be used for temporary light or power purposes, including lamps, without the Architect/ Engineer's written authorization.

C. Items of equipment of one generic type (such as fuses), except conduit, conduit fittings, outlet boxes, wiring and cable, shall be the product of one manufacturer throughout, unless otherwise indicated or accepted by the Architect/Engineer.

D. Where two or more makes or kinds of materials or equipment are specified, indicate which of these choices will be used. This information shall be included with the list of manufacturers for equipment and materials to be submitted to the Architect/Engineer.

E. Manufacturers of equipment shall be firms regularly engaged in manufacturing factory-fabricated systems and equipment whose products have been in satisfactory use in similar service for not less than 5 years.

2.02 MANUFACTURERS' NAMEPLATES

A. Each major electrical component such as switchgear, transformers, motor control centers, panelboards, circuit breakers, disconnect switches, etc. shall have the manufacturer's name, address, catalog number, model number, rating, and any other required specified markings on a plate or label located inside the cover or otherwise inconspicuously but readily accessible.

PART 3 EXECUTION

3.01 DELIVERY AND STORAGE

A. Receive, handle, and store electrical items and materials at the project site. Materials and electrical items shall be so placed that they are protected from damage and deterioration.

B. The Contractor shall bear full responsibility for equipment judged unacceptable due to his failure to comply with these specifications.

3.02 INSTALLATION

A. The Drawings for work under Division 26 are diagrammatic and are intended to convey the scope of work and indicate the general arrangement of conduit, boxes, equipment, fixtures, and other work included in the Contract.

B. Location of items required by the Drawings or specifications not definitely fixed by dimensions are approximate only and exact locations necessary to secure the best conditions and results shall be determined at the site and shall be subject to the approval of the Architect/Engineer.

C. Follow Drawings in laying out work, check drawings of other trades to verify spaces in which work will be installed, and maintain maximum headroom and space conditions at all points.

   1. Where headroom or space conditions appear inadequate, the Architect/Engineer shall be notified before proceeding with installation.

   2. Minor conduit rerouting and changes shall be made at no additional cost to the Owner.

D. Perform all work with skilled mechanics of the particular trade involved in a neat and workmanlike manner.

E. Perform all work in cooperation with other trades and schedule.

F. Perform all work in accordance with the manufacturer’s recommendations.

G. Furnish other trades advance information on locations and sizes of frames, boxes, sleeves and openings needed for the work, and also furnish information and shop drawings necessary to permit trades affected to install their work properly and without delay.

H. Where there is evidence that work of one trade will interfere with the work of other trades, all trades shall assist in working out space allocations to make satisfactory adjustments and shall be prepared to submit and revise coordinated shop drawings.

I. With the approval of the Architect/Engineer and without additional cost to the Owner, make minor modifications in the work as required by structural interferences, by interferences with work of other trades or for proper execution of the work.

J. Work installed before coordinating with other trades so as to cause interference with the work of such other trades shall be changed to correct such condition without additional cost to the Owner and as directed by the Architect/Engineer.

K. Architect/Engineer reserves the right to change location of electrical equipment or device within 10’-0” radius before work is installed without extra charge.

L. Electrical Contractor shall cooperate with other trades and coordinate work so that conflicts with other work are eliminated.

M. Provide a 3” high chamfered concrete housekeeping pad, 6” larger than the footprint of the equipment (3” all around), for all floor mounted equipment.

N. Equipment shall be installed with adequate space allowed for removal, repair or changes to equipment. Ready accessibility to removable parts of equipment and to wiring shall be provided without moving other equipment which is to be installed or which is in place. Electrical Contractor shall verify measurements. Discrepancies shall be brought to the Architect/Engineer's attention for interpretation.

O. Determine temporary openings in the buildings that will be required for the admission of apparatus furnished under this Division, and notify the Architect/Engineer accordingly. In the event of failure to give sufficient notice in time to arrange for these openings during construction, assume all costs of providing such openings thereafter.

P. Location of electrical outlets, lighting fixture, lighting panels, cabinets, equipment, etc. is approximate and exact locations shall be determined at the project.

Q. Electrical Contractor shall refer to contract documents for details, reflected ceiling plans, and large-scale drawings.

R. Apparatus, lighting fixtures, material or work not shown on the drawings, but mentioned in the project specifications, or vice versa or any included accessories such as wiring, relays, switches, transformers (line voltage or low voltage), etc., necessary to make the work complete and ready for operating, even though not specified or shown on the electrical drawings shall be furnished and installed without additional expenses to the Owner. It is the Contractor’s responsibility prior to bids to review all project documents.

S. Verify final locations for rough-ins with field measurements of the actual equipment to be connected. Refer to equipment specifications in Division 2 through 26 for rough-in requirements.

T. Equipment specified under other divisions and requiring electrical supply shall be erected, aligned, leveled and prepared for operation. Provide required controls and accessories along with installation instructions, diagrams, dimensions and supervision of installation and start-up. Provide the required electrical rough-ins and connections and confirm the electrical controls and accessories furnished under the specifications for the other divisions. Install those controls and accessories not located in the mechanical piping and ductwork. Provide additional electrical controls, accessories, fittings and devices not specified under the equipment but required for a finished, operating job. Make all final electrical connections. Participate in the start-up and test procedure.

U. Where surface mounted conduit or surface mounted raceway is installed on new walls, the electrical contractor shall paint the surface mounted conduit or surface mounted raceway to match the new or existing wall.

V. Electrical Contractor shall weatherproof all openings and penetrations through foundations and exterior walls created by fixtures and conduits to prevent moisture from entering through.

W. Contractor shall furnish other trades advance information and/or shop drawings on locations and sizes of conduits, raceways, equipment, frames, boxes, sleeves and openings, etc. needed for their work to install their work properly and without delay.

X. Contractor shall provide sleeves in beams, floors, columns and walls as shown on the drawings, as required by job site conditions, and/or as specified, when installing their work. All beams and columns which are required to be sleeved shall be cut and reinforced as required by field conditions and locations and sizes shall be checked and approved by Architect before contractor cuts any structural building member.

Y. Contractor shall refer to the architectural and structural contract drawings (before submitting their bids) to familiarize themselves with the extent of the general contractor’s work, ceiling heights and clearance for installing their work.

Z. Contractor shall install all auxiliary supporting steel as required for the supporting of their conduit, fixtures, devices, equipment, etc. All supporting steel for items above a suspended ceiling shall be from new building structure members only. All supports in the existing building shall be from walls. No connection to wood, roof deck or structure is allowed.

AA. The locations shown for all lighting fixtures and ceiling mounted electrical equipment are diagrammatic. Exact location shall be determined from the reflected ceiling plans and/or on the job site by the construction manager. It shall be the contractor’s responsibility to maintain code required spacing for items such as fire alarm devices.

BB. Contractor shall be required to maintain the fire rated integrity of floors and/or wall partitions. All penetrations through fire rated building elements shall be effectively sealed using approved materials and methods.

CC. Contractor shall store all materials and equipment shipped to the site on a protected area. If material is stored outside the building, it must be stored off the ground a minimum of six inches (6”) set on 6 x 6 planks and/or wood pallets. All material and equipment must be completely covered with waterproof tarps or visqueen. All conduits will have the ends closed to keep out dirt and other debris. No equipment will be allowed to be stored on the site unless it is sitting on wood planks and completely protected with weatherproof covers.

DD. This contractor shall be responsible for furnishing all labor and material required to patch all openings in existing floors, walls, ceilings and fire separations created by the removal of this trades material and equipment where these openings are not to be reused.

3.03 PROTECTION

A. Protect conduit and wire way openings against the entrance of foreign matter by means of plugs or caps. Cover fixtures, materials, equipment and devices or otherwise protect against damage from any cause, both before and after installation. Fixtures, materials, equipment, or device damaged prior to final acceptance of the work shall be restored to their original condition or replaced, all at no additional cost to Owner.

B. Equipment shall be inherently safe and moving parts shall be covered with guards.

3.04 COOPERATION

A. Where jurisdictional rules require the assistance of electrical mechanics in the moving and setting of electrically power equipment, provide such assistance.

B. Where work covered by this section connects to equipment furnished under other sections, verify electrical work involved in the field and make proper connection to such equipment.

3.05 CUTTING AND PATCHING

A. Do drilling, cutting, fitting and patching necessary for the installation of conduits, wire ways, and other electrical equipment, and provide supports necessary for same and for bracing and anchorage of work. No cutting of structural work or of fireproofing shall be done without the written consent of the Architect/Engineer.

B. Conduits passing through roofs or other surfaces exposed to weather shall be properly flashed as specified in roofing and waterproofing sections. This flashing work shall be paid for as part of the electrical work.

3.06 WALL CHASES

A. Provide templates or details of wall chases, where conduits, pull boxes, cabinets, and other items of equipment are to be concealed or recessed, before the work of other trades is performed in the respective areas. Show exact locations and sizes of such equipment.

3.07 SLEEVES AND OPENINGS

A. Provide sleeves and openings for exposed wires, cables, and wire ways where they pass through walls and floors.

B. Sleeves for individual cables shall be hot-dip galvanized inside and outside. Sleeve shall be equal in gauge to heavy wall steel conduit and extended 3 inches above finished surface or wall.

C. Furnish complete dimensioned drawings of openings required through walls and floors, for conduits, or busways, or wire ways, before the work of other sections is performed in the respective areas.

D. Installation of 3-inch-high concrete curbs around openings through concrete slabs in electrical closets and other openings shall be provided under Division 3.

E. Pack or fill sleeves and openings after the completed work is in place. Filling shall comply with U.L., match rating of original construction and shall provide a waterproof and fireproof packing to prevent leakage of liquid, smoke, or fire through the sleeve or opening.

3.08 EQUIPMENT NOISE LIMITATION

A. Noise levels of electrical devices and equipment shall be within acceptable limits as established by NEMA or other valid noise rating agencies. Noise levels shall be subject to the Architect/Engineer’s acceptance, based on practical and reasonable consideration of occupancy requirements.

B. Check and tighten the fastenings of sheet metal plates, covers, doors, and trims to prevent vibration isolation and chatter under normal conditions of use.

C. When located elsewhere than in high-noise-level equipment rooms, the enclosures of solenoid-operated switching devices and other noise-producing device shall have anti-vibration mountings and non-combustible sound-absorbing linings.

D. Reactors, dimmers, lamp ballasts, and solenoids shall be designed and rated for “quiet” operation.

E. Remove and replace any individual electrical item or device that is found to produce a sound energy output exceeding that of other identical devices installed at the project.

3.09 EXCAVATING AND BACKFILLING

A. Excavating, bracing and shoring, testing disposition of excess, excavated material, provision of borrow, and placing of backfill shall be in accordance with Division 33 Utilities Excavating and Backfilling.

3.10 TEMPORARY UTILITIES AND HEAT

A. Contractor’s attention is directed to Division 01, which sets forth respective responsibilities of all concerned with furnishings temporary water, electricity and heat for use during construction of all Project.

3.11 EXECUTION, CORRELATION AND INTENT OF DOCUMENTS

A. In the event that conflicts, if any, cannot be settled promptly and amicably between the affected trades, with work proceeding in a workmanlike manner, then the Architect/Engineer shall decide which work is to be relocated and his judgment shall be final and binding on this Contractor.

3.12 ADJUSTMENTS

A. The primary adjustments of the system(s) shall be accomplished by the Contractor to the complete satisfaction of the Owner and Architect/Engineer at the time of completion of the installation.

3.13 ACCESS PANELS

A. Provide access panels as required. The access panels shall comply with Division 8.

3.14 TESTING

A. General: Furnish meters, instruments, cable connections, equipment or apparatus necessary for making all tests.

B. Insulation Tests:

1. After being pulled in place and before being connected, test all service and feeder cables with 1000-volt, 60 Hz insulation tester for one minute to determine that conductor insulation resistance to ground is not less than that recommended by the manufacturer. Test all branch circuit conductors for lighting, receptacle and miscellaneous loads prior to connection of loads. Tests shall not register less than one megaohm to ground during an insulation test as described above for service and feeder cables. Remove, replace and retest all cable failing insulation test.

2. Measure insulation resistance of electrical wiring with a self-contained instrument such as direct-indicating ohmmeter of the generator battery of electronic type.

3. When using any type of d-c voltage source, it is essential that the output voltage is steady to prevent fluctuations in charging current. Where protective resistors are used in test instruments, take into account their effect on the magnitude of the voltage applied to the insulation under test. Properly maintain the instrument used in insulation resistant testing. Make periodic checks to ensure that rated voltage is delivered and that the instrument is in calibration.

C. Unless otherwise specified, the insulation resistance shall be approximately one megaohm for each 1000 volts of operating voltage with a minimum value of one megaohm.

D. Test all motors under load, with ammeter readings taken in each phase and the RPM of motors recorded at the time. Test all motors for correct direction of rotation.

E. Documentation: Keep records of all tests, in tabulated, permanent, reproducible form, completely indexed and explained, indicating the specific test performed, environmental conditions such as temperature and humidity, date of performance, results obtained, corrective actions taken (if any), final results, and comments, if required. Copies of all tests shall be delivered to the Architect/Engineer prior to this final project review.

3.15 MOUNTING HEIGHTS

A. Mounting heights of electrical items shall be as listed below, unless otherwise specified, or by the Architect/Engineer's field instructions. Dimensions are above finished floor, unless otherwise indicated. - In areas where codes require different mounting heights, as in hazardous areas, comply with code requirements.

1.	General Receptacles	- 18" to C.L.
2.	Outdoor Receptacles	- 24" to C.L.
3.	General Tele/Data Outlets	- 18" to C.L.
4.	General Toggle Switches	- 44" to C.L.
5.	Fire Alarm Pull Stations	- 44" to C.L.
6.	Security and Intercom Call Stations	- 44" to C.L.
7.	Clock and Paging Speaker Outlets	- 84" to C.L.
8.	Fire Alarm Audio/Visual Devices	- 80" to C.L.
9.	Corridor Wall Sconces (>4" deep)	- 66" to C.L.
10.	Exit Signs	- 90" to C.L.
11.	Volume Controls	44" to C.L.
12.	T.V. Outlets	80" to C.L.
13.	Individual Disconnects and Starters	- 60" to C.L.
14.	Grouped Disconnects and Starters	$\geq$ 12" to C.L. $\leq$ 72" to C.L.
15.	Panelboard Overcurrent Devices	$\geq$ 12" to C.L. $\leq$ 72" to C.L.
16.	Grouped Utility Revenue Meters	$\geq$ 30" to C.L. $\leq$ 66" to C.L.

END OF SECTION

SECTION 26 0503
EQUIPMENT WIRING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 RELATED SECTIONS

A. Section 26 0532 - Conduit.

B. Section 26 0519 - Building Wire and Cable.

C. Section 26 0533 - Boxes.

1.03 REFERENCES

A. Section 01090 - Reference Standards: Requirements for references and standards.

B. NEMA WD 1 - General Purpose Wiring Devices.

C. NEMA WD 6 - Wiring Devices - Dimensional Requirements.

D. NFPA 70 - National Electrical Code.

1.04 SUBMITTALS FOR REVIEW

A. Submit under provisions of the General Requirements.

1.05 SUBMITTALS FOR INFORMATION

A. Submit under provisions of the General Requirements.

1.06 REGULATORY REQUIREMENTS

A. Conform to requirements of local electrical code.

B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.07 COORDINATION

A. Section 26 0500 - Basic Electrical Requirements.

B. Obtain and review shop drawings, product data, manufacturer's wiring diagrams and instructions for equipment furnished under other sections.

C. Determine connection locations and requirements.

D. Sequence rough-in of electrical connections to coordinate with installation of equipment.

E. Sequence electrical connections to coordinate with start-up of equipment.

PART 2 - PRODUCTS

(Not Used.)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 26 0500 - Basic Electrical Requirements: Verification of existing conditions prior to beginning work.

B. 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 liquid-tight 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 match 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.

J. Seal roof penetrations properly and as recommended by roofing manufacturer.

3.03 MECHANICAL EQUIPMENT SCHEDULE

A. As soon as practical and before any material or equipment is purchased or installed, the contractor shall submit for review, the mechanical equipment connection schedule for all mechanical equipment, completely filled in. The mechanical contractor shall stamp the mechanical equipment schedule to certify that he has coordinated and reviewed it. Any material or equipment installed without stamped or written approval of the mechanical equipment connection schedule shall be removed, modified or otherwise corrected at no additional cost to the Owner.

B.

MECHANICAL EQUIPMENT CONNECTION SCHEDULE						
EQUIPMENT DESIGNATION TAG	LOAD			BREAKER SIZE	FUSE SIZE	CONDUIT AND WIRE SIZE
	VOLTS	PHASE	H.P.			
AC'S						
ACCU'S						
CF'S						
CND'S						
CU'S						
DHU'S						
DOAS'S						
ECU'S						
EF'S						
ERCP'S						
ERV'S						
EUH'S						
EWH'S						
FCU'S						
GWH'S						
HCP'S						
IRH'S						
RTU'S						
TEWH'S						
VRF'S						

END OF SECTION

SECTION 26 0519
BUILDING WIRE AND CABLE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specification Sections, apply to the work in this Section.

B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.02 SECTION INCLUDES

A. Building wire and cable.

B. Wiring connectors and connections.

1.03 RELATED SECTIONS

A. Section 26 0553 - Electrical Identification.

B. Section 26 0526 - Grounding and Bonding.

1.04 REFERENCES

A. NECA Standard of Installation (National Electrical Contractors Association).

B. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association).

C. NFPA 70 - National Electrical Code.

1.05 SUBMITTALS

A. Submit under provisions of The General Requirement Specification Sections and Section 26 0500.

B. Product Data: Provide for each cable assembly type.

C. Test Reports: Indicate procedures and values obtained.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

E. Project Record Documents: Record actual locations of components and circuits.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years’ experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of local electrical code, unless otherwise specified.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.08 COORDINATION

A. Coordinate under provisions of the General Requirement Specification Sections and Section 26 0500.

B. Field Measurements: Verify that field measurements are as shown on Drawings.

C. Where wire and cable routing is shown on Drawings, it is approximate unless dimensioned. Include wire and cable lengths within 10 feet of length where shown.

D. Where wire and cable destination is indicated and routing is not shown on Drawings, determine exact routing and lengths required.

PART 2 PRODUCTS

2.01 BUILDING WIRE

A. Manufacturers:

1. American Insulated Wire Corp.
2. Cerro.
3. Collyer.
4. Capitol Wire and Cable.
5. Okonite.
6. Senator.
7. South Wire.
8. Triangle.

B. Description: Single conductor insulated copper wire.

1. AWG No. 12 minimum, unless otherwise specified.
2. AWG No. 10 and smaller may be solid or stranded, unless otherwise specified.
3. AWG No. 8 and larger shall be stranded.
4. AWG No. 14 stranded, for control and signal wire, unless otherwise specified.
5. Provide wire and cable suitable for the temperature, conditions and location where indicated.
6. Conductivity: Copper conductors shall have a conductivity of not less than 98% at 20°C (68°F). Conductor resistance values shall be in accordance with the values in NEMA WC 8.
7. Jackets: Factory-applied nylon or PVC external jacketed wires and cables for pulls in raceways over 100-feet in length, for pulls in raceways with more than three equivalent 90° bends, for pulls in conduits underground or under slabs on grade, and where indicated.

C. Insulation: 600 volts NFPA 70 Types as follows:

Wire Location	Line/Load terminations on OCP devices rated from 15A thru 600A	Line/Load Terminations on 100% rated OCP devic-
Interior Locations	THHN/THWN	<45°C ambient XHHW
	XHHW	>45°C ambient
Exposed Exterior	THHN/THWN	XHHW - damp locations
		XHHW-2 wet locations
Concealed in Slab	THHN/THWN	<45°C ambient N/A
	XHHW	- >45°C ambient
Below Slab	THHN/THWN	XHHW-2

2.02 WIRING CONNECTORS

A. Solderless Insulated Mechanical Connectors:

1. Manufacturers:
    a. Burndy DUC.
    b. Dossert GTC.
    c. OZ/Gedney XTPC.
    d. Thomas & Betts CTC.
2. Provide parallel clamp connector with insulating cover.
3. Connector shall be constructed of an all copper alloy with bolted tangential plates which will receive the clamping pressure and redistribute the pressure uniformly over the entire surface of the clamping mechanism.
4. Insulating cover shall be of the same manufacturer as the connectors and shall have cable openings suitable for the cable insulation being installed. Where insulating covers do not completely seal taps, tape the installation. The insulating cover shall not kink or crimp the cable insulation when cover is completely closed.

B. Spring Wire Connectors:

1. Manufacturers:
    a. Thomas & Betts PT.
    b. 3M Scotchloc.

C. Compression Connectors:

1. Manufacturers:
    a. Burndy Hydent.
    b. Thomas & Betts 54000.
2. One-hole lugs for AWG No. 4/0 and smaller.
3. Two-hole lugs for AWG No. 250 kcmil and larger.
4. Feeders 1200 Amps and larger shall include cable limiter type lugs at each end of each phase conductor.

2.03 ADDITIONAL ACCESSORIES

A. In the event that conduit and wire sizes increase beyond the motor or equipment manufacturer’s normal provisions for conduit and wire terminations, due to voltage-drop or other considerations in motor branch-circuit designs, provide necessary auxiliary termination facilities with adequate boxes, lugs, terminals, and other components as may be required. Consult with the suppliers of motors and other items to ensure that the equipment is furnished with suitable components to accept the required conduits and wires.

B. Riser cables shall have cable supports as required by code.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that raceway installation is complete and supported.

3.02 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

B. Install wiring in conduits buried in plaster or in poured concrete after the encasing medium is set and dry.

3.03 INSTALLATION

A. Route wire and cable as required to meet Project Conditions.

B. Install cable in accordance with the NECA "Standard of Installation."

C. Pull all conductors into raceway at same time.

D. Use pulling means including fish tape, cable, rope and basket weave wire/cable grips which will not damage cables or raceways.

E. Feeders shall be installed as continuous conductors without splices whenever possible. Where feeder splices are required, the contractor shall submit a request for approval in writing to the engineer indicating the feeder and splice location. Where splices are installed without written approval, the engineer reserves the right to have the contractor replace the spliced conductors with continuous conductors at no additional cost to the Owner.

F. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

1. Cable lubricants shall be less than 6 percent solid residue after drying for 24 hours at 105°C. Cable lubricants shall not contain any waxes, greases, polyakylene glycol oils, or silicones. Manufacturer: Polywater J by American Polywater Corp.

G. Protect exposed cable from damage. Install exposed cable, parallel and perpendicular to surfaces, or exposed structural members, and follow surface contours, where possible.

H. Support signal cables above accessible ceiling, using cable ties to support cables from structure. Do not rest cable on ceiling grid.

I. Use suitable cable fittings, connectors, and supports.

1. Cable supports shall be as required by Code and shall be compatible with the wire and cable type and the associated conduit size.

a. Manufacturer: OZ/Gedney or Thomas & Betts.

J. Increase conductor size as required due to availability. Minimum feeder conductor sizes are shown on Drawings. If increased, be responsible for associated feeder conduit size and increased ground conductor size per NEC.

K. Provide conductors of the same size from the protective device to the last load.

L. Make conductor length identical for parallel feeders.

M. Support conductors in vertical raceways. One cable support shall be provided at the top or as close to the top as practical, plus a support for each additional interval of spacing per Table 300-19a of the NEC.

N. Provide slack wire for all future connections with ends of wires taped and blank box covers installed.

O. Do not bend cables, either permanently or temporarily during installation, to radii less than that recommended by the manufacturer.

P. Use conductors with 90°C insulation when wiring is within seven feet of, passing over or attached to the following:

1. Boilers.

2. Hot water heaters.

3. Other heat producing equipment.

Q. Neatly train and lace wiring inside boxes, equipment, and panelboards.

R. Splices, Taps and Terminations

1. Make splices and taps in wiring #10 AWG and smaller mechanically and electrically secure with mechanical pressure type splicing devices.

2. Make splices and taps of conductors #8 AWG or larger and all splices in motor terminal boxes using compression connectors requiring the use of compression tools for securing the conductors in the connectors. Termination of conductors at all distribution equipment, except transformers, shall be made using mechanical lugs. Connectors shall be of high conductivity, corrosion-resistant material and have actual contact area that shall provide at least the current carrying capacity of the wire or cable. For conductors #1/0 and larger, connector lugs shall be of the two-hole type. Connector lugs shall be bolted to bussing using Belleville washers in combination with flat washers and nuts.
3. Each conductor lug or bus shall be individually made with separate lug and/or bolt as required for the termination.
4. Provide insulated connectors for splices and taps with a self-fusing rubber insulating tape that is non-corrosive to the connector and the conductor. Insulation tape shall have a minimum of 350 volts per mil dielectric strength. Friction or vinyl tape shall be applied directly over rubber insulating tape equal to 3M Scotch 88 type.

S. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torqueing requirements are not indicated, tighten connector and terminals to comply with tightening torques specified in UL Standards 486A and B.

T. Identify and color code wire and cable under provisions of Section 260553. Identify each conductor with its circuit number or other designation indicated. Wire color coding shall be as follows or as required by local codes:

120/208 Volts:

Phase A - Black
Phase B - Red
Phase C - Blue
Neutral - White
Ground - Green

277/480 Volts:

Phase A - Yellow
Phase B - Brown
Phase C - Orange
Neutral - Gray
Ground - Green

3.04 MAXIMUM BRANCH CIRCUIT LENGTHS

A. The following indicates maximum installed length a circuit can have and still maintain an adequate voltage level at the last point of use for 20-amp circuit. If the 20-amp circuit length exceeds the length listed, use the next larger wire sized. Multiple circuit runs in the same raceway shall have all conductors sized the same based on worst case circuit lengths.

BRANCH CIRCUIT LENGTH (IN FEET)

Wire Size	2 Wire 120V	2 Wire 277V	1 Phase 208V	1 Phase 480V	3 Phase 208V	3 Phase 480V
12	0 to 61'	0 to 141'	0 to 105'	0 to 244'	0 to 122'	0 to 282'
10	62' to 97'	142' to 224'	106' to 168'	245' to 388'	123' to 194'	283' to 449'
8	98' to 154'	225' to 357'	169' to 267'	389' to 618'	195' to 309'	450' to 714'
6	155' to 246'	358' to 567'	268' to 426'	619' to 983'	310' to 491'	715' to 1135'

3.05 FIELD QUALITY CONTROL

A. Testing: Upon installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification, Section 7.3.1. Certify compliance with test parameters.

B. Correct malfunctioning products at site, where possible, and retest to demonstrate compliance; otherwise remove and replace with new units, and retest.

C. Inspection: Inspect wire and cable for physical damage and proper connection.

D. Insulation Resistance Test: Prior to energization of circuitry, check installed wires and cables with megaohm meter to ensure insulation resistance requirements are fulfilled.

E. Continuity Test: Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections. Correct if necessary.

F. Branch Circuits with Receptacles: Branch circuit receptacle wiring shall be tested using a Daniel Woodhead Co. circuit tester Model #1750.

G. Torque Test: Torque test conductor connections and terminations to manufacturer's recommended values.

END OF SECTION

SECTION 26 0526
GROUNDING AND BONDING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specification Sections, apply to the work in this Section.

B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.02 SECTION INCLUDES

A. Grounding electrodes and conductors.

B. Equipment grounding conductors.

C. Bonding.

1.03 REFERENCES

A. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association).

B. National Electrical Code.

1.04 SUBMITTALS

A. Submit under provisions of the General Requirements and Section 260500.

B. Product Data: Provide for grounding electrodes and connections.

C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

E. Project Record Documents: Record actual locations of components and grounding electrodes.

F. Certificate of Compliance: Submit detailed drawings including grounding details and material specifications to the authority having jurisdiction. Indicate approval of installation by authority having jurisdiction.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to requirements of local electrical code.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.07 COORDINATION

A. Coordinate under provisions of the General Requirements and Section 260500.

PART 2 PRODUCTS

2.01 GROUNDING SYSTEM

A. Description: Complete grounding system of ground ring and rod electrodes, with connections to metal underground water pipe and building frame.

B. Grounding System Resistance: 1-5 ohms.

2.02 ROD ELECTRODES

A. Manufacturers:
   1. Harger Lightning Protection, Inc.
   2. Thompson Lightning Protection, Inc.
   3. Independent Protection Co., Inc.
B. Material: Copper.
C. Diameter: 3/4 inch.
D. Length: 10 feet.

2.03 MECHANICAL CONNECTORS

A. Manufacturers:
   1. Appleton.
   2. OZ/Gedney.
   3. Thomas & Betts.
   4. Harger Lightning Protection, Inc.
   5. Thompson Lightning Protection, Inc.
   6. Independent Protection Co., Inc.
B. Material: Bronze.

2.04 WIRE

A. Material: Stranded copper.
B. Grounding Electrode Conductor: Size to meet local code requirements.
C. Grounding Conductors: Size to meet electrical code requirements. Green insulated, 600-volt minimum, stranded copper within raceway.

2.05 GROUNDING BUSHINGS

A. Manufacturers:
   1. Appleton GIB-50L.
   2. OZ/Gedney IBC-50L.
   3. Thomas & Betts 3870.
B. Material: Malleable iron, threaded, with insulated liner and solderless lug.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify conditions under provisions of the General Requirement Specification Sections.
B. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.02 INSTALLATION

A. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground. Drive rod electrodes into permanent moister where soil conditions permit. Rod spacing shall be minimum two and one-half rod lengths to nearest electrode.
B. Install bare copper wire in foundation footing where indicated.
C. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing where indicated.

D. Provide bonding to meet Regulatory Requirements.

E. Bond together metal components including supports, elevator rails, pipes, and ducts not attached to grounded structure.

F. Provide isolated grounding conductor for circuits as indicated.

G. Provide a separate ground conductor in each feeder and branch circuit wiring.

1. The Equipotential Grounding System shall consist of grounding and bonding conductors connected to ground bars arranged to minimize potential differences between exposed conductive surfaces of electrical and non-electrical equipment.

2. All bonding and grounding conductors shall be installed in one continuous length, without splice, to ground bar.

3. Minimum size:

a. No. 12 AWG to receptacles, light switches, and light fixtures.

H. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

I. Flexible Conduit Connections: Provide separate, insulated ground bonding-jumper conductor within each flexible conduit.

J. Interface with site grounding system installed under the General Requirement Specification Sections.

K. Bond together metal sides not attached to grounded structure; bond to ground.

L. Bond together reinforcing sheet and metal accessories in pool and fountain structures.

M. Install transient suppression plate where indicated.

N. Bond together each metallic raceway, pipe, duct and other metal object entering space under access floors. Bond to underfloor ground grid.

END OF SECTION

SECTION 26 0529
SUPPORTING DEVICES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specifications, apply to the work in this Section.

B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.02 SECTION INCLUDES

A. Conduit and equipment supports.

B. Anchors and fasteners.

C. Vibration Isolation.

1.03 RELATED SECTIONS.

A. Section 26 0526 - Grounding and Bonding.

1.04 REFERENCES

A. NECA - National Electrical Contractors Association.

B. National Electrical Code.

1.05 SUBMITTALS

A. Submit under provisions of the General Requirements and Section 26 0500.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years of experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of local electrical code, unless otherwise specified.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.08 COORDINATION

A. Coordinate under provisions of the General Requirement Specification Sections and Section 26 0500.

PART 2 PRODUCTS

2.01 PRODUCT REQUIREMENTS

A. Materials and Finishes: Provide adequate corrosion resistance.

B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products. Design of supports and methods of fastening to building structures shall be acceptable to the Architect/Engineer.

C. Anchors and Fasteners: For point of attachment weight of 100 pounds or less.

1. Concrete Structural Elements: Use precast insert system, expansion anchors, and preset inserts.

2. Steel Structural Elements: Use beam clamps.

3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts.
5. Solid Masonry Walls: Use expansion anchors and preset inserts.
6. Sheet Metal: Use sheet metal screws.
7. Wood Elements: Use wood screws.

D. Anchors and Fasteners: For point of attachment weight of 100 pounds or more, obtain direction and approval from Architect/Engineer.

2.02 STEEL CHANNEL

A. Manufacturer:
1. B-Line.
2. Unistrut.
3. Allied.

B. Description: Galvanized steel with baked enamel finish.

2.03 VIBRATION ISOLATION

A. Suspended vibration producing equipment shall have spring elements in the hanger rods or isolation pads under the equipment.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
D. Do not use ceiling system components for support.
E. Connections to vibration producing equipment shall be made with flexible conduit.
F. Obtain permission from Architect/Engineer before using spring steel clamps.
G. Obtain permission from Architect/Engineer before using powder actuated anchors.
H. Obtain permission from Architect/Engineer before drilling or cutting structural members.
I. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
J. Install surface mounted cabinets and panelboards with minimum of four anchors.
K. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall.
L. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
M. Support surface or pendant lighting fixtures:
1. From an outlet box by means of an interposed metal strap, where weight is less than 5 pounds.
2. From an outlet box by means of a hickey or other direct threaded connection, where weight is from 5 to 50 pounds.
3. Directly from structural slab, deck, or framing member, where weight exceeds 50 pounds.

N. Support Recessed Lighting Fixtures:

1. From ceiling suspension members, where weight is less than 60 pounds.
2. Directly from structural slab, deck, or framing member, where weight is 60 pounds or more.

O. Provide cushioned, swivel type hangers with appropriate outlet boxes for pendant fixtures in mechanical areas. Such hangers shall have a support rating at least twice that of the load supported.

P. Provide weight distributing facilities, where required, so as not to exceed the load bearing capabilities of floors or walls that bear the weight of, or support, electrical items.

Q. Exposed parts of hangers and supports shall be painted with one coat of rust inhibiting primer.

R. Equipment shall not be held in place by its own dead weight. Provide base anchor fasteners in each case.

S. Vertical raceway shall be supported with spring type hangers.

END OF SECTION

SECTION 26 0532
CONDUIT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specification Sections, apply to the work in this Section.

B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.02 SECTION INCLUDES

A. Metal conduit.

B. Flexible metal conduit.

C. Liquid-tight flexible metal conduit.

D. Electrical metallic tubing.

E. Nonmetal conduit.

F. Fittings and conduit bodies.

1.03 RELATED SECTIONS

A. Section 26 0533 - Boxes.

B. Section 26 0526 - Grounding and Bonding.

C. Section 26 0529 - Supporting Devices.

D. Section 26 0553 - Electrical Identification.

1.04 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

C. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

D. National Electrical Code.

E. NECA "Standard of Installation."

F. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

G. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.05 SUBMITTALS

A. Submit under provisions of the General Requirement Specification Sections and Section 26 0500.

B. Product Data: Provide for metallic conduit, flexible metal conduit, liquid-tight flexible metal conduit, metallic tubing, nonmetallic conduit, fittings, and conduit bodies.

C. Project Record Documents: Accurately record actual routing of conduits 1 1/4 inches and larger.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years of experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of local electrical code.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.08 COORDINATION

A. Coordinate under provisions of the General Requirement Specification Sections and Section 26 0500.

B. Design Requirements: Conduit Size per local electrical code.

C. Field Measurements: Verify that field measurements are as shown on Drawings.

D. Field Locations: Verify routing and termination locations of conduit prior to rough in.

E. Where conduit routing is shown on Drawings, it is in approximate locations unless dimensioned. Include conduit lengths within 10 ft. of length where shown.

F. Where conduit destination is indicated and routing is not shown on Drawings, determine exact routing and lengths required.

1.09 DELIVERY, STORAGE, PROTECTION, AND HANDLING

A. Accept Products and inspect for damage.

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

C. Protect PVC conduit from sunlight.

D. Conduit that shows corrosion within the guarantee period shall be replaced.

PART 2 PRODUCTS

2.01 CONDUIT SCHEDULE

A. Conduit Location	From Ø V up thru 50V	Above 50V up thru 250V	Above 250V up thru 600V
Above an Accessible Ceiling	≤ 2 1/2"EMT ≥ 3" IMC	≤ 2 1/2" EMT ≥ 3" IMC	≤ 2 1/2" EMT ≥ 3" IMC
Concealed in Walls	≤ 2 1/2"EMT ≥ 3" IMC	≤ 2 1/2"EMT ≥ 3" IMC	≤ 2 1/2"EMT ≥ 3" IMC
Exposed Interior	≤ 2 1/2"EMT ≥ 3" IMC	≤ 2 1/2" EMT ≥ 3" IMC	≤ 2 1/2" EMT ≥ 3" IMC
Concealed in Slab	≤ 1"EMT ≥ 1 1/4" IMC	≤ 1" EMT ≥ 1 1/4" IMC	≤ 1" EMT ≥ 1 1/4" IMC
Below Slab	IMC/PVC	IMC/PVC	IMC/PVC
Hazardous Areas	IMC	IMC	HWG
Exposed Exterior	HWG	HWG	HWG
Below Grade	HWG/PVC	HWG/PVC	HWG/PVC
Corrosive Environments	HWG – PVC Coated	HWG – PVC Coated	HWG – PVC Coated

2.02 CONDUIT REQUIREMENTS

A. Minimum Size: ¾” except conduits to switches and receptacles having 5 or less #12 conductors shall be ½” C unless noted otherwise. All remaining conduits shall be minimum of ¾” including conduits for telephone, data, any other control, intercom device, etc.

B. Conduit installed below grade at exterior locations may be Schedule 40 PVC when encased within a 3-inch concrete enclosure.

C. Flexible conduit connections to recessed lighting fixtures shall be made with UL approved flexible steel conduit, except where UL listed liquid tight flexible conduit is required by code, such as in air plenums, etc.

D. Final connections to motors shall be made through UL listed liquid tight flexible steel conduits, ½-inch minimum size unless otherwise indicated.

E. Flexible connections, where required, shall be made with flexible metallic tubing ½-inch minimum size or sized in accordance with code, except in areas where such connections will be exposed to oil, grease, water, or where installed out of doors. In those areas of adverse exposure, flexible connections shall be made with UL listed liquid tight flexible steel conduit. Grounding conductors with green colored insulation shall be extended through all flexible connections including fixture "whips" and fastened to terminals within the first junction boxes on either side of the flexible length. Refer to Section 26 5100 for flexible connections to lighting fixtures.

2.03 METAL CONDUIT

A. Manufacturers:
   1. Allied.
   2. LTV/Republic.
   3. Steelduct.
   4. Wheatland.

B. Rigid Steel Conduit: ANSI C80.1; hot dipped galvanized or electro-galvanized steel.

C. Intermediate Metal Conduit (IMC): Rigid steel.

D. Fittings and Conduit Bodies: ANSI/NEMA FB 1; all steel fittings of threaded joints.

2.04 FLEXIBLE METAL CONDUIT

A. Description: Interlocked galvanized steel construction.

B. Fittings: ANSI/NEMA FB 1; steel or malleable iron.

C. Minimum Size: 1/2 inch (13 mm), unless otherwise specified.

2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Manufacturers:
   1. Anaconda.
   2. American Brass.
   3. Electri-Flex Company.

B. Description: Interlocked galvanized steel construction with UL PVC jacket.

C. Fittings: ANSI/NEMA FB 1; steel or malleable iron.

2.06 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
   1. Allied.
   2. LTV/Republic.
   3. Steelduct.
   4. Wheatland.

B. Description: ANSI C80.3; hot dipped or electro-galvanized tubing.

2.07 EMT FITTINGS AND CONDUIT BODIES

A. Manufacturers:
   1. Appleton.
   2. Crouse Hinds/Midwest.
   3. OZ/Gedney.
   4. Raco.
   5. Steel City.
   6. T&B

B. Description: ANSI/NEMA FB 1; steel or malleable iron, compression type with insulated throat.
   1. Set-screw type fittings are not acceptable.
   2. Die-cast fittings of pot metal are not acceptable.

2.08 NON-METALLIC CONDUIT

A. Manufacturers:
   1. Carlon.
   2. Sedco.

B. Description: NEMA TC 2; Schedule 40 PVC, type EB for concrete encasement.

C. Fittings and Conduit Bodies: NEMA TC 3; material to match conduit.

2.09 EXPANSION FITTINGS

A. Provide a suitable expansion fitting in each concealed or exposed electrical raceway crossing a building expansion joint. Fittings shall be complete with bonding jumper and clamps.

B. Manufacturers: OZ/Gedney, Crouse-Hinds and Appleton.

2.10 BUSHINGS

A. Bushings for conduits 1 inch and smaller shall be self-extinguishing thermoplastic grounding type – 150 degrees C. and insulating type.

B. Bushings for conduits 1 ¼ inch and larger shall be malleable iron body with 150-degree C. insulating ring and shall be grounding type. Insulating material shall be locked in place and non-removable.

2.11 CONDUIT SYSTEM FOR CORROSIVE ENVIRONMENTS

A. All PVC coated conduit, fittings, and accessories shall be supplied by the same manufacturer.

B. Acceptable Manufacturers:
   1. Plasti-Bond
   2. Perma-Cote
   3. KorKap

C. The PVC coated galvanized rigid steel conduit must be UL Listed. The PVC coating must have been investigated by UL as providing the primary corrosion protection for the rigid metal conduit. Ferrous fittings for general service locations must be UL Listed with PVC as the primary corrosion protection. Hazardous location fittings, prior to PVC coating must be UL listed. All PVC coated conduit, fittings, and accessories must be new, unused material. Applicable UL standards may include: UL 6 Standard for Safety, Rigid Metal Conduit, UL 514B Standard for Safety, Fittings for Conduit and Outlet Boxes.

D. The PVC coated galvanized rigid conduit must be ETL Verified to the Intertek ETL SEMKO High Temperature H2O PVC Coating Adhesion Test Procedure for 200 Hours. The PVC coated galvanized rigid conduit must bear the ETL Verified PVC-001 label to signify compliance to the adhesion performance standard.

E. The bond between the PVC coating and the conduit surface shall be greater than the tensile strength of the coating. This bond shall be verified by testing described in NEMA Standard RN-1, section 3.8.

F. The conduit shall be hot dip galvanized inside and out with hot galvanized threads.

G. A PVC sealing sleeve extending one pipe diameter or two inches, whichever is less, shall be formed at every female fitting opening, except unions. The inside sealing sleeve diameter shall be matched to the outside diameter of the conduit.

H. The PVC coating on the outside of conduit couplings shall be 40 mils in thickness and have a series of raised longitudinal ribs to protect the coating from tool damage during installation.

I. Form 8 condulets, 1/2" through 2" diameters, shall have a tongue-in-groove, V-Seal gasket to effectively seal against the elements. The design shall be equipped with a positive placement feature to ease and assure proper installation. Certified results confirming seal performance at 15 psig (positive) and 25 in. of mercury (vacuum) for 72 hours shall be available.

J. Form 8 condulets shall be supplied with plastic encapsulated stainless-steel cover screws.

K. A urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2-mil thickness. Conduit or fittings having pinholes or areas with thin or no coating shall be unacceptable.

L. The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above 30˚F.

M. All factory cut threads on conduit, elbows, nipples, and fittings shall be protected by application of a urethane coating.

N. Right angle beam clamps and U bolts shall be specially formed and sized to snugly fit the outside diameter of the PVC coated conduit. All U bolts will be supplied with plastic encapsulated nuts that cover the exposed portions of the threads.

PART 3 EXECUTION

3.01 INSTALLATION - CONDUIT

A. Install conduit in accordance with NECA "Standard of Installation."

B. Install nonmetallic conduit in accordance with manufacturer's instructions.

C. Installation of the PVC coated conduit system shall be performed in accordance with the manufacturer’s installation manual. To assure correct installation, the installer shall be certified by the PVC coated conduit manufacturer before the installation can begin.

D. Arrange conduit to maintain headroom and present neat appearance.

E. Route conduit parallel and perpendicular to walls.

F. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

G. Route conduit in and under slab from point to point.

H. Do not cross conduits in slab.

I. Maintain adequate clearance, minimum of 12 inches, between conduit and piping.

J. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

K. Cut conduit square using saw or pipe cutter; de burr cut ends.

L. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender to fabricate bends in metal conduit larger than 2-inch size or provide factory elbows.

M. Provide suitable pull string in each empty conduit except sleeves and nipples.

N. Ground and bond conduit under provisions of Section 260526.

O. Identify conduit under provisions of Section 260553.

P. In general, conduits shall be run concealed. Where exposed conduit runs are shown or required, they shall be run parallel to building construction and shall be suitably supported at required intervals.

Q. Conduits run to and from cabinets shall be run neatly, in accurate manner, and shall emerge from the floors and ceilings at right angles thereto.

R. Conduit stub ups and stub downs shall be arranged in a neat and orderly manner and shall emerge at right angles to floors or ceilings.

S. In equipment spaces, such as fan rooms, plenums, etc., conduits and outlets may be exposed, but shall avoid interference with ventilating ducts, piping, etc.

T. Exposed conduit installed on or adjacent to ventilating ducts shall be installed after the ducts are in place and shall be run from ceiling or wall junction boxes in such manner as to retain accessibility to junction box covers and to permit future removal or replacement of ducts.

U. Non-metallic conduit changes of direction shall be made by use of large radius bends, sweeps, or offsets.

V. Steel conduit bends of same size as the non-metallic conduit shall be used to terminate non-metallic conduit underground runs above ground.

W. Steel conduit sections of the same size as the non-metallic conduit shall be used to terminate non-metallic conduit runs in handholes, power pits, building line, etc. Length of steel conduit sections shall extend a minimum of 5 feet from outside face of handhole, or power pit, building line, etc.

X. All underground conduit shall be water-tight using water-tight compounds and fittings.

3.02 INSTALLATION - FITTINGS

A. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

B. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

C. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

D. Provide conduit seals for conduits and ducts entering/exiting hazardous locations.

E. Provide suitable fittings to accommodate expansion and deflection where conduit crosses expansion joints and in each uninterrupted run of horizontal or vertical conduit in excess of 100 feet. Fittings shall be complete with bonding jumpers and clamps.

F. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

G. Double locknuts shall be used at termination of IMC and HWG conduit in knock out openings.

H. Ends of conduits shall be equipped with insulating bushings for 1 inch and smaller and insulated metallic bushings for 1 1/4 inches and larger. Ends of conduit shall be temporarily capped prior to installation and during construction to exclude foreign material.

I. Joints in conduit run underground or in slabs on ground shall be made watertight with copper base anti corrosive conductive compound.

J. Provide wall flanges and gasketing on conduits entering fan housings to minimize air leakage at points of penetration of housing.

K. No running threads shall be cut or used.

L. Transitions between non-metallic and steel conduit shall be made by means of conduit manufacturer's standard adapters.

3.03 INSTALLATION - SUPPORTS

A. Arrange supports to prevent misalignment during wiring installation.

B. Conduit embedded in underground concrete shall be adequately supported to prevent movement during concrete placement. Compact gravel fill and soil below underground conduit or support conduit with suitable separators and chairs prior to placing concrete.

C. Support conduit using coated steel or malleable iron straps, lay in adjustable hangers, clevis hangers, and split hangers.

D. Group related conduits; support using conduit rack. Construct rack using steel channel.

E. Fasten conduit supports to building structure and surfaces under provisions of Section 260529.

F. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports

G. Do not attach conduit to ceiling support wires.

H. Bring conduit to shoulder of fittings; fasten securely.

I. Conduit risers shall be rigidly supported on the building structure, using appropriate supports only.

J. Installation of conduit in concrete structure shall conform to the requirements of ACI 318.

K. Sizes and spacing of conduits run in concrete shall be reviewed by the Architect/Engineer. Conduit shall not be reactive with the concrete. Conduit shall not cross-over one another.

L. Conduit embedded in concrete structure shall have a minimum cover of 1 inch to parallel concrete surface, or as otherwise specified. Parallel conduit runs within concrete shall have not less than 4 inches clear space between conduits, or spacing equal to 2 outside diameters, whichever is greater.

M. Conduit embedded in concrete shall be located by the trades concerned, between the bottom and top reinforcement. Conduit parallel to reinforcing steel shall not be supported by or tied directly to the steel. It shall be supported on bar chairs or support bars provided solely for that purpose.

N. Conduits and other electrical items shall not be fastened to or supported from ventilating ducts but shall be separately supported. The method of supporting and details of the supporting members shall be reviewed by the Architect/Engineer. In no case shall screws penetrate the sheet metal of the ducts.

O. Exposed conduits run on surfaces shall be supported according to code and within 3 feet of each outlet, junction box, or cabinet, by galvanized malleable conduit clamps and clamp backs. Suspended conduits shall be supported every 5 feet by conduit hangers and round rods, or where 2 or more conduits are run parallel, by trapeze hangers suitably braced to prevent swaying.

P. Screws for exposed work shall be stainless steel.

Q. Cadmium plated steel screws may be used for interior unexposed dry locations only.

R. All trenching, coring, backfilling and compacting for the electrical installation is by the electrical contractor. All excess debris from trenching and coring shall be removed from the site by the electrical contractor.

S. All underground site work conduit shall be minimum 36” below finished grade or below frost line whichever is deepest. Unless noted otherwise, underground conduits shall be PVC Schedule 40. Galvanized rigid steel conduits will be used under concrete areas and thru footing, foundation, etc.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods under the provisions of the General Requirements.

B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation.

END OF SECTION

SECTION 26 0533
BOXES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specification Sections, apply to the work in this Section.

B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.02 SECTION INCLUDES

A. Wall and ceiling outlet boxes.

B. Pull and junction boxes.

1.03 RELATED SECTIONS

A. Section 26 0925 - Wiring Devices.

B. Section 26 0526 - Grounding and Bonding.

C. Section 26 0529 - Supporting Devices.

D. Section 26 0553 - Electrical Identification.

1.04 REFERENCES

A. NECA (National Electrical Contractors Association) Standard of Installation.

B. NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.

C. NEMA OS 1 - Sheet steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

E. National electrical code.

1.05 SUBMITTALS

A. Submit under provisions of the General Requirement Specification Sections and Sections 26 0500.

B. Product Data: Provide for outlet boxes and floor boxes.

C. Project Record Documents: Record actual locations and mounting heights of outlet boxes, floor boxes, junction boxes, and pull boxes.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years of experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of local electrical code.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.08 COORDINATION

A. Coordinate under provisions of the General Requirement Specification Sections and Section 26 0500.

B. Field Measurements: Verify that field measurements are as shown on Drawings.

C. Field Locations: Verify locations of boxes prior to installation.

PART 2 PRODUCTS

2.01 OUTLET BOXES

A. Manufacturers:

1. Appleton
2. Raco
3. Steel City

B. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel with knockouts.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include ½-inch male fixture studs where required.
2. Concrete Ceiling Boxes: Concrete type.

C. Cast Boxes: NEMA FB 1, Type FD, cast feralloy. Provide gasketed cover and threaded hubs.

D. Wall Plates for Finished Areas: As specified in Section 262726.

2.02 FIRE RATED POKE THROUGH DEVICES

A. Manufacturers

1. Hubbell or approved equal.

B. Description: Must be flush with floor and utilize a 4” core. Must meet a 4-hour fire rating and must meet or exceed UL514A Scrub Water Requirements. Provide IG receptacle and IG wiring where poke-through is used for an IG outlet.

C. Poke-Through Devices shall be required to have at least two 1” EMT trade size conduit stems to feed power, communication, and audio-visual applications.

D. Hubbell part numbers or approved equal:

1. S1PTFIT
2. S1CFCXXX (CARPET FLANGE)
3. S1TFCXXX (TILE FLANGE)
4. Appropriate device subplate part number SISPXXX

2.03 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1.

1. Material: Hot-dipped galvanized steel.
2. Covers: Secured with stainless steel screws.
3. Finish: Paint interior and exterior with rust-inhibitive paint.
4. Gaskets: Provide in accordance with applicable Code.

B. Hinged Enclosures: As specified.

C. Surface Mounted Cast Metal Box: NEMA 250, flat flanged, surface mounted junction box:

1. Material: Galvanized cast iron.
2. Cover: Furnish with ground flange, neoprene gasket, and stainless-steel cover screws.

D. In Ground Cast Metal Box: NEMA 250, Type 6, flanged, recessed cover box for flush mounting:

1. Material: Galvanized cast iron.
2. Cover: Nonskid cover with neoprene gasket and stainless-steel cover screws.

E. Fiberglass Handholes: Die molded glass fiber hand holes:

1. Cable Entrance: Pre-cut 6-inch x 6-inch cable entrance at center bottom of each side.
2. Cover: Glass fiber weatherproof cover with nonskid finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify locations and mounting heights of floor boxes and outlets prior to rough in.

3.02 INSTALLATION

A. Install boxes in accordance with NECA "Standard of Installation."

B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

C. Set wall mounted boxes at elevations to accommodate mounting heights indicated.

D. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Adjust box location up to 10 feet if required to accommodate intended purpose.

E. Box sizes shall not be smaller than that required by Code for the number and size of wires and/or conduits to be installed.

F. Orient boxes to accommodate wiring devices oriented as specified in Section 262726.

G. Maintain headroom and present neat mechanical appearance.

H. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

I. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

J. Plenum Ceiling Areas: Install boxes in accordance with applicable Code.

K. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in the General Requirements.

L. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

M. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.

N. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

O. Outlet boxes for toggle switches shall be located on the strike side of the door.

P. Use flush mounting outlet box in finished areas.

Q. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

R. Do not install flush mounting box back to back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in acoustic rated walls.

S. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

T. Use stamped steel bridges to fasten flush mounting outlet box between studs.

U. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

V. Use adjustable steel channel fasteners for hung ceiling outlet box.

W. Do not fasten boxes to ceiling support wires.

X. Support boxes independently of conduit.

Y. Use gang box where more than one device is mounted together. Do not use sectional box.

Z. Use gang box with plaster ring for single device outlets.

AA. Use cast outlet box in exterior locations and wet locations.

BB. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

CC. Set floor boxes level.

3.03 INTERFACE WITH OTHER PRODUCTS

A. Coordinate installation of outlet box for equipment connected under Section 260503.

3.04 ADJUSTING

A. Adjust installed work under the provisions of the General Requirements.

B. Adjust floor box flush with finish flooring material.

C. Adjust flush mounting outlets to make front flush with finished wall material.

D. Install knockout closures in unused box openings.

3.05 CLEANING

A. Clean installed work under the provisions of the General Requirements Specification Sections.

B. Clean interior of boxes to remove dust, debris, and other material.

C. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 26 0553
ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specifications, apply to the work in this Section.

B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.02 SECTION INCLUDES

A. Nameplates and labels.

B. Wire and cable markers.

C. Conduit and Pullbox markers.

D. Directories.

E. Signs and Diagrams.

1.03 RELATED SECTIONS

A. Division 09 - Painting.

1.04 REFERENCES

A. National Electrical Code.

1.05 SUBMITTALS

A. Submit under provisions of the General Requirements and Section 26 0500.

B. Product Data: Provide for nameplates, labels, and markers.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

1.06 REGULATORY REQUIREMENTS

A. Conform to requirements of local electrical code, unless otherwise specified.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 NAMEPLATES

A. Normal System Nameplates: Engraved three-layer laminated plastic, black letters on white background, identification as shown.

1. Size: 1¼-inch by 3-inch minimum.
2. Location: Each normal electrical distribution and control equipment enclosure: switchboards, motor control centers, panelboards, transformers, motor starters, disconnect switches, circuit breakers, contactors, relay panels, control panels, Cable TV, and associated apparatus. Communications control cabinets.

B. Letter Size:

1. Use 3/16-inch height lettering for identifying equipment and loads.

C. Identification: Engraving marking.

1. Switchboard, distribution panel: Equipment name and load device names.
2. Branch circuit panelboard, relay panel, control panel, control cabinet: name.

3. Transformer: name, primary and secondary voltage, service from.
4. Motor starter, disconnect switch, individual circuit breaker, contactor: name, equipment served, service from.

2.02 LABELS

A. Labels: Engraved device plates for individual wall switches, receptacles, and other electrical devices as shown.
   1. Provide color coded device labels to match Owner's established standard. Coordinate requirements with Owner and provide as required.
B. Locations: special purpose switches, receptacles, and other electrical devices.
C. Identification: Engraved device covers.
   1. Individual switches and receptacles: use or as indicated on drawings.
   2. 480 Volt System: 480

2.03 WIRE AND CABLE MARKERS

A. Description: Tape type wire markers.
B. Locations: Each conductor at panelboard gutters, pull boxes, and each load connection.
C. Legend:
   1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
D. Color: As indicated in Section 26 0519.

2.04 BUS IDENTIFICATION

A. Description: Stamped phase identification letters.
B. Location: Switchboard, motor control center, and panelboard bus, in readily visible locations.

2.05 CONDUIT MARKERS

A. Description: Alkyd stenciled paint.
B. Location: Each power conduit, except branch lighting and receptacle conduits, longer than 6 feet.
C. Spacing: At intermediate pull boxes, enclosures, etc.
D. Legend:
   1. 208 Volt System: 208 – panel name – panel number.
   2. 480 Volt System: 480 – panel name – panel number.

2.06 FEEDER INTERMEDIATED BOX MARKERS

A. Description: Alkyd stenciled paint.
B. Location: On pull box, splice box, and junction box covers.
C. Color:
   1. Grounding System: Green cover.
   2. Fire Alarm System: Red cover.

2.07 PANELBOARD DIRECTORIES

A. Description: Type written directory of branch circuit loads.
B. Location: At branch circuit panelboards.
C. Legend: circuit number - load location and description.

PART 3 EXECUTION

3.01 PREPARATION

A. De-grease and clean surfaces to receive nameplates and labels.

3.02 APPLICATION

A. Install nameplate and label parallel to equipment lines.

B. Secure nameplate to equipment front using screws or rivets.

C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.

END OF SECTION

SECTION 26 0923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Devices and associated accessories for automatic control of lighting and other loads:
   1. Wallbox timers.
   2. Wallbox occupancy sensors.
   3. Wired occupancy sensors.
   4. Wireless occupancy/vacancy sensors.
   5. Wireless daylight sensors.
   6. Wired load control modules with wireless communication inputs for wireless sensors and control stations.
   7. Wired dimmers and switches with wireless communication inputs.
   8. Wireless control stations.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0537 - Boxes.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 2726 - Wiring Devices.
   1. Includes finish requirements for wall controls specified in this section.
   2. Includes accessory receptacles, switches, dimmers and wall plates, to match lighting controls specified in this section.
   3. Includes companion switches/dimmers for providing multi-location capability to wall controls specified in this section.
   4. Includes wired load control modules with wireless communication inputs for wireless sensors and control stations.
   5. Includes wired wall dimmers and switches with wireless communication inputs, compatible with wireless devices specified in this section.
   6. Includes wireless control stations compatible with wireless devices specified in this section.

E. Section 26 5113 - Luminaires, Ballasts, and Drivers - Lutron.

1.03 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.

B. ASTM D4674 - Standard Practice for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Office Environments; 2002a (Reapproved 2010).

C. ASTM E308 - Standard Practice for Computing the Colors of Objects by Using the CIE System; 2015.

D. IEC 60929 - AC and/or DC-Supplied Electronic Control Gear for Tubular Fluorescent Lamps - Performance Requirements; 2015.

E. IEC 61000-4-2 - Electromagnetic Compatibility (EMC) - Part 4-2: Testing and Measurement Techniques - Electrostatic Discharge Immunity Test; 2008.

F. ISO 9001 - Quality Management Systems-Requirements; 2008.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

H. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association; 2010.

I. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2015

J. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2015).

K. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Current Edition, Including All Revisions.

M. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of sensors and wall controls with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate the placement of wall controls with actual installed door swings.
3. Coordinate the placement of daylight sensors with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
4. Coordinate the work to provide luminaires and lamps compatible with the lighting controls to be installed.
5. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install sensors and wall controls until final surface finishes are complete.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1. Occupancy/Vacancy Sensors: Include detailed basic motion detection coverage range diagrams.
2. Wall Dimmers: Include derating information for ganged multiple devices.

C. Samples:

1. Wallbox Controls:
   a. Show available color and finish selections.
   b. Provide one sample(s) for each product as requested.
2. Sensors: Provide one sample(s) for each product as requested.

D. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Project Record Documents: Record actual installed locations and settings for lighting controls.

F. Operation and Maintenance Data: Include detailed information on lighting control system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

G. Warranty: Submit sample of manufacturer's Warranty as specified in Part 1 under "WARRANTY". Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications:

1. Company with not less than ten years of experience manufacturing lighting controls, including products using wireless communication between devices.
2. Registered to ISO 9001, including in-house engineering for product design activities.
3. Provides factory direct technical support hotline available 24 hours per day, 7 days per week.
4. Qualified to supply specified products and to honor claims against product presented in accordance with warranty.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1. System Requirements- Lutron, Unless Otherwise Indicated:
   a. Ambient Temperature:
      1) Lighting Controls: Between 32 and 104 degrees F (0 and 40 degrees C).
   b. Relative Humidity: Less than 90 percent, non-condensing.
   c. Protect lighting controls from dust.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's Standard Warranty:

1. Manufacturer Lighting Control System Components, Except Wallbox Occupancy Sensors, Wireless Sensors, Ballasts/Drivers and Ballast Modules: One-year 100 percent parts coverage, no manufacturer labor coverage.
2. Wallbox Occupancy Sensors and Wireless Sensors: Five years 100 percent parts coverage, no manufacturer labor coverage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Manufacturer: Lutron Electronics Company, Inc; www.lutron.com.

B. Acceptable Alternates: Acuity Brands.

C. All performance requirements of this specification shall be met by the product selected.

D. Source Limitations: Where possible, furnish products produced by a single manufacturer and obtained from a single supplier.

2.02 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL) as suitable for the purpose indicated.

B. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, programming, etc. as necessary for a complete operating system that provides the control intent indicated.

C. Design lighting control equipment for 10-year operational life while operating continually at any temperature in an ambient temperature range of 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C) and 90 percent non-condensing relative humidity.

D. Electrostatic Discharge Tolerance: Design and test equipment to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.

E. Power Failure Recovery: When power is interrupted for periods up to 10 years and subsequently restored, lights to automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.

F. Wireless Devices:

1. Capable of diagnosing system communications.
2. Capable of having addresses automatically assigned to them.
3. Receives signals from other wireless devices and provides feedback to user.
4. Capable of determining which devices have been addressed.
5. RF Frequency: 434 MHz; operate in FCC governed frequency spectrum for periodic operation; continuous transmission spectrum is not permitted.
6. RF Range: 60 feet (18 m) line-of-sight or 30 feet (9 m) through typical construction materials between RF transmitting devices and compatible RF receiving devices.
7. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 15, for Class B application.

G. Device Finishes:

1. Wallbox Controls: To be selected by Architect.
2. Standard Colors: Comply with NEMA WD1 where applicable.
3. Color Variation in Same Product Family: Maximum delta E of 1, CIE L*a*b color units per ASTM E308.
4. Visible Parts: Exhibit ultraviolet color stability when tested with multiple actinic light sources as defined in ASTM D4674. Provide proof of testing upon request.

2.03 WALLBOX TIMERS

A. Provide warning to occupant of impending load turn-off.

B. Product(s):

1. Wallbox Timer; Lutron Maestro Series Countdown Timer Control Switch, Model MA-T51: 120 V, 600 W/VA (5 A) lighting (incandescent/halogen, magnetic low voltage), 3 A general purpose fan; adjustable from 5 to 60 minutes with option for untimed full on; single-pole only (no multi-location capability); minimum load requirement.
2. Companion Switch: Provides multi-location capability for compatible Lutron Maestro Series Wallbox timers.
    a. Lutron Model MA-AS; gloss finish; 120 V.

2.04 WALLBOX OCCUPANCY SENSORS

A. 0-10 V Wall Dimmer Occupancy Sensors; Lutron Maestro 0-10 V Dimmer Sensor Series:

1. General Requirements;
    a. Compatible with sourcing electronic 0-10 V ballasts/drivers, as per IEC 60929 Annex E.2 0-10 V protocol.
    b. Adjustable sensitivity (high, medium, low, and minimum presets).
    c. Adjustable high/low end trims.
    d. Selectable dimming curve (linear or square law).
    e. Dimmer Features: Locked preset, fade-to-on, fade-to-off.
    f. Turns off lighting after reasonable and adjustable time delay once the last person to occupy the space vacates a room or area. Provide adjustable timeout settings of 1, 5, 15, and 30 minutes.
    g. Selectable option to enable low light feature (automatic-on when ambient light is below threshold). Ambient light threshold to be selectable as either adaptive utilizing occupant feedback (Lutron Smart Ambient Light Detection) or as fixed (high, medium, low, and minimum presets).
    h. Fades lights to off over period of 10 seconds to warn occupant of impending load turn-off.
    i. Provides visual alert for mis-wire and incompatible load.
2. Passive Infrared 0-10 V Wall Dimmer Combination Occupancy/Vacancy Sensors:
    a. Programmable to operate as an occupancy sensor (automatic-on and automatic-off) or a vacancy sensor (manual-on and automatic-off).
    b. Product(s):
        1) Passive Infrared 0-10 V Wall Dimmer Occupancy/Vacancy Sensor; Lutron Maestro 0-10 V Dimmer Sensor Series, Model MS-Z101: 0-10 V control for 0-10 V fluorescent ballasts/LED drivers (8 A load at 120-277 V, 50 mA max control current); coverage of 900 square feet (81 sq. m) with mounting height of 4 feet (1.2 m); 180-degree field of view; multi-location capability using standard 3-way or companion switch (up to nine companion switches may be connected).
3. Companion Switches: Provide as required for multi-location control as indicated.
    a. Product(s):
        1) Companion Switch: Provides multi-location capability for compatible Lutron Maestro Series wall switch occupancy sensors.
            a) Lutron Model MA-AS-277V; gloss finish; 277 V.

2.05 WIRELESS SENSORS

A. General Requirements:

1. Operational life of 10 years without the need to replace batteries when installed per manufacturer's instructions.
2. Communicates directly to compatible RF receiving devices through use of a radio frequency communications link.
3. Does not require external power packs, power wiring, or communication wiring.
4. Capable of being placed in test mode to verify correct operation from the face of the unit.

B. Wireless Occupancy/Vacancy Sensors:

1. General Requirements:

a. Provides a clearly visible method of indication to verify that motion is being detected during testing and that the unit is communicating to compatible RF receiving devices.

b. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.

c. Sensing Mechanism: Passive infrared coupled with technology for sensing fine motions; Lutron XCT Technology. Signal processing technology detects fine-motion passive infrared (PIR) signals without the need to change the sensor's sensitivity threshold.

d. Provide optional, readily accessible, user-adjustable controls for timeout, automatic/manual-on, and sensitivity.

e. Turns off lighting after reasonable and adjustable time delay once the last person to occupy the space vacates a room or area. Provide adjustable timeout settings of 1, 5, 15, and 30 minutes.

f. Capable of turning dimmer's lighting load on to an optional locked preset level selectable by the user. Locked preset range to be selectable on the dimmer from 1 percent to 100 percent.

g. Color: White.

h. Provide all necessary mounting hardware and instructions for both temporary and permanent mounting.

i. Provide temporary mounting means for drop ceilings to allow user to check proper performance and relocate as needed before permanently mounting sensor. Temporary mounting method to be designed for easy, damage-free removal.

j. Sensor lens to illuminate during test mode when motion is detected to allow installer to place sensor in ideal location and to verify coverage prior to permanent mounting.

k. Ceiling-Mounted Sensors:

1) Provide surface mounting bracket compatible with drywall, plaster, wood, concrete, and compressed fiber ceilings.

2) Provide recessed mounting bracket compatible with drywall and compressed fiber ceilings.

l. Wall-Mounted Sensors: Provide wall or corner mounting brackets compatible with drywall and plaster walls.

2. Wireless Combination Occupancy/Vacancy Sensors:

a. Ceiling-Mounted Sensors: Programmable to operate as an occupancy sensor (automatic-on and automatic-off), an occupancy sensor with low light feature (automatic-on when less than one foot-candle of ambient light available and automatic-off), or a vacancy sensor (manual-on and automatic-off).

b. Wall-Mounted Sensors: Programmable to operate as an occupancy sensor (automatic-on and automatic-off), or a vacancy sensor (manual-on and automatic-off).

c. Product(s):

1) Ceiling-Mounted Occupancy/Vacancy Sensor; Lutron Radio Powr Savr Series, Model LFR2-OCR2B-P-WH: Coverage from 324 square feet (30.2 sq m) to 676 square feet (62.4 sq. m) depending on ceiling height from 8 to 12 feet (2.4 to 3.7 m); 360-degree field of view.

2) Wall-Mounted Occupancy/Vacancy Sensor; Lutron Radio Powr Savr Series, Model LFR2-OWLB-P-WH: Minor motion coverage of 1500 square feet (139.4 sq. m) and major motion coverage of 3000 square feet (278.7 sq. m) with mounting height of 6 to 8 feet (1.8 to 2.4 m); 180-degree field of view.

C. Wireless Daylight Sensors:

1. Product: Lutron Radio Powr Savr Series, Model LFR2-DCRB-WH.
2. Open-loop basis for daylight sensor control scheme.
3. Stable output over temperature from 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C).
4. Partially shielded for accurate detection of available daylight to prevent fixture lighting and horizontal light component from skewing sensor detection.
5. Provide linear response from 2 to 150 foot-candles.
6. Color: White.
7. Mounting:
   a. Provide surface mounting bracket compatible with drywall, plaster, wood, concrete, and compressed fiber ceilings.
   b. Provide all necessary mounting hardware and instructions for both temporary and permanent mounting.
   c. Provide temporary mounting means for drop ceilings to allow user to check proper performance and relocate as needed before permanently mounting sensor. Temporary mounting method to be designed for easy, damage-free removal.

2.06 LOAD CONTROL MODULES FOR WIRELESS SENSORS AND CONTROL STATIONS: AS PART OF NETWORKED LIGHTING CONTROL SYSTEM AS SPECIFIED IN SECTION 26 2726.

2.07 LOAD CONTROL MODULES FOR WIRELESS SENSORS AND CONTROL STATIONS AS STAND-ALONE ROOMS.

A. Provide wireless load control modules as indicated or as required to control the loads as indicated.

B. Junction Box-Mounted Modules:

1. Communicates via radio frequency with up to nine compatible wireless control stations, up to six occupancy/vacancy sensors, and one daylight sensor.
2. Plenum rated.
3. Dimming Modules:
   a. Product(s):
      1) 5 A dimming module with 0-10V control; Lutron PowPak Dimming Module Model RMJ-5T-DV-B.
   b. Single low voltage dimming module with Class 1 or Class 2 isolated 0-10V output signal conforming to IEC 60929 Annex E.2; source or sink automatically configures.
   c. Configurable high- and low-end trim.
   d. Relay: Rated for 0-10 V ballasts, LED drivers, or fixtures that conform with NEMA 410.
4. Relay Modules:
   a. Product(s):
      1) 16 A relay module, without contact closure output; Lutron PowPak Relay Module Model RMJ-16R-DV-B

2) 5 A relay module, without contact closure output; Lutron PowPak Relay Module Model RMJ-5R-DV-B.

b. Relay:

1) Rated Life of Relay: Typical of 1,000,000 cycles at fully rated 16 A for all lighting loads.

2) Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.

3) Fully rated output continuous duty for inductive, capacitive, and resistive loads.

2.08 WIRELESS CONTROL STATIONS: AS PART OF NETWORKED LIGHTING CONTROL SYSTEM AS SPECIFIED IN SECTION 26 2726.

2.09 WIRELESS CONTROL STATIONS

A. Product(s):

1. 2-Button Control; Lutron Pico Wireless Control Model PJ2-2B.

a. Button Marking: Light icons.

2. 2-Button with Raise/Lower Control; Lutron Pico Wireless Control Model PJ2-2BRL.

a. Button Marking: Light icons.

3. Wallbox Adapter; Lutron Model PICO-WBX-ADAPT.

B. Quantity: As indicated on the drawings.

C. Communicates directly to compatible RF receiving devices through use of a radio frequency communications link.

D. Does not require external power packs, power or communication wiring.

E. Allows for easy reprogramming without replacing unit.

F. Button Programming:

1. Single action.

2. Toggle action.

G. Includes LED to indicate button press or programming mode status.

H. Mounting:

1. Capable of being mounted with a table stand or directly to a wall under a faceplate.

2. Faceplates: Provide concealed mounting hardware.

I. Power: Battery-operated with minimum ten-year battery life (3-year battery life for night light models).

J. Finish: To be selected by Architect.

2.10 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Factory Testing; Lutron Standard Factory Testing:

1. Perform full-function factory testing on all completed assemblies. Statistical sampling is not acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that ratings and configurations of devices are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive devices.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, except for mounting heights specified in those standards; including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 0537 as required for installation of devices provided under this section.

C. Where multiple devices are installed at the same location and at the same mounting height, gang devices together under a common wall plate.

D. Install products in accordance with manufacturer's instructions.

E. Install permanent barrier between ganged devices when voltage between adjacent devices exceeds 300 V.

F. Install wall dimmers to achieve full rating specified after derating for ganging as instructed by manufacturer.

G. Sensor Locations:

1. Sensor locations indicated are diagrammatic. Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage, in accordance with manufacturer's recommendations.

H. Ensure that daylight sensor placement minimizes sensor view of electric light sources. Locate ceiling-mounted and luminaire-mounted daylight sensors to avoid direct view of luminaires.

I. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

J. Identify devices<< in accordance with Section 260553>>.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

3.05 ADJUSTING

A. Sensor Fine-Tuning: Contractor to provide fine-tuning of sensor calibration.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of lighting control devices to Engineer; or Owner, and correct deficiencies or make adjustments as directed.

3.08 PROTECTION

A. Protect installed products from subsequent construction operations.

END OF SECTION

SECTION 26 2416
PANELBOARDS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specifications, apply to the work in this Section.

B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.02 SECTION INCLUDES

A. Power panelboards.

B. Branch circuit panelboards.

1.03 RELATED SECTIONS

A. Section 26 0526 - Grounding and Bonding.

B. Section 26 0553 - Electrical Identification.

1.04 DEFINITIONS

A. Lighting and Appliance Panelboard: A panelboard with thermal magnetic circuit breaker branches, bolt-on type only, designed for heavy commercial use, operating at 600 V and below, 3-phase versions, equipped as either surface or flush mounting. Panelboard shall have more than 10% of its overcurrent devices rated 30 amperes or less for which neutral connections are provided.

B. Power Panelboard: A panelboard with thermal magnetic circuit breakers or fusible switches, bolt-in type, designed for heavy commercial use, operating at 600V and below, 3-phase version, equipped as surface mounting with cabled connections between sections. Panelboard shall have less than 10% of its concurrent devices rated 30 amperes or less for which neutral connections are provided.

C. Overcurrent Protective Devices – a circuit breaker pole or single fuse. Example: a 2-pole device is considered 2 protective devices.

1.05 REFERENCES

A. ANSI 61.

B. ANSI/NEMA KS 1, Enclosed and Miscellaneous Distribution Equipment Switches (600 volts).

C. ANSI/NEMA PB 1, Panelboards.

D. ANSI/NFPA 70, National Electrical Code.

E. ASTM – American Society of Testing Materials.

F. CSA C22.2 No. 29, Panelboards and Enclosed Panelboards.

G. CSA C22.2 No. 5.1, Molded Case Circuit Breakers.

H. Federal Specification W-C-375, Rev. B, Amend. 1, Circuit Breakers, Molded Case; Branch Circuit and Service.

I. Federal Specification W-P 115, Rev. C, Panel, Power Distribution.

J. NEMA AB1, Molded Case Circuit Breakers and Molded Case Switches.

K. NEMA PB 1.1, General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

L. UL 489, Molded-Case Circuit Breakers and Circuit-Breaker Enclosures.

M. UL 50, Enclosures for Electrical Equipment.

N. UL 67, Panelboards.

O. UL 943, Ground-Fault Circuit-Interrupters.

1.06 SUBMITTALS

A. Submit under provisions of the General Requirements and Section 26 0500.

B. Product Data: Provide for fusible switches and circuit breakers.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

E. Project Record Documents: Record actual locations of panelboards and record actual circuiting arrangements in project record documents.

F. Maintenance Data: Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum twenty years of experience.

1.08 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70, unless otherwise specified.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.09 COORDINATION

A. Coordinate under provisions of the General Requirements and Section 260500.

B. Field Measurements: Verify that field measurements are as shown on Drawings.

C. Field Locations: Verify locations of panelboards prior to rough in.

1.10 DELIVERY, STORAGE, PROTECTION, AND HANDLING

A. Deliver, store, protect and handle products in accordance with recommended practices in manufacturer's Installation and Maintenance Manuals.

B. Deliver each lighting panelboard in individual shipping cases for ease of handling. Each panelboard shall be wrapped for protection.

C. Inspect and report concealed damage to carrier within specified time.

D. Store in a clean, dry space. Maintain factory protective or cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. (Heat enclosures to prevent condensation).

E. Handle in accordance with NEMA and manufacturer's written instructions to avoid damaging equipment, installed devices and finish.

1.11 OPERATION AND MAINTENANCE DATA

A. Manufacturer shall provide copies of installation, operation and maintenance procedures to Owner in accordance with general requirements of the General Requirements and Division 26.

B. Submit operation and maintenance data based on factory and field testing, operation and maintenance of specified product.

1.12 FIELD MEASUREMENTS

A. Make all necessary field measurements to verify that equipment shall fit in allocated space in full compliance with minimum required clearances specified in National Electrical Code.

1.13 EXTRA MATERIALS

A. Submit extra materials under provisions of the General Requirements and Section 26 0500.

B. Furnish five of each panelboard key.

PART 2 PRODUCTS

2.01 PANELBOARDS

A. Phase sequence and balance.
   1. Phase sequence: A-B-C, left to right.
   2. Load balance: Distribute loads for maximum 10 percent difference.

B. Each panelboard, and associated fused switches and circuit breakers, shall be of the same manufacturer.

C. Each panelboard lock shall be operable by the same key.

D. Panelboard Manufacturers:

E. Manufacturer:

1. Square D – No substitute manufacturers will be accepted.

2.02 DISTRIBUTION PANELBOARDS

A. Description: NEMA PB 1, circuit breaker or fusible switch type as shown on drawings. Provide contactors as indicated.

B. Panelboard Bus: 1000 amp per sq.in. Copper, ampere and voltage ratings as indicated. Provide copper ground bus in each panelboard.

C. Minimum Short Circuit Rating: Fully rated, 42,000 amperes rms symmetrical for 240-volt panelboards; 65,000 amperes rms symmetrical for 480-volt panelboards, or as indicated, or as required to be greater than the available short circuit current.

D. Interlocks: Disconnects shall have ON and OFF indication. Disconnect door or cover shall be interlocked mechanically with the disconnect device to prevent opening door with the disconnect device in ON position and application of power while the door is open. Means shall be provided for releasing the interlock for intentional access to the interior, and intentional application of power, if desired, while the door is open. Padlocking arrangements shall permit locking the disconnect device OFF with a maximum of 3 padlocks with door closed or open.

E. Fusible Switch Assemblies: NEMA KS 1, quick make, quick break, load interrupter enclosed knife switch with externally operable handle. Quantity and ratings as indicated. Switches shall bolt directly onto bus, modular devices utilizing spring reinforcement jaws with pressure locked connections are not acceptable.

F. Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits. Quantity and ratings as indicated. Circuit breakers shall bolt directly onto bus, modular devices utilizing spring reinforcement jaws with pressure locked connections are not acceptable.

G. Controllers: NEMA ICS 2, AC general purpose Class A magnetic controller for induction motors rated in horsepower, with bimetal overload relay. Size and ratings as indicated. Provide unit mounted control power transformer and HAND-OFF-AUTO selector switch and GREEN indicating light in front cover.

H. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated.

I. Enclosure: NEMA PB 1, Galvanized steel finished inside and outside with manufactures standard gray enamel, fully flanged, fastened with quarter-turn trim clamps. Type 1 or 12 or 3R as suitable for the location, 12 inches deep, 35 inches wide, minimum, or as required to accommodate the number of outgoing conduits.

J. Cabinet Front: Surface type, finished in manufacturer's standard gray enamel. Fasten doors 48 inches in height or less with concealed hinged door with flush catch lock. Fasten doors over 48 inches in height with three-point catch lock and vault type handle.

2.03 BRANCH CIRCUIT PANELBOARDS

A. Equipment:
   1. Minimum Short Circuit Rating: Fully rated, 22,000 amperes rms symmetrical for 240-volt panelboards; 22,000 amperes rms symmetrical for 480-volt panelboards, or as indicated, or as required to be greater than the available short circuit current.

B. Enclosure
   1. Boxes shall be a nominal 20 inches wide and 6 inches deep with wire bending space per local electrical code.
   2. Fronts shall be reinforced steel with concealed hinges and concealed trim adjusting screws. Trim clamps are unacceptable.
   3. All door locks shall be corrosion proof Valox (or equal) with retractable latches. All door locks shall be keyed for a single key.
   4. Clean Lexan (or equal) directory card holders shall be permanently mounted on interior of front door.
   5. All panelboard series ratings shall be prominently displayed on dead front shield.
   6. Interiors shall permit top or bottom incoming cables.
   7. Boxes shall be corrosion resistant, zinc finish galvanized.
   8. Fronts shall be powder finish painted ANSI G1 gray.

C. Bus bars
   1. Bus bars shall be copper and phase sequenced, fully insulated and supported by high impact Noryl (or equal) interior base assemblies.
   2. Panelboard Bus: 1000 amp per sq. in. Copper, ampere and voltage ratings as indicated. Provide copper ground bus in each panelboard. Provide insulated ground bus where identified. All neutral bus bars shall be at minimum 100% rated.
   3. Bus bars shall be mechanically supported by zinc finished galvanneal steel frames to prevent vibration and damage from short circuits.
   4. Terminations shall be UL tested and listed and suitable for UL copper wire.
   5. Provide [1] continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors for bolt-on branch circuit breakers. Bus bars shall be rated as indicated in drawings.
   6. Split solid neural bus shall be plated and located in main compartment for all incoming neutral cables to be same length.
   7. Lugs shall be rated for 75-degree C terminations.
   8. Main lugs for copper conductors shall be bolted lugs.
   9. Lug bodies shall bolt in place.

D. Circuit Breakers
   1. Molded case circuit breakers shall be bolt-on type.
   2. All circuit breakers shall have thermal and magnetic type elements in each pole.
   3. Two and three pole breakers shall have internal common trip crossbars for simultaneous tripping of each pole.
   4. Circuit breakers shall not be restricted to any mounting location due to physical size.
   5. All branch breakers 15 to 100 amperes shall be able to be mounted in any panel position for twin or double mounting without space penalty. Sum of ratings for 2 such twin mounted devices shall not exceed 180 amperes.
   6. Main and sub-feed circuit breakers may be vertically or horizontally mounted.
   7. Branch breaker panelboard connections shall be copper to copper.
   8. All panelboard terminations shall be rated as indicated in drawings.
   9. All breakers shall have an over center mechanism and be quick make and quick break.
   10. All breakers shall have handle trip indication and a trip indicator in window of circuit breaker housing.
   11. Breaker handle and faceplate shall indicate rated ampacity.
   12. Circuit breaker escutcheon shall have standard ON/OFF markings.

13. Main breakers shall be UL listed for use with: Shunt, Under Voltage, and Ground Fault Shunt Trips; Auxiliary and Alarm Switches; and Mechanical Lug Kits. Provide these accessories as indicated on drawings.
14. Where indicated on drawings, the branch circuit breakers shall be SWD type, type HACR for air-conditioning equipment, ground fault circuit interrupter type, arc fault circuit interrupter type and shall have shunt trip accessories.

E. Contactors
1. Contactors shall be mechanically held GE type CR160MC, or ASCO Type 920 or approved equal.

2.04 ACCESSORIES

A. Contactor control relays.

B. Tork (or equal) time clocks.

C. Locking devices for breakers and/or operating handles.

D. Furnish nameplates for each device as indicated in drawings.

E. Provide Transient Voltage Surge Suppression system as specified.

PART 3 EXECUTION

3.01 PREPARATION

A. Provide concrete equipment base for floor mounted equipment installation.

B. Verify field measurements.

C. Verify that required utilities are available, in proper location and ready for use.

D. Beginning of installation means installer accepts conditions.

3.02 INSTALLATION

A. Install panelboards in accordance with NEMA and NECA standards and as instructed by manufacturer.

B. Install panelboards plumb. Install recessed panelboards flush with wall finishes.

C. Support free-standing panelboards with structural channel framework.

D. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with lowest operating handle not lower than 18” above finished floor per NEC.

E. Provide filler plates for unused spaces in panelboards.

F. Provide typed circuit directory for each branch circuit panelboard under the provisions of Section 26 0553. Revise directory to reflect circuiting changes required to balance phase loads.

G. Provide engraved plastic nameplates under the provisions of Section 26 0553.

H. Provide 3-3/4” spare conduits out of each recessed panelboard to an accessible location above ceiling. Identify each as SPARE.

I. Ground and bond panelboard enclosure according to Section 26 0526.

J. Inspect installed panelboards for anchoring, alignment, grounding and physical damage.

K. Check tightness of all accessible mechanical and electrical connections with calibrated torque wrench. Minimum acceptable values are specified in manufacturer’s instructions.

L. Test each key interlock system for proper functioning.

3.03 ADJUSTING

A. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 10 percent of each other. Maintain proper phasing for multi wire branch circuits.

B. Adjust all circuit breakers, access doors, operating handles for free mechanical and/or electrical operation as described in manufacturer’s instructions.

3.04 CLEANING

A. Clean installed work under the provisions of the General Requirements.

B. Clean interior of cabinets and enclosures to remove dust, debris, and other material.

C. Clean surfaces and touch up scratched or marred surfaces to match original finish.

END OF SECTION

SECTION 26 2726
WIRING DEVICES

PART 1- GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirements Specification Sections, apply to the work in this Section.

B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.02 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Device plates and decorative box covers

1.03 RELATED SECTIONS

A. Section 26 0533 - Boxes.

1.04 REFERENCES

A. NECA (National Electrical Contractors Association) Standard of Installation.

B. NEMA WD 1 - General Requirements for Wiring Devices.

C. NEMA WD 6 - Wiring Device Dimensional Requirements.

D. NFPA 70 – National Electrical Code.

1.05 SUBMITTALS

A. Submit under provisions of the General Requirements and Section 260500.

B. Product Data: Provide for wiring devices, device plates, and fittings. Include manufacturer's catalog information showing dimensions, colors, and configurations.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

D. Project Record Documents: Record actual locations of devices and record actual circuiting arrangements in project record documents.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years’ experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of local electrical code, unless otherwise specified.

B. Furnish Products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.08 COORDINATION

A. Coordinate under provisions of the General Requirements and Section 260500.

PART 2- PRODUCTS

2.01 WALL SWITCHES

A. Manufacturers:
   1. Hubbell
   2. Leviton
   3. Cooper Wiring Devices
   4. Pass and Seymour

B. Specification Grade Toggle Style: 20A, 120-277V, back- and side-wired.

	Hubbell	Leviton	Cooper	Pass and Seymour
1P	CS120	CSB1-20	CSB120	CS20AC1
2P	CS1222	CSB2-20	CSB220	CSB20AC2
3W	CS1223	CSB3-20	CSB320	CSB20AC3
4W	CS 1224	CSB4-20	CSB420	CSB20AC4
1P-K	HBL1221-L	------	2221L	PS20AC1-L
1P-PL	HBL1221 PL	1221-PL	2221PL	PS20AC1-RPL
3W-PL	HBL1223 PL	1223-PL	------	PS20AC3-RPL

C. Legend: 1P=single pole, 2P=double pole, 3W=three way, 4W=four-way, K=keyed, PL=pilot light, MC=momentary contact.

D. Color: Ivory or red, unless otherwise specified. Final color selection shall be by the Architect.

2.02 WALL RECEPTACLES

A. Manufacturers:
1. Hubbell
2. Leviton.
3. Cooper Wiring Devices.
4. Pass and Seymour.

B. Description: Receptacles shall be constructed to include a grounding pole from which a wired connection to ground shall be provided.

C. Specification Grade Traditional Style: 20A, 120V, NEMA 5-20R, back- and side-wired.

	Hubbell	Leviton	Cooper	Pass and Seymour
S	HBL5361	5361	5361	5361
D	CR5362	5362	CR5362	5362
C	HBL5235	5261-CH	93632	S3733-SS
GFI	GF20L	7899	VGF20	2095
IG	CR5352IG	5362-IG	IG5362	IG5362-OSP
HG-S	HBL8310	8310	8310	8301
HG-D	HBL8300H	8300	8300	8300
HG-GFI	GFR8300HL	7899HG	VHGF20	2095-HG
HG-IGI	IG8300	8300-IG	IG8300	IG8300
TR	HBL8300SGA	8300-SG	TR8300	TR63

D. Range Outlet: 50A, 125/250V, NEMA 10-50R.

	Hubbell	Leviton	Cooper	Pass and Seymour
Single	HBL7962	5206	32B	3890

E. Combination Outlet: 15A, 125/250V, NEMA 5-15R & 6-15R.

	Hubbell	Leviton	Cooper	Pass and Seymour
Duplex	5292	5031	829	5290

F. Special NEMA configurations shall be specification grade, unless otherwise specified.

G. Color: Ivory or red, unless otherwise specified. Isolated ground devices: Orange, unless otherwise specified. Final color selection shall be by the Architect.

H. Legend: S=single, D=duplex, C=clock hanger, GFI=ground fault, IG=isolated ground, TR=tamper resistant, HG = Hospital Grade.

2.03 WALL PLATES

A. Manufacture: Provide stainless steel cover plates for all wiring devices.

B. Jumbo Cover Plate: Stainless steel, sized to cover opening completely.

C. Weatherproof Cover Plate: Gasketed corrosion resistant cast metal with hinged and gasketed device cover.

2.04 FIRE RATED POKE THROUGH DEVICES

A. Manufacturers
   1. Hubbell or approved equal.

B. Description: Must be flush with floor and utilize a 4” core. Must meet a 4-hour fire rating and must meet or exceed UL514A Scrub Water Requirements. Provide IG receptacle and IG wiring where poke-through is used for an IG outlet.

C. Poke Through Devices shall be required to have at least two 1” EMT trade size conduit stems to feed power, communication and audio-visual applications.

D. All poke-through devices shall be fully recessed, and contain a recessed chamber to accommodate plugs, and be closeable “in use”.

PART 3- EXECUTION

3.01 EXAMINATION

A. Verify that device types, traditional or designer, finishes, and colors are in conformance with the Architects direction.

B. Verify that outlet boxes are installed at proper height.

C. Verify that outlet boxes for light switches are on strike side of door.

D. Verify that wall openings are neatly cut and will be completely covered by wall plates.

E. Verify that floor boxes are adjusted properly.

F. Verify that outlet boxes for wall dimmers are adequately sized to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

G. Verify that exterior, wet locations, and other locations required by authority having jurisdiction, are provided with GFI type devices.

H. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean debris from outlet boxes.

3.03 INSTALLATION

A. Install in accordance with NECA "Standard of Installation."

B. Install fittings in accordance with manufacturer’s instructions.

C. Install devices plumb and level.

D. Install switches with OFF position down.

E. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

F. Do not share neutral conductor on load side of dimmers.

G. Install receptacles with grounding pole on right side.

H. Connect wiring device grounding terminal to separate green branch circuit equipment grounding conductor.

I. Connect wiring devices by wrapping conductor around screw terminal.

J. Use jumbo size plates for outlets installed in masonry walls.

K. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

L. Install protective rings on active flush cover service fittings.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 26 0533 to obtain mounting heights as specified.

B. Coordinate the installation of wiring devices with furniture systems.

3.05 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of the General Requirements.

B. Inspect each wiring device for defects.

C. Operate each wall switch with circuit energized and verify proper operation.

D. Verify that each receptacle device is energized.

E. Test each receptacle device for proper polarity.

F. Test each GFI receptacle device for proper operation.

3.06 ADJUSTING

A. Adjust installed work under the provisions of the General Requirements.

B. Adjust devices and wall plates to be flush and level.

3.07 CLEANING

A. Clean installed work under the provisions of the General Requirements.

B. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION

SECTION 26 2813
FUSES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specifications, apply to the work in this Section.

B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.02 SECTION INCLUDES

A. Fuses

1.03 REFERENCES

A. National Electric Code

B. NEMA FU 1 - Low Voltage Cartridge Fuses

1.04 SUBMITTALS

A. Submit under provisions of the General Requirements and Section 26 0500.

B. Product Data: Provide data sheets showing electrical characteristics including time current curves.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

D. Project Record Documents: Record actual fuse sizes in project record documents.

E. Maintenance Data: Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years of experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to requirements of local electrical code.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.07 COORDINATION

A. Coordinate under provisions of the General Requirements and Section 26 0500.

1.08 EXTRA MATERIALS

A. Provide two fuse pullers.

B. Provide spare fuses as specified.

PART 2 PRODUCTS

2.01 FUSES

A. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.

B. Voltage: Provide fuses with voltage rating suitable for circuit phase to phase voltage.

C. Interrupting Rating: 100,000 rms amperes.

D. Coordination: Provide fuses for properly coordinated system of overcurrent protection.

2.02 MOTOR AND DRY TYPE TRANSFORMER LOAD FUSES

A. Description: 600 amperes and smaller, 250 volts or less, Class RK5.
   1. Manufacturers (RK5):
      a. Bussmann Fusetron FRN-R
      b. Gould Shawmut.

B. Description: 601 amperes and larger, 250 volts or less, Class L.
   1. Manufacturers (L):
      a. Bussmann KRP-C
      b. Gould Shawmut

C. Description: 600 amperes and smaller, 600 volts or less, Class RK5.
   1. Manufacturers (RK5):
      a. Bussmann Fusetron FRS-R
      b. Gould Shawmut
   2. Manufacturers (J):
      a. Bussmann Low Peak LPJ
      b. Gould Shawmut

D. Description: 601 amperes and larger, 600 volts or less, Class L.
   1. Manufacturers (L):
      a. Bussmann KRP-C
      b. Gould Shawmut

2.03 LIGHTING AND HEATING LOAD FUSES

A. Description: 600 amperes and smaller, 250 volts or less, Class RK1, RK5.
   1. Manufacturers (RK5-time delay):
      a. Bussmann Fusetron FRN-R
      b. Gould Shawmut
   2. Manufacturers (J-time delay):
      a. Bussman LPJ
      b. Gould Shawmut

B. Description: 601 amperes and larger, 250 volts or less, Class L.
   1. Manufacturers (L-time delay):
      a. Bussmann KRP-C
      b. Gould Shawmut
   2. Manufacturers (L-non-time delay):
      a. Bussmann KTU
      b. Gould Shawmut

C. Description: 600 amperes and smaller, 600 volts or less, Class RK1, RK5.
   1. Manufacturers (RK1-time delay):
      a. Bussmann Low Peak LPS-RK
      b. Gould Shawmut
   2. Manufacturers (RK5-time delay):
      a. Bussmann Fusetron FRS-R
      b. Gould Shawmut

3. Manufacturers (J-time delay):
    a. Bussmann LPJ
    b. Gould Shawmut

D. Description: 601 amperes and larger, 600 volts or less, Class L.
1. Manufacturers (L-time delay):
    a. Bussmann KRP-C
    b. Gould Shawmut
2. Manufacturers (L-non-time delay):
    a. Bussmann KTU
    b. Gould Shawmut

PART 3 EXECUTION

3.01 INSTALLATION

A. Install fuses in accordance with manufacturer's instructions.

B. Install fuse with label oriented such that manufacturer, type, and size are easily read.

C. Do not install parallel sets of fuses for any single phase.

D. Replace fuses blown during construction and during testing.

END OF SECTION

SECTION 26 2819
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specifications, apply to the work in this Section.

B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.02 SECTION INCLUDES

A. Fusible switches.

B. Non-fusible switches.

1.03 RELATED SECTIONS

A. Section 26 2413 - Fuses.

B. Section 26 0553 - Electrical Identification.

1.04 REFERENCES

A. NECA - (National Electrical Contractors Association) Standard of Installation

B. NEMA FU1 - Low Voltage Cartridge Fuses

C. NEMA KS1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (published by the International Electrical Testing Association)

E. National Electrical Code

1.05 SUBMITTALS

A. Submit under provisions of the General Requirements and Section 26 0500.

B. Product Data: Provide for enclosed switches.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

D. Project Record Documents: Record actual locations of enclosed switches in project record documents.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years’ experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of the National Electrical Code.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. or suitable for the purpose specified and indicated.

1.08 COORDINATION

A. Coordinate under provisions of the General Requirements and Section 26 0500.

B. Field Measurements: Verify that field measurements are as shown on Drawings.

C. Field Locations: Verify locations of transformers prior to rough in.

PART 2 PRODUCTS

2.01 ENCLOSED SWITCHES

A. Manufacturer:

1. Square D – No substitute manufacturers will be accepted.

2.02 FUSIBLE SWITCH ASSEMBLIES

A. Description: NEMA KS 1, Type HD (Heavy Duty) type, horsepower rated, with operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

B. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses only.

2.03 NONFUSIBLE SWITCH ASSEMBLIES

A. Description: NEMA KS 1, Type HD (Heavy Duty) type, horsepower rated, with externally operable handle interlocked to prevent opening front cover with switch in ON position.

2.04 ENCLOSURES

A. Description: Code gauge steel

B. Finish: Phosphate coated, primed and finished with high grade lacquer, manufacturers standard color.

C. Fabrication: NEMA KS 1.

1. Indoor clean, dry locations: Type 1.
2. Indoor dusty, dry locations: Type 12.
3. Indoor wet locations: Type 4X.
4. Outdoor locations: Type 3R.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with NECA "Standard of Installation."

B. Install fuses in fusible disconnect switches.

C. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

D. Apply Identification Tag.

3.02 CLEANING

A. Clean installed work under the provisions of the General Requirements.

B. Clean interior of enclosures to remove dust, debris, and other material.

C. Clean surfaces and restore finish.

END OF SECTION 262819

SECTION 26 2913
ENCLOSED MOTOR CONTROLLERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specifications, apply to the work in this Section.

B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.02 SECTION INCLUDES

A. Manual motor starters.

B. Magnetic motor starters.

C. Combination magnetic motor starters.

1.03 RELATED SECTIONS

A. Section 26 0526 - Grounding and Bonding.

B. Section 26 0503 - Equipment Wiring Systems.

C. Section 26 0529 - Supporting Devices.

D. Section 26 0553 - Electrical Identification.

E. Section 26 2819 - Enclosed Switches.

F. Section 26 2413 - Fuses.

1.04 REFERENCES

A. NFPA 70 - National Electrical Code.

B. CSA C22 No 14, Industrial Control Equipment.

C. NEMA ICS 2, Industrial Control and Systems: Controllers, Contactors and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.

D. UL 508, Industrial Control Equipment.

1.05 SUBMITTALS

A. Submit under provisions of the General Requirements and Section 26 0500.

B. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.

C. Test Reports: Indicate field test and inspection procedures and test results.

D. Manufacturer’s Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

E. Project Record Documents: Record actual locations of controllers in project record documents.

F. Maintenance Data: Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum ten years documented experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of local electrical codes, unless otherwise specified.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

1.08 COORDINATION

A. Coordinate under provisions of the General Requirements and Section 26 0500.

B. Field Measurements: Verify that field measurements are as shown on Drawings.

C. Field Locations: Verify locations of controllers prior to rough in.

1.09 DELIVERY, STORAGE, PROTECTION, AND HANDLING

A. Deliver, store, protect, and handle products in accordance with recommended practices listed in manufacturer's Installation and Maintenance Manuals.

B. Deliver each combination starter in individual shipping cartons for ease of handling. Each starter shall be wrapped for protection.

C. Inspect and report concealed damage to carrier within specified time.

D. Store in a clean, dry space. Storage temperature shall be minus 30 to plus 65 degrees C. Maintain factory protection or cover to keep out dirt, water, construction debris, and traffic. (Heat enclosures to prevent condensation.)

E. Handle in accordance with NAED and manufacturer's written instruction to avoid damaging combination starters, installed device and finish.

1.10 OPERATION AND MAINTENANCE DATA

A. Manufacturer shall provide copies of installation, operation and maintenance procedures to Owner.

B. Submit operation and maintenance data based on factory and field testing, operation and maintenance of specified product.

1.11 QUALITY ASSURANCE (QUALIFICATIONS)

A. Manufacturer shall be specialized in the manufacture and assembly of combination starters for 10 years.

B. Combination starters shall be listed and/or classified by Underwriters Laboratories in accordance with standards listed in Article 1.03 of this specification.

C. Manufacturer's Certificate of ISO 9000 Compliance.

D. Installer's Certificate of ISO 9000 Compliance.

PART 2 PRODUCTS

2.01 CONTROLLERS

A. Phase sequence and balance.
   1. Phase sequence: A-B-C, left to right, front to rear, top to bottom.

B. Each NEMA type controller and combination controller, shall be of the same manufacturer.

C. General operating voltage characteristics unless otherwise specified:
   1. Motors ¾-horsepower and larger 460-volts, operating on 480-volt, 3-phase, 60 Hertz system.
   2. Motors ½-horsepower and smaller 115-volts, operating on 120-volt, 1-phase, 60 Hertz system.

D. Minimum 3 phase starter size: NEMA 1.

E. Manufacturer:
   1. Square D – No substitute manufacturers will be accepted.

2.02 MANUAL CONTROLLERS

A. Fractional Horsepower Manual Controller for motors: NEMA ICS 2, AC general purpose Class A manually operated, full voltage controller for fractional horsepower induction motors, with thermal overload unit, red pilot light, and toggle operator suitable for mounting in standard outlet box.

B. Manual Motor Controller: NEMA ICS 2, AC general purpose Class A manually operated, full voltage controller with auxiliary contacts, red pilot light, START-STOP push button switches, overload elements, and control power transformer.

C. Enclosure: NEMA ICS 6; Type 1, 12, or 3R as suitable for the location.

2.03 AUTOMATIC CONTROLLERS

A. Magnetic Motor Controllers: NEMA ICS 2, AC general purpose Class A automatically operated, full voltage controller with auxiliary contacts, green pilot light, ON-OFF-AUTO selector switch, overload elements, fusible lockable disconnect and control power transformer.

B. Reduced Voltage Controllers: NEMA ICS 2, AC general purpose Class A automatically operated, closed transition reduced voltage autotransformer type controller with 50%, 65%, and 80% tap settings, auxiliary contacts, green pilot light, ON-OFF-AUTO selector switch, overload elements, fusible lockable disconnect and control power transformer.

C. Reversing Controllers: NEMA ICS 2, AC general purpose Class A automatically operated, full voltage controller with auxiliary contacts, green pilot light, ON-OFF-AUTO selector switch, FORWARD-OFF-REVERSE selector switch, overload elements, fusible lockable disconnect, and control power transformer. Include electrical interlock and integral time delay transition between FORWARD and REVERSE rotation.

D. Two Speed Controllers: NEMA ICS 2, AC general purpose Class A automatically operated, full voltage dual single winding controller with auxiliary contacts, green pilot light, ON-OFF-AUTO selector switch, FAST-SLOW selector switch, overload elements, fusible lockable disconnect and control power transformer. Include integral time delay transition between FAST and SLOW speeds. Verify exact starter requirement with mechanical contractor.

E. Enclosure: NEMA ICS 6, Type 1 or 12 or 3R as suitable for the location.

F. Size: The starter shall be large enough to serve the motor being served.

2.04 PRODUCT FEATURES

A. Auxiliary Contacts: NEMA ICS 2, 2 normally open, 2 normally closed field convertible contacts in addition to seal in contact.

B. Cover Mounted Pilot Devices: NEMA ICS 2, heavy duty type.

C. Pilot Device Contacts: NEMA ICS 2, Form Z, rated A150.

D. Indicating Lights: LED type.

E. Selector Switches: Rotary type, on-off-auto.

F. Overload Relays: NEMA ICS; melting alloy, one per phase, wired on the line side of the holding coil.

G. Cover Mounted Overload Relay Reset: Recessed pushbutton type.

H. Relays: NEMA ICS 2.

I. Control Power Transformers: 120-volt secondary with capacity for starter coils, relays, pilot lights, etc. Provide fused primary and secondary, and bond unfused leg of secondary to enclosure.

J. Remote start-stop stations: Include green ON pilot light.

2.05 DISCONNECTS

A. Combination Controllers: Combine motor controllers with non-fusible switch or fusible switch disconnect within common enclosure.

B. Description: Refer to section 262819.

2.06 FUSES

A. Fuse: Class RK-1, dual element, time delay.

B. Description: Refer to section 262913.

2.07 WARNING SIGNS

A. Steel and enamel, painted as follows: WARNING! THIS MOTOR HAS AN AUTOMATIC CONTROL AND MAY START AT ANY TIME

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify the actual manufacture, size, and location of each motor provided to determine final connection, control, and overcurrent protection selection.

3.02 INSTALLATION

A. Perform Work in accordance with NECA Standard of Installation.

B. Install enclosed controllers where indicated, in accordance with manufacturer's instructions.

C. Install enclosed controllers plumb. Provide supports in accordance with Section 26 0529.

D. Select and install fuses in motor controller fusible switches to match installed motor characteristics. Verify time-current curves for proper selection.

E. Select and install overload heater elements in motor controllers to match installed motor characteristics.

F. Provide engraved plastic nameplates under the provisions of Section 26 0553.

G. Provide neatly typed label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

H. Install warning signs at automatically controlled motors.

3.03 FIELD QUALITY CONTROL

A. Inspect and test each enclosed controller to NEMA ICS 2.

B. Clean starter enclosure to remove construction debris, dirt, shipping material.

C. Repaint scratched or marred exterior surfaces to match original finish.

END OF SECTION

SECTION 26 5100
INTERIOR LIGHTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specifications, apply to the work in this Section.

B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.02 SECTION INCLUDES

A. Interior luminaires.

B. Exit signs.

1.03 RELATED SECTIONS

A. Section 26 0529 - Supporting Devices.

1.04 REFERENCES

A. NFPA 70 - National Electrical Code.

B. NFPA 101 - Life Safety Code.

1.05 SUBMITTALS

A. Submit under provisions of the General Requirement Specification Sections and Section 26 0500.

B. Product Data: Provide for each luminaire. Include dimensions, ratings, and performance data. Data shall be submitted in order of Luminaire Number as identified on drawings.

C. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

D. Manufacturer’s Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

E. Project Record Documents: Record actual locations of luminaires and record actual circuiting arrangements in project record documents.

F. Maintenance Data: Submit manufacturer's operation and maintenance instructions for each product. Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of local electrical code, unless otherwise specified.

B. Conform to requirements of local electrical code.

C. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.08 COORDINATION

A. Coordinate under provisions of the General Requirements and Section 26 0500.

B. Field Measurements: Verify that field measurements are as shown on Drawings.

C. Field Locations: Verify locations of luminaires prior to rough in.

1.09 DELIVERY, STORAGE, PROTECTION, AND HANDLING

A. Protect from moisture by using appropriate coverings. Store in dry interior locations.

B. Do not install until building is closed in and suitable temperature conditions are controlled.

C. Maintain suitable temperature and humidity conditions during and after installation of luminaires.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide components as indicated within the Lighting Fixture Schedule on the drawings.

B. Acceptable Alternates: Acuity Brands. Aesthetic/Architectural components must be pre-approved by the Architect.

C. Conformance: Fixtures shall be manufactured in strict accordance with the Contract Drawings and Specifications.

D. Codes: Materials and installation shall be in accordance with the latest revision of the National Electrical Code and any applicable Federal, State, and local codes and regulations.

E. UL or CSA US Listing: All fixtures shall be manufactured in strict accordance with the appropriate and current requirements of the “Standards for Safety" to UL 8750 or others as they may be applicable. A listing shall be provided for each fixture type, and the appropriate label or labels shall be affixed to each fixture in a position concealing it from normal view.

F. Specifications and scale drawings are intended to convey the salient features, function and character of the fixtures only, and do not undertake to illustrate or set forth every item or detail necessary for the work.

2.02 LUMINAIRES

A. Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply) and integral controls as per this specification.

B. Each luminaire shall be designed to operate at an average operating temperature of 25°C.

C. The operating temperature range shall be 0°C to +25°C.

D. Each luminaire shall meet all parameters of this specification throughout the minimum operational life when operated at the average operating temperature.

E. Nominal luminaire dimensions:
   1. It is the responsibility of this Contractor to verify final dimensions of each fixture and coordinate this size with the ceiling/structure in/on which it is to be installed, such that all fixtures come with all components required to install it correctly. Any discrepancies shall be resolved prior to purchasing the fixtures or the ceiling system.

F. Luminaire Construction:
   1. Luminaire housing to have no visible welding, screws, springs, hooks, rivets, bare LED’s or plastic supports.
   2. The luminaire shall be a single, self-contained device, not requiring on-site assembly for installation. The power supply and circuit board for the luminaire shall be integral to the unit.

G. LED Sources:
   1. Color Temperature – Unless specifically noted otherwise on the drawings, all LED sources shall have a color temperature of 3500K, unless specifically noted otherwise.
   2. Lumen output shall not decrease by more than 20% over the minimum operational life of 50,000 hours.
   3. Individual LEDs shall be connected such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.

4. LED boards shall be suitable for field maintenance or replacement without complete removal of the fixture.
5. Color Rendering Index (CRI) – The CRI of each LED source shall be 80 or greater.

H. Power Supply and Driver:
1. Driver: 120 – 277-volt, UL Listed, CSA Certified, Sound Rated A+. Driver shall be > 80% efficient at full load across all input voltages. Input wires shall be 18AWG solid copper minimum.
2. Driver shall be suitable for full-range dimming. The luminaire shall be capable of continuous dimming without perceivable flicker over a range of 100% to 10% of rated lumen output with a smooth shut off function. Dimming shall be controlled as determined by the driver selection specified within the Lighting Fixture Schedule on the drawings.
3. Fixtures connected to the Lutron Lighting Control System shall contain EcoSystem drivers. If EcoSystem drivers are not available, a suitable control module shall be provided for each fixture or zone of fixtures.
4. Driver shall be UL listed.
5. Unless specifically noted otherwise, all dimming drivers shall utilize 0-10V technology.
6. Driver disconnect shall be provided where required to comply with codes.
7. The electronics/power supply enclosure shall be internal to the SSL luminaire and be accessible per UL requirements.
8. The surge protection which resides within the driver shall protect the luminaire from damage and failure for transient voltages and currents as defined in ANSI/IEEE C64.41 2002 for Location Category A, where failure does not mean a momentary loss of light during the transient event.

I. Electrical:
1. Operation Voltage - The luminaire shall operate from a 60 HZ ±3 HZ AC line over a voltage ranging from 120 VAC to 277 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output. The standard operating voltages are 120 VAC, 277 VAC.
2. Power Factor: The luminaire shall have a power factor of 90% or greater at all standard operating voltages and full luminaire output.
3. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 10 percent at any standard input voltage.
4. Surge Suppression: The luminaire shall include surge protection to withstand high repetition noise and other interference.
5. RF Interference: The luminaire and associated on-board circuitry must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 Non-Consumer requirements for EMI/RFI emissions.
6. Electrical connections between normal power and driver must be modular utilizing a snap fit connector. All electrical components must be easily accessible after installation and be replaceable without removing the fixture from the ceiling.

J. Thermal Management:
1. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
2. The LED manufacturer’s maximum junction temperature for the expected life shall not be exceeded at the average operating ambient temperature.
3. The LED manufacturer’s maximum junction temperature for the catastrophic failure shall not be exceeded at the maximum operating ambient temperature.
4. The luminaire shall have an UL IC rating.
5. The Driver manufacturer’s maximum case temperature shall not be exceeded at the maximum operating ambient. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.

K. Luminaire Identification:
   1. Each luminaire shall have the manufacturer's name, trademark, model number, serial number, date of manufacture (month-year), and lot number as identification permanently marked inside each unit and the outside of each packaging box.
   2. The following operating characteristics shall be permanently marked inside each unit: rated voltage and rated power in Watts and Volt-Ampere.

L. Quality Assurance:
   1. The luminaires shall be manufactured in accordance with a manufacturer quality assurance (QA) program. The QA program shall include two types of quality assurance: (1) design quality assurance and (2) production quality assurance. The production quality assurance shall include statistically controlled routine tests to ensure minimum performance levels of the modules built to meet this specification. These tests shall include: CCT, CRI, Lumen output and wattage. Tests shall be recorded, analyzed and maintained for future reference.
   2. QA process and test results documentation shall be kept on file for a minimum period of seven years.
   3. LED luminaire designs not satisfying design qualification testing and the production quality assurance testing performance requirements described below shall not be labeled, advertised, or sold as conforming to this specification.

2.03 EXIT SIGNS

A. Furnish Products as scheduled and in compliance with applicable codes.

B. Description: Exit sign fixture.

C. Housing: Sheet steel or thermoplastic, as indicated in Lighting Fixture Schedule on plans.

D. Face: Translucent glass face with red letters on white background.

E. Letters: 6" high, with 3/4" stroke, minimum.

F. Directional Arrows: As indicated, with letters 4½ " high, ¾" stroke, minimum.

G. Lamps: Light emitting diodes.

H. Electrical Connections: Conduit connection.

2.04 WARRANTY

A. The manufacturer shall provide a warranty against loss of performance and defects in materials and workmanship for the Luminaires for a period of 5-years after acceptance of the Luminaires. Warranty shall cover all components comprising the luminaire. All warranty documentation shall be provided to customer prior to the first shipment.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install suspended luminaires and exit signs directly from building structure using rigid stem pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.

B. Support luminaires larger than 2'x 4' size independent of ceiling framing.

C. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.

D. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

E. Grid Ceilings: Provide auxiliary members spanning ceiling grid members to support surface mounted luminaires. Fasten surface mounted luminaires to ceiling grid members using bolts, screws, rivets, or suitable clips.

F. Install recessed luminaires to permit removal from below.

G. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

H. Install clips to secure recessed grid supported luminaires in compliance with applicable codes.

I. Install wall mounted luminaires and exit signs at height as shown.

J. Install accessories furnished with each luminaire.

K. Connect luminaires and exit signs to branch circuit outlets provided under Section 260533 using flexible conduit, 1/2" minimum.

L. Bond products and metal accessories to branch circuit separate green equipment grounding conductor.

M. Install specified lamps in each luminaire and exit sign in accordance with manufactures instructions for handling and burning position.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Coordinate installation of recessed luminaire frames and trims with ceiling construction.

B. Coordinate the installation of suspended luminaires with building components, verify exact locations and mounting heights.

3.03 FIELD QUALITY CONTROL

A. The use of permanent luminaires for temporary lighting shall only be as permitted by the Architect/Engineer.

B. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.04 ADJUSTING

A. Adjust installed work under provisions of the General Requirement Specification Sections.

B. Aim and adjust luminaires as indicated and as directed.

C. Position exit sign directional arrows as indicated.

3.05 CLEANING

A. Clean installed work under provisions of the General Requirement Specification Sections.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosures.

D. Clean photometric control surfaces to remove all dust and smudges with cleaning solution as recommended by manufacturer.

E. Clean finishes and touch up damage.

3.06 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate installed work under provisions of the General Requirement Specification Sections.

B. Demonstrate luminaire operation for minimum of two hours.

3.07 PROTECTION OF FINISHED WORK

A. Protect installed work under provisions of the General Requirement Specification Sections.

B. Re-lamp luminaires used for temporary lighting and luminaires that have failed lamps at the time of project turn-over.

END OF SECTION

SECTION 27 0533
CONDUIT ROUGH-IN FOR SPECIAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and the General Requirement Specification Sections, apply to this Section.

B. This section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.02 DESCRIPTION

A. Furnish and install Conduit Rough-In systems including all work incidental thereto as shown on Drawings and specified.

B. This section is applicable to security systems, including CCTV and Access Control Systems.

1.03 SUBMITTALS

A. Shop drawings are not required for material and equipment specified under this section of the specifications.

PART 2 PRODUCTS

2.01 OUTLET BOXES

A. Minimum two-gang for CCTV and card reader devices.

2.02 PLASTER COVER RINGS

A. Single gang for single device, double gang for two devices, etc.

2.03 COVER PLATES

A. Cover plates for CCTV and card reader devices shall be provided by its respective trade.

2.04 RACEWAYS

A. Per appropriate section with insulated throat bushings on all conduit runs and rubber grommeted holes between boxes or box sections. Provide pull strings.

PART 3 EXECUTION

3.01 COORDINATION

A. Comply with all requirements of the Owner's representative for all raceways, boxes, cover plates, etc., and their specific installation considerations.

B. Consult with Owner's representative prior to installation to determine special raceway requirements for all CCTV and card reader devices.

3.02 INSTALLATION

A. Furnish and install the trunk raceways, outlet box, and outlet box raceways as shown on drawings and specified.

B. Install trunk raceways to within six inches of backboards.

C. Stub outlet box raceways to cable support system provided by others within accessible ceiling cavity.

D. Minimum outlet box conduit sizes shall be 1 inch for voice/data, and 3/4 inch for all other low voltage systems.

E. In each instance where two or more device boxes are generally located in the same vicinity and at the same mounting height, mount those devices in a common multi-gang barrier box appropriate for the device types.

F. Mark each conduit end for identification and destination of raceway.

G. Provide required sleeves in all walls and floors as required by low voltage system contractors.

H. Provide pull rope in each raceway.

I. Provide insulating bus wings and locknuts for all raceways.

J. There shall not be more than the equivalent of three 90-degree bends in any single run of conduit between boxes or fittings.

K. Bends shall be made so that the conduit will not be flattened or kinked and the internal diameter of the conduit will not be reduced.

L. The radius of the curve of the inner edge of any bend shall not be less than as indicated by the National Electrical Code and ANSI/TIA/EIA 569A Commercial Building Standard for Telecommunications Pathways and Spaces.

M. In no case shall any conduit be bent or any fabricated elbow be applied no less than the allowable bending radius as specified by the cable manufacturer of the installed conductor.

N. Provide blank cover plates for each unused outlet box.

END OF SECTION

SECTION 27 1443
DATA AND VOICE CABLING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specifications, apply to the work in this Section.

B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.02 SECTION INCLUDES

A. Data Cabling.

B. Voice Cabling.

1.03 RELATED SECTIONS

A. Section 26 0532 – Conduit.

B. Section 26 0503 – Boxes.

1.04 SYSTEM DESCRIPTION

A. Furnish, install and test all cabling and equipment necessary for a complete data and voice cabling system as specified and indicated on drawings. Conduit, raceway and outlet boxes for the associated outlets shall be provided by this contractor.

B. The cabling system shall meet specifications for 10/100/1000 Base-T and gigabit network. Provide connections to 10/100/1000 Base-T Switches by changing patch cords in wiring closets.

C. Insure that the cable run from the distribution frame to the information outlet does not exceed 90 meters (295 Feet).

D. Furnish and install all faceplates, patch panels, equipment racks, equipment trays and all other items necessary to provide connections at all specified information outlets and patch panel(s).

E. The cabling system shall be in compliance to EIA/TIA 568B, TSB-67, and ISO/TEC IS 11801.

F. Support analog and digital voice applications, data system on a common cabling platform. The systems that shall be supported include, but are not limited to:

1. Data Communications – TIA/EIA-568B/569, Ethernet, Category 6, UTP plenum cable.
    a. Data communications from the IDF to MDF will be via 12-strand 6 pair OM4 50-micron, 10 gig rated Beltec multimode fiber plenum cable. From IDFs to local data ports will be over Category 6 UTP plenum cable.
2. Voice Application – The voice communication systems utilized within the facility is Voice Over Internet Protocol (VoIP). Voice communications will be transmitted through the cat. 6 data cabling.

1.05 PROJECT/SITE CONDITIONS

A. Examine areas and conditions under which all items are to be installed and notify architect in writing of conditions detrimental to proper completion of the work. Do not proceed with that portion of the work affected until unsatisfactory conditions have been corrected in a manner acceptable to installer.

1.06 SUBMITTALS

A. Submit shop drawings and product data under provisions of the General Requirements.

B. Contractor shall review all shop drawings prior to submitting them for Architect/Engineer's review. Contractor shall stamp each shop drawing to certify that he has reviewed it. Engineer will not check any shop drawings that Contractor has not stamped with his review certification.

1.07 QUALIFICATIONS

A. Low voltage contractor shall have at least ten (10) years' experience in the installation of similar systems. The low voltage contractor shall provide documentation upon request to certify that all assigned staff have attended training courses corresponding to the type of cabling and equipment specified herein.

B. Low voltage contractor shall currently be licensed to install low voltage electronic cabling systems in the State if applicable. Work to be performed by low voltage trained and certified electricians.

C. Low voltage contractor shall currently meet all manufacturer's requirements for the provision and installation of all equipment specified herein.

D. Low voltage contractor shall utilize and have operators trained in the utilization of the following test equipment:
   1. Copper Cable test equipment
      a. Fluke 4100
      b. Ideal Lantek 6 or prior approved equal.
   2. Printout generated by the test equipment showing jack number and cable footage shall be part of submittals.

1.08 MAINTENANCE SERVICE

A. Provide service and maintenance of cabling system for one (1) year from date of Final Acceptance.
   1. Warranty: Warrant the cabling system against malfunction due to component failure or improper installation for a period of (10) years from the date of Final Acceptance. When notified of a malfunction, proceed to immediately correct the situation by replacement or repair without cost to the Owner. Extend manufacturer's warranties when necessary to achieve the full duration. Clearly indicate provisions of the warranty in the Warranty Manual.
   2. Response Time: Within the Warranty period, low voltage contractor will replace defective parts within one business day after receiving notification of a problem.
   3. Warranty inspection: Prior to expiration of the one-year warranty period, arrange to make an inspection of the cabling system. Make adjustments and correct defects that exist to bring the system up to as-new specifications.

PART 2 PRODUCTS

2.01 GENERAL

A. Low voltage contractor shall provide written notification to Engineer, prior to bidding, of any discrepancies in model or part numbers specified.

B. Low voltage contractor shall provide written notification to Engineer, prior to bidding, of the announced discontinuation or replacement of any items specified herein.

C. Low voltage contractor shall provide all necessary components, mounting hardware and accessories required to install the materials specified herein.

2.02 PRODUCT SUBSTITUTIONS

A. No substitutions will be allowed.

2.03 MATERIALS

A. Cabling:
   1. Data Cable: Furnish and install plenum 4-pair 23/24awg, solid copper unshielded twisted-pair (UTP) cable or quality that exceeds pending EIA/TIA-568 and EIA/TIA TSB-36 Category 6 requirements.
      a. Basis of Design Manufacturer: Belden
         1) Acceptable Alternates: Mohawk, CommScope

b. Data Cables serving equipment shall all have yellow jacket color.

2. UTP Patch Cables
   a. Provide patch cables in 1', 2', 3', 4', 5', or 6', overall quantity of (1) patch cord for each cat. 6 jack within patch panels. Specific lengths shall be coordinated with the Customer's Technology Department.
   b. Patch Cables shall meet the performance requirements of all other cat. 6 cabling.
3. Fiber Optic Intra-Building Backbone (Multimode) Cable: 12-Strand 50-micron multimode, Interlock Armored "OM4" or higher grade, tight buffered (900 micron). Riser rated (OFNP) distribution cable.
   a. Acceptable Manufacturers: Mohawk #M9C241, CommScope, Seicor, Belden #B9C241.
   b. Coordinate color of Fiber jacket with Owner's I.T. department and provide as directed.

B. Faceplates:
1. Voice and Data Drop Locations:
   a. Two gang junction box, single gang faceplate.
   b. Basis-of-Design Manufacturer: Hubbell
      1) Acceptable Alternates: Belden, Lucent, Panduit
   c. Cat-6 Data Jack: Cat-6, high density, T568A wired.
   d. Refer to Drawings for quantities and locations of jacks.
2. Voice Only Wall Phone Drop Location: Stainless steel single gang faceplate, Wall plate jack.
   a. Basis-of-Design Manufacturer: Hubbell
      1) Acceptable Alternates: Belden, Lucent, Panduit
   b. Wall Mount Telephone Mounting Plate: Stainless steel, single gang.
   c. Cat-6A Voice Jack: Cat-6A, T568B wired, Yellow, silver wall plate jack.

C. Equipment Racks:
1. Wall Mounted Intermediate Distribution Frame (IDF) Network Server Rack:
   a. Equipment racks shall be wall mounted, 45U capacity, with threaded mounting rails, manufactured to support 19" wide, 30" nominal depth rack-mounted network equipment.
      1) Basis of Design Manufacturer: Tripp Lite
         a) Acceptable Manufacturers: Chatsworth, Belden, Hubbell

D. Patch Panels:
1. Unshielded Twisted Pair (UTP) Patch Panel and Associated Items:
   a. Unpopulated modular 48-Port Patch Panel: 19" rack mount, 48-port cat-6A patch panel, with cable support bar and color-coded label strip, T568A wired.
      1) Basis of Design Manufacturer: Hubbell.
         a) Acceptable Manufacturers: Belden, Leviton.
         b) Acceptable Alternates: Panduit, Siemon, Belden.

PART 3 EXECUTION

3.01 GENERAL

A. Coordinate all work with Customer before deploying in field.

B. Coordinate all work with Customer's Technology Department – Network/Infra-Structure Division before deploying in field.

C. Install all equipment and components in accordance with manufacturer's written instructions, in compliance with NEC, and with recognized industry practices, to ensure that all items comply with specifications and serve intended purposes.

D. All Cabling and equipment shall be installed in accordance with good engineering practices as established by the EIA and the NEC. Cabling shall meet all applicable local, State, and Federal building codes.

E. Record serial numbers of all items provided that are serialized. To be completed prior to Final Acceptance.

F. All items must be complete as specified prior to Final Acceptance. Ensure cabling meets all specifications and standards defined herein.

3.02 INSTALLATION

A. Cabling - General:

1. All cables shall be provided in conduits except cables above accessible ceiling space. Cables above accessible ceiling space shall be exposed.
2. All cables shall be plenum rated.
3. Furnish and install cabling runs between Wiring Closets and all outlets specified on drawings. A dedicated cabling run shall be utilized for each Faceplate Jack.
4. Conduit, Raceways and Outlet Boxes, to be provided as required.
5. Furnish and install Faceplates and Faceplate Jacks in Outlet Boxes for all outlets specified on drawings.
6. All Jacks shall be terminated in accordance with Cable Pinout Detail T568A.
7. Furnish and install grommets in conduit to prevent damage to insulation or conductors.
8. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque-tightening values for equipment connectors.
9. Do not damage cabling and shielding. Avoid excessive and sharp bends. Ensure manufacturer's recommended pulling tensions are not exceeded.
10. Allow sufficient slack in cable to prevent premature deterioration of cable system components and to assist in the maintenance and servicing of cable and/or other building systems and components.
11. Cable that is run above a suspended ceiling shall be supported by J-hooks every 5'-0".
12. Cable running along exposed ceilings shall be run within a solid-bottom 4" width cable tray, painted to match structural ceiling color.
13. Fittings or connections are allowed only at the input and output of devices. Splicing shall not be accepted in any cable runs. The entire cable run shall be replaced in all such instances.
14. All cable must be free of tension at both ends as well as over the length of the run. In cases where a cable must bear some stress, Kellum grips may be used to spread the strain over a longer length of the cable. Cables that require service loops or additional length should be coiled from 100-200% of their recommended minimum bend radius. The coil shall then be cabled tied and attached to a nearby support.
15. Excess cable behind faceplate connections shall be pulled back into ceiling spaces and secured in such a manner as to prevent damage to cabling or connections.

16. A minimum 10-foot loop of extra cable shall be secured in accessible ceiling space for outlets installed in movable partition walls or power poles.
17. Use a cable tie tool to install cable ties with appropriate pressure to the cable bundles so not to damage cable and provide a smooth cut of excess cable tie. Cable ties MUST be able to be turned freely around the bundle of cable. Cable bundles shall be limited to 2" diameter. Cable ties to be used for cable bundle "above the ceiling".
18. Use Velcro® Bands to secure cable bundles from where the cable exits the ceiling and terminates at the Patch Panel on the IDF.

B. Grounding: Ground all equipment per manufacturers' instructions and NEC guidelines.

C. Labeling:
1. Confirm all room numbers with the Owner prior to labeling.
2. Use the following format for all Outlet and Patch Panel labeling: Room Number-Outlet Number-Jack ID. The Jack ID shall be "A" for the top jack or "B" for the bottom jack. For example, the top jack of Outlet #1 in Room 114 shall be labeled as 114-1-A.
3. Brother P-Touch, Casio EZ Label, Brady or prior approved equal self-adhesive labels shall be utilized for all Outlet and Patch Panel labeling. A sample of EACH information outlet with 1' Minimum of each cable terminated shall be required for approval.
4. Place labels on Faceplates and inside Outlet Boxes for all Outlet locations.
5. Label all patch panel terminations with the identical numbers used at outlet locations.
6. Label the ends of all cabling runs with Panduit Pan-Ty, Brady or equal labels in permanent marker.
7. Label all Patch Cords with Panduit Pan-Ty, Brady or equal labels in permanent marker.

3.03 CERTIFICATION AND DOCUMENTATION

A. All circuits must be certified to comply with EIA/TIA 568, TSB36 and TSB40 specifications for data systems including NExT (near end cross talk), TD (time domain reflectometer) distance and attenuation for all pairs and must meet or exceed all NEC, NFPA, BOCA and local building codes pertaining to low voltage signal cabling.

B. In order to verify certification and provide reference for future use, the contractor shall provide a complete documented cable performance testing certification on each UTP cable segment per ANSI/EIA/TIA 568, TSB36, TSB40 on all pairs swept at all frequencies. Documentation must be provided in a magnetic media format agreed to in writing by the Owner with results including the following for all pairs at 100 MHZ, 150 MHZ and 250MHz:
1. Cross talk levels (NExT).
2. Attenuation.
3. TDR (cable length).
4. Signal to noise ratio (SNR).
5. Testing for Shorts/Breaks, Correct Pairing

C. Testing must be done in both directions: Permanent Link
1. From the station outlet/connector.
2. From the telecommunications closet.

D. Results must meet or exceed all parameters for proposed Category 6A structured premise cabling systems. Provide hard copy test results for each cabling run in Technical Manual.

E. Low voltage contractor shall utilize and have operators trained in the utilization of the following test equipment:
1. Copper Cable test equipment
   a. Ideal Lantek 6A or prior approved equal.
2. Printout generated by the test equipment showing jack number and cable footage shall be part of submittals see Section 1.06

END OF SECTION

SECTION 28 3100
FIRE ALARM AND DETECTION SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SYSTEM DESCRIPTION

A. Non-coded, UL Listed intelligent analog addressable system with multiplexed signal transmission and survivable network nodes. The control panel shall be UL2572 Listed Mass Notification System.

B. The new Fire Alarm System shall be Notifier, or Equal.

C. The fire alarm equipment and installation shall comply with the current provisions of the following latest edition UL and NFPA standards and shall be listed for its intended purpose and be compatibility listed to insure integrity of the complete system.

D. The fire alarm equipment and installation shall comply with the current provisions of the following latest edition standards (unless otherwise noted below) applicable to the jurisdictional authorities, including their local adoptions and amendments and it shall be listed for its intended purpose of a Mass Notification and Emergency Communication Signaling System and be compatibility listed to insure integrity of the complete system. It shall be listed to all of the UL Standards listed below, without exception.

1.03 BUILDING CODES and STANDARDS

A. National Fire Protection Association (NFPA):
   1. NFPA 70 - National Electrical Code (NEC)
   2. NFPA-72 - National Fire Alarm and Signaling Code – 2013 Edition with Mass Notification
   3. NFPA 101 - Life Safety Code
   4. IBC - International Building Code
   5. IFC - International Fire Code
   6. IMC - International Mechanical Code

B. National Electrical Manufacture’s Association (NEMA)

C. Underwriters Laboratories, Inc. (UL)
   1. UL-864 - Control Units for Fire Protective Signaling Systems (9th Edition)
   2. UL-268 - Smoke Detector for Fire Protective Signaling Systems
   3. UL-217 - Smoke Detectors for Single and Multiple Station
   4. UL-521 - Heat Detectors for Fire Protective Signaling Systems
   5. UL-464 - Audible Signaling Appliances
   6. UL-1971 - Visual Signaling Appliances
   7. UL-38 - Manually Actuated Signaling Boxes
   8. UL-1480 - Standard for Speakers for Fire Alarm, Emergency, and Commercial and Professional Use
   9. UL-1481 - Power Supplies for Fire Protective Signaling Systems
   10. UL 2017 - Mass Notification Systems
   11. UL 2572 - Control and Communication Units for Mass Notification Systems

1.04 SUBMITTALS

A. The Contractor shall not purchase any equipment for the system specified herein until the Owner and/or designated representative has approved the project submittals in their entirety and has returned them to the contractor. It is the responsibility of the contractor to meet the entire intent and functional performance detailed in these specifications. Approved submittals shall only allow the contractor to proceed with the installation and shall not be construed to mean that the contractor has satisfied the requirements of these specifications. The Contractor

shall submit three (3) complete sets of documentation within 30 calendar days after award of purchase order.

B. Each submittal shall include a cover letter providing a list of each variation that the submittal may have from the requirements of the Contract Documents. In addition, the Contractor shall provide specific notation on each Shop Drawing, sample, catalog cut, data sheet, installation manual, etc. submitted for review and approval, of each such variation.
   1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to the Architect.
   2. Technical Submittals including Engineered Fire Alarm Installation layout Shop Drawings shall be prepared by persons with the following qualifications:
      a. Registered Professional Fire Protection Engineer which is a Licensed Professional Engineer who has passed the NCEES Principles and Practices of Fire Protection Engineering Examination licensed in the state which has jurisdiction.
      b. NICET Level IV technician who has been certified at Level IV in the sub-field of Fire Alarm Systems Layout.
      c. Submittals shall also include the Quality Assurance certifications of the Fire Alarm Technician (see Section 1.5).
      d. Distributor Qualifications: Provide documentation of the independently owned, Fire Alarm Distributor’s qualifications, including all licenses, certificates and proof of authorization as a Manufacturer’s Representative in Good Standing.

C. Product Data: Product Data sheets with the printed logo or trademark of the manufacturer of all equipment. Indicated in the documentation shall be the type, size, rating, style, and catalog number for all items proposed to meet the system performance detailed in this specification. The proposed equipment shall be subject to the approval of the Owner.

D. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Comply with all recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA72.
   2. Include voltage drop calculations for notification appliance circuits based on manufacturer-provided panel start voltage and point-to-point notification appliance circuit calculations. System Layout drawings prepared using the Lump Sum Method for visual strobe circuits are not acceptable.
   3. Include battery-size calculations. Batteries shall include a 20% safety factor above the minimum requirements derived from calculations, as required by NFPA 72.
   4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
   5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors in accordance with 2013 edition of NFPA 72.
   6. Indicate all Acoustically Distinguishable Areas on the installation shop drawings.
   7. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits from end-to-end. “Home Run” indicators or other non-end-to-end wire path designations are not acceptable.

E. Operation and Maintenance Data: For fire-alarm systems and components to be included in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data, include the following:
   1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA72.
   2. Provide "Record of Completion Documents" according to NFPA72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.

3. Record copy of site-specific software database file, hardcopy printout and CD, with password for delivery to the owner. Proprietary system/service companies will not be acceptable.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA72 article of the same name and include the following:
    a. Frequency of testing of installed components.
    b. Frequency of inspection of installed components.
    c. Requirements and recommendations related to results of maintenance.
    d. Manufacturer's user training manuals (hardcopy) and electronic on CD.
5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.

F. Software and Firmware Operational Documentation:
1. CD of site-specific software database file with password and all product data sheets. Provide hard copy printout of the software program. Single Source Providers or Proprietary System/service companies will not be acceptable.
2. Provide a list of global system settings.
3. Provide a list of the contents of each system cabinet and their settings.
4. Provide a list of all addressable devices with their addresses and settings.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Fire Alarm distributor’s employed personnel shall be trained and certified by manufacturer on the make and model of the fire alarm control panel specified for this Project.

B. Additional Installer Qualifications: Installation shall be by personnel certified by NICET as a technician who has been certified at Level II in the sub-field of Fire Alarm Systems Layout.

C. Project Manager Qualifications: Installation shall be supervised by personnel certified by NICET as Fire Alarm System Layout Level IV Technician (SET), an NFPA Certified Fire Protection Specialist (CFPS) or an NCEES accredited Licensed Fire Protection Engineer (FPE).

D. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with and operate as a fully U.L. listed extension of a U.L. 864 listed fire alarm control system.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA70, by a qualified testing agency, and marked for intended location and application.

F. Fire Alarm Distributor Qualifications:
1. Contractor shall utilize an Illinois Licensed Private Alarm Contractor Agency that is an authorized, independently owned Manufacturers representative of the specified fire alarm equipment manufacturer.
2. Fire Alarm Distributor shall be a full-service entity qualified to provide the engineering for the technical submittal, furnishing of the equipment, commissioning, testing and inspection services outlined herein including intelligibility testing and capable of providing full repair service to any fire alarm system and/or provide fire alarm system installation and design including, but not limited to, the following minimum requirements:
    a. Qualified Fire Alarm Service Company with employees who meet the criteria defined by NFPA 72 for the qualifications of both System Designers and System Installers to include the requirements of the Authorities Having Jurisdiction (AHJ).
    b. Certified Fire Alarm Service Inspectors with employees of the entity who are certified in Fire Protection Engineering Technology by the National Institute for Certification in Engineering Technologies (N.I.C.E.T.) in FIRE ALARM SYSTEMS – LEVEL III, minimum.
3. Distributor shall be a registered Illinois legal entity (Corporation, Partnership, Professional Corporation or Limited Liability Company) in Good Standing with the Secretary of State of Illinois.

4. EST Distributor entity shall be qualified by the AHJ, including the Illinois Department of Professional Regulation to provide engineering design services for a fire alarm and mass notification system as evidenced by holding an Illinois Registered Professional Design Firm license. Sub-contractors or individually licensed individual Registered Architects, Professional or Structural Engineers DO NOT meet this requirement.
5. All service employees of the entity shall have a valid Illinois Permanent Employee Registration Card (P.E.R.C.).

1.06 WARRANTY AND SOFTWARE SERVICE AGREEMENT

A. The contractor shall warranty all materials, installation and workmanship for One (1) year from date of acceptance, and all Fire Alarm Equipment Component materials for a period of Two (2) years after that, for a Three (3) year in total manufacturer's equipment warranty. A copy of the manufacturers' Three (3) year warranty shall be provided with closeout documentation and included with the operation and installation manuals.

B. The System Supplier shall maintain a service organization with adequate spare parts stocked within 75 miles of the installation. Any defects that render the system inoperative shall be repaired within 24 hours of the Owner notifying the contractor.

C. Technical Support: Beginning with Substantial Completion, provide software support for one (1) year shall be included in this project.

D. Detector Sensitivity Testing: During the warranty period, each year the contractor is to perform detector sensitivity testing and provide report to the Owner. Unless, the system is UL Listed to perform automatic sensitivity testing without any manual intervention and should detector fall outside of sensitivity window, the system will automatically indicate a devices trouble. A copy of UL letter is to be provided as proof of system operation.

E. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within one (1) year from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
   1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.07 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Provide quantity equal to 10 percent of amount of each type installed, but no less than 1 unit of each type.
      a. Smoke Detectors, heat detectors, manual pull stations, monitor modules and control modules:
      b. Notification appliances; Horns, horn-strobes, and strobes.
   2. Keys: The installing contractor shall collect all equipment spare keys provided with each lockable or resettable device/cabinet and shall turn all of them over to the Owner at completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Notifier, or Equal.

B. The Contractor shall provide, from the acceptable manufacturer's current product lines, equipment, and components, which comply, with the requirements of these Specifications. Equipment or components, which do not provide the performance and features, required by these specifications are not acceptable, regardless of manufacturer.

C. Strict conformance to this specification is required to ensure that the installed and programmed system will function as designed and will accommodate the future requirements and operations of the building Owner. All specified operational features must be met without exception.

2.02 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices:
   1. Manual stations.
   2. Heat detectors.
   3. Smoke detectors.
   4. Duct smoke detectors.
   5. Verified automatic alarm operation of smoke detectors.
   6. Automatic sprinkler system water flow.
   7. Heat detectors in elevator shaft and pit.
   8. Fire-extinguishing system operation.

B. Fire-alarm signal shall initiate the following actions where applicable to this facility and jurisdiction:
   1. Activate Audible Horn Units.
   2. Continuously operate the visual notification appliances.
   3. Identify alarm at fire-alarm control unit and remote annunciators.
   4. Transmit an alarm signal to the remote alarm receiving station.
   5. Unlock electric door locks in designated egress paths.
   6. Release fire and smoke doors held open by magnetic door holders.
   7. Switch heating, ventilating, and air-conditioning equipment controls to fire alarm mode.
   8. Activate stairwell and elevator-shaft pressurization systems.
   9. Close smoke dampers in air ducts of designated air-conditioning duct systems.
   10. Recall elevators to primary or alternate recall floors.
   11. Activate emergency shutoffs for gas and fuel supplies.
   12. Record events in the system memory.
   13. Record events by the system printer (if shown or called for in the contract documents).

C. Supervisory signal initiation shall be by one or more of the following devices and actions:
   1. Valve supervisory switch.
   2. Low-air-pressure switch of a dry-pipe sprinkler system.
   3. Elevator shunt-trip supervision.
   4. Duct smoke detector activation.

D. System trouble signal initiation shall be by one or more of the following devices and actions:
   1. Open circuits, shorts, and grounds in designated circuits.
   2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
   3. Loss of primary power at fire-alarm control unit.
   4. Ground or a single break in fire-alarm control unit internal circuits.
   5. Abnormal ac voltage at fire-alarm control unit.
   6. Break in standby battery circuitry.
   7. Failure of battery charging circuitry
   8. High or low battery charge.
   9. Abnormal position of any switch at fire-alarm control unit or annunciator.
   10. Fire-pump power failure, including a dead-phase or phase-reversal condition.
   11. Low-air-pressure switch operation on a dry-pipe or pre-action sprinkler system.

E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators. Record the event on system printer.

2.03 FIRE-ALARM CONTROL PANEL

A. The control panel(s) shall include all required hardware, software and site-specific system programming to provide a complete and operational system. The control panel(s) shall be designed such that interactions between any applications can be configured and modified using software provided by a single supplier. The control panel operational priority shall assure that life safety takes precedence among the activities coordinated by the control panel.

B. The network of control panels shall include the following features.
   1. Ability to download all network applications and firmware from the configuration computer on the network or at any control panel (network node) location.
   2. Each control panel (network node) shall have an LCD display with common controls. The display shall be configurable to display the status of any and all combinations of alarm, supervisory, trouble, monitor, or group event messages.
   3. From each LCD display on the system shall be capable of being programmed for control functions of any node or the entire network. - The LCD display shall reside on the network as a node and continue to operate with fault on the network. An LCD can be programmed to be only operation when a node is operational in stand-alone mode, with a network fault.
   4. The system program shall have a minimum of 100 system definable Service Groups to facilitate the testing of installed system based on the physical layout of the system. Service groups that disable entire circuits serving multiple floors or fire zones shall not be considered as equal.
   5. Advanced Windows based programming with Program Version Reporting to document any and all changes made during system start-up or system commissioning. Time and date stamps of all modifications made to the program must be included to allow full retention of all previous program version data. The operator display shall clearly identify unacknowledged and acknowledged alarm, supervisory, trouble, and monitor status messages. The system shall provide the ability to download data from the analog/addressable detectors to a PC while the system is on-line and operational in the protected premises. The downloaded data may then be analyzed in a diagnostic program supplied by the system manufacturer.
   6. Provide system reports that list a detailed description of the status of system parameters for corrective action or for preventive maintenance. Reports shall be displayed on the operator interface or be capable of being sent to a printer.
   7. Provide an authorized operator with the ability to operate or modify system functions such as system time, date, passwords, holiday dates, restart the system and clear the control panel event history file.
   8. Provide an authorized operator the ability to perform test functions within the installed system.
   9. Supervision of system components, wiring, initiating devices and software shall be provided by the control panel. Failure or fault of system component or wiring shall be indicated by type and location on the LCD display. Software and processor operation shall be independently monitored for failure. The system shall provide fail-safe operation, with multiple-levels of system operation.

C. Each network control panel shall be capable of:
   1. Supporting up to 2500 intelligent analog/addressable points.
   2. Supporting up to ten (10) intelligent addressable loops, each loop supporting 125 detectors and 125 modules, total of 250 points.
   3. Supporting network connections up to 63 other control panels and annunciators.
   4. Supporting up to 124 (security/access control) Keypad/Displays.
   5. Support up ten network digital dialers with Contact ID or SIA format and TAP Pager protocol.
   6. Supporting multiple RS-232 communication ports and protocol.
   7. Supporting up to 1000 chronological history events.
   8. Total network response shall not exceed 3 seconds.

D. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, monitor, trouble and component status messages and control menu.
   1. The common control switches and with corresponding LEDs provided as minimum will be; Reset Alarm Silence, Panel Silence, and Drill. It shall be able to add additional switches/LEDs as required.

2. The main control panel shall have display that is 8 lines by 21-character graphic LCD and backlit when active.
3. Each point shall have custom event message of up to 40 characters, for total of 80 charters. In addition to instructional text message support a maximum of 2,000 characters each.
4. Provide 8 simultaneous events to be displayed. The first seven (7) highest priority events in addition to the most recent event. The events shall be automatically placed in event types (Alarm, Supervisory, Monitor & Trouble) for easy access and shall be possible to view the specific event type separately. Having to scroll through a mixed list of event types is not acceptable.
5. Provide an internal audible signal with different programmable patterns to distinguish between alarm, supervisory, trouble and monitor conditions.
6. Systems not capable of such a display on the main panel faceplate shall include a CRT/Monitor display meeting the above requirements and battery stand-by.

E. Circuits Requirements:
1. Signaling Line Circuits for Network Communications:
   a. Class B, Level
2. Ethernet IP Network
   a. Class C, Level
3. Signaling Line Circuits for Intelligent Analog Addressable Loop:
   a. Class B, Level
   b. No more than 100 detectors or 100 modules installed on a loop.
4. Initiating Device Circuit:
   a. Class B, Level
5. Notification Appliance Circuits:
   a. Class B, Level
   b. Maximum circuit loading to 2.25-amps for each 3.0-amp visual circuit, not to exceed 75% of the visual circuits terminal capacity or the power supplies total amperage rating (i.e. no more than 6.0-amps on an 8.0-amp power supply)
6. Door Holder Circuits
   a. Class D, Level
7. Activation of alarm notification appliances, smoke control, elevator recall and other functions shall occur within 3 seconds after the activation of an initiating device.

F. Elevator Recall:
1. Smoke detectors at the following locations shall initiate automatic elevator recall. Alarm-initiating devices, except those listed, shall not start elevator recall.
   a. Elevator lobby detectors except the lobby detector on the designated floor.
   b. Smoke detector in elevator machine room.
   c. Smoke detectors in elevator hoist-way.
2. Elevator lobby detectors located on the designated recall floors shall be programmed to move the cars to the alternate recall floor.
3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.
   a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.

G. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke barrier walls shall be connected to fire-alarm system.

H. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change to alternate settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

I. Alpha-Numerical Pager Interface: (not applicable).

J. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, shall be powered by nominal 24-V dc source.

K. Secondary Power: Shall provide 24 hours supervisory and 15 minutes of alarm with batteries, automatic battery charger, and automatic transfer switch.

2.04 REMOTE ANNUNCIATOR– LOCAL OPERATOR CONSOLE (FAAP)

A. Annunciator shall match those of fire-alarm control unit LCD display functions for alarm, supervisory, monitor and trouble indications and common system controls including; acknowledging, silencing, resetting, and testing. The fire alarm bypass function switches and LCD Keypad may be housed separately in a locked enclosure to prevent unauthorized use and control of fire alarm system program control and bypass, The Contractor shall verify this feature with Owner prior to final commissioning.

2.05 NAC POWER SUPPLY:

A. The NAC power supply shall be independent unit that will provide power to visual strobe notification appliances. It shall be possible to configure the NAC's to follow the main panel's NAC or activate from intelligent synchronized modules. The booster NAC's must be configurable to operate independently at any one of the following rates: continuous synchronized, or 3-3-3 temporal. Fault conditions on the power supply shall not impede alarm activation of host NAC circuits or other power supplies. The NAC power supply must be able to provide concurrent power for notification devices, security devices, access control equipment and auxiliary devices such as door holders. All the NAC Power Supplies shall be synchronized. The power supply shall support up to 24-amp hour batteries.
   1. Power supply shall be minimum of 10 amps and UL 864 Listed.
   2. Four independent 3.0-amp NAC circuits. Each being configurable as auxiliary power.
   3. All circuits shall be synchronized.
   4. Shall be EDWARDS-KIDDE, model BPS10A or APS10A

2.06 INTELLIGENT ANALOG SYSTEM SMOKE, HEAT AND CARBON MONOXIDE DETECTORS

A. General Requirements for Intelligent Analog Detectors
   1. Integral Microprocessor: All decision are made at the detector determining if the device is in the alarm or trouble condition.
   2. Non-Volatile Memory: Permanently stores serial number, and type of device. Automatically updates historic information including hours of operation, last maintenance date, number of alarms and troubles, time of last alarm1 and analog signal patterns for each sensing element just before last alarm.
   3. Field Replaceable Smoke Sensing Chamber: Analog detectors must have a modular, removable smoke sensing chamber which can be removed for easy cleaning and/or convenient, cost effective service replacement without removing the detector base or resetting the device address, without removal of detector electronics and without requiring any system or device programming adjustments which necessitate a system re-test.
   4. Electronic Addressing: Permanently stores programmable system address. It shall be possible to address each intelligent module without the use of DIP or rotary switches. Devices using switches for addressing shall not be acceptable.

5. Automatic Device Mapping: Each detector transmits wiring information regarding its location with respect to other devices on the circuit, creating an As-Built wiring diagram. This will also provide enhanced supervision of the device physical location and the device message shall reside with the location and not the device address. Devices installed in the wrong location will always report the correct message of the physical location.
6. Sensitivity Range: Each analog addressable smoke detector's sensitivity shall be capable of being programmed individually as: most sensitive, more sensitive, normal, less sensitive or least sensitive. It shall be possible to automatically change the sensitivity of individual analog/addressable detectors for the day and night periods. - It shall be possible to program control panel activity to each level.
7. Pre-Alarm: Detector stores 20 pre-alarm sensitivity values to alert local personnel prior to the sensor reaching a full evacuation sensitivity. Sensitivity values can be set in 5% increments.
8. Environmental Compensation: The detector's sensing element reference point shall automatically adjust, compensating for background environmental conditions such as dust, temperature, and pressure. Periodically, the sensing element real-time analog value shall be compared against its reference value. - The detector shall provide a maintenance alert signal when the detector reaches 75% (Dirty) to 99% (More Dirty) compensation has been used. The detector shall provide a dirty fault signal when 100% or greater compensation has been used.
9. Twin Status LEDs: Flashing Green LED shows normal; flashing RED shows alarm state; steady RED and steady GREEN show alarm state in stand-alone mode, visible from any direction.
10. UL Sensitivity Testing: The detector shall utilize a supervised microprocessor that is capable of monitoring the sensitivity of the detector. If the detector sensitivity shifts outside of the UL limits, a trouble signal is sent to the panel.
11. Device Replacement: The system shall allow for changing of detector types for service replacement purposes without the need to reprogram the system. The replacement detector type shall automatically continue to operate with the same programmed sensitivity levels and functions as the detector it replaced. System shall display an off-normal condition until the proper detector type has been installed or change in the application program profile has been made.

B. Intelligent 3D Multi-Sensor Detector (Photo/Thermal and Time)
1. Where called for on the contract drawings, provide intelligent analog addressable 3D multi-sensor smoke detectors at the locations shown on the drawings. The 3D intelligent detector gathers analog information from each of its two fire sensing elements and converts it into digital signals. The detectors on-board microprocessor measures and analyzes these signals separately with respect to a third element – Time. It compares the information to historical readings, time patterns and known fire characteristics to make an alarm decision. Digital filters remove signal patterns that are not typical of fires.

C. Intelligent Photoelectric Detector
1. Provide intelligent analog addressable photoelectric smoke detectors at the locations shown on the drawings.

D. Intelligent CO (Carbon Monoxide) Detector.
1. Where called for on the contract drawings, provide intelligent CO sensor at locations shown on the drawings. The CO sensor (or combination type sensor) shall reside on the Intelligent Addressable loop with its unique system identifier and be able to be programmed as Alarm, Supervisory or Monitor.
2. CO sensor shall be capable of detecting carbon monoxide from any source of combustion and analyzes the sensor data to determine when to initiate a life safety CO alarm. Carbon monoxide electrolytic sensing module shall provide toxic gas sensing to UL2034 and UL2075 standards.
3. The CO element shall have minimum of six-year life span and be field replaceable element without. The CO element shall be factory calibrated.

4. The CO end of life shall be supervised / monitored by the Control Panel to annunciate end of life. Also, the control panel shall provide a system report of all CO detectors end of life status.
5. The CO Detector shall activate upon the following conditions:
    a. 70 PPM for 60 – 240 minutes
    b. 150 PPM 10- 50 minutes
    c. 400 PPM 4 – 15 minutes
6. The CO activation shall be programmable type as follows: Alarm, Supervisory Latching, Supervisory Non-Latching, Monitor Latching, or Monitory Non-Latching.

E. Intelligent 135 Degree Fixed Temperature / Rate of Rise Heat Detector
1. Where called for on the contract drawings, provide intelligent combination fixed temperature/rate-of-rise heat detectors at the locations shown on the drawings. The heat detector shall have a low mass thermistor heat sensor and operate at a fixed temperature and at a temperature rate-of-rise. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions shall not be acceptable. The intelligent heat detector shall have a nominal fixed temperature alarm point rating of 135oF (57oC) and a rate-of-rise alarm point of 15oF (9oC) per minute. The heat detector shall be rated for ceiling installation at a minimum of 70 ft (21.3m) centers and be suitable for wall mount applications.

F. Intelligent Multi-Sensor Detectors Types (where called for on the contract drawings)
1. Multi-criteria sensor can be any combination of photoelectrical smoke sensing, heat and carbon monoxide (CO) detection. The combined photoelectric smoke detection/heat/CO module shall have separate sensors that adjust the detection profile in response to the input from the sensors.
2. Multi-criteria detector can be combination of photoelectrical smoke sensing and carbon monoxide (CO) detection.
3. Multi-criteria detector can be combination of fix-temperature heat and carbon monoxide (CO) detection.
4. All the Multi-Sensor detector shall use only one address on the SLC.
    a. The CO activation shall be programmable type as follows: Alarm, Supervisory Latching, Supervisory Non-Latching, Monitor Latching, or Monitory Non-Latching.

G. Detector Base Types
1. Provide standard detector mounting bases suitable for mounting on 1-gang, or 4inch octagon box and 4-inch square box. The base shall, contain no electronics and support all series detector types. Bases with electronics or dip-switches are not acceptable.
2. Provide relay detector mounting bases suitable for mounting on 1-gang, or 4” octagon box and 4” square box. The relay base shall support all Signature Series detector types and have the following minimum requirements:
    a. The relay shall be a bi-stable type and selectable for normally open or normally closed operation.
    b. The position of the contact shall be supervised.
    c. The relay shall automatically de-energize when a detector is removed.
    d. The operation of the relay base shall be controlled by its respective detector processor or under program control as required by the application. Detector relays not capable of operational programming independent of the detector shall not be considered equal. Form “C” Relay contacts shall have a minimum rating of 1 amp @ 30 Vdc and be listed for “pilot duty”.
    e. Removal of the respective detector shall not affect communications with other detectors.

3. Provide audible detector mounting bases suitable for mounting on 4” x 4” octagonal concrete ring (mud box) and 4” square x 2-1/8” (54 mm) deep box.
    a. The base shall support all Signature Series detector types and be capable of single or group operation. The audible base shall emit a temporal alarm tone and be selectable for low or high output.
    b. The operation of the audible base shall be controlled by its respective detector processor or under program control as required by the application. Detector audible base not capable of operational programming independent of the detector shall not be considered equal.
    c. The audible bases shall be UL268 and UL464 Listed and provide a reverberant room sound output per UL464 of 81 dBA at 10ft (3m) and an average anechoic sound output of 90 dBA at 10 ft (3m).

H. Audible Base – 520hz Low Frequency – Sleeping Room Occupancies (not applicable)

I. Intelligent Duct Smoke Detector - Photoelectric
1. Provide intelligent photoelectric duct smoke detector at the locations shown on the drawings.
    a. One form C auxiliary alarm relay rated at 2amps @ 30Vdc.
    b. The operating range shall be 100ft/min to 4,000ft/min air velocity and temperature range of –20 to 158F.
    c. Sample tube can be installed with or without the cover place and be rotated in 45-degree increments to ensure proper alignment with duct airflow.
    d. Local magnet-activated test switch.
2. Provide remote test station with Alarm LED and Key Switch.
3. Relay Fan Shutdown: Rated to interrupt fan motor control circuit. Furnish and install separate device for each motor start. Connect to motor start as required for fan shutdown during alarm condition.

2.07 INTELLIGENT MODULES

A. It shall be possible to address each intelligent module without the use of DIP or rotary switches. Devices using switches for addressing shall not be acceptable. The personality of multifunction modules shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller.
1. Integral Microprocessor: All decisions are made at the module determining if the device is alarm or trouble condition.
2. Non-Volatile Memory: Permanently stores serial number, and type of device. Automatically updates historic information including hours of operation, number of alarms and troubles, time of last alarm.
3. Automatic Device Mapping: Each detector transmits wiring information regarding its location with respect to other devices on the circuit, creating an As-Built wiring diagram. This will also provide enhanced supervision of the device physical location. The device message shall reside with the location and not the device address. Devices installed in the wrong location will always report the correct message of the physical location.
4. Twin Status LEDs: The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status.
5. Input and output circuit wiring shall be supervised for open and ground faults.
6. Two styles of modules shall be available, those designed for gang box mounting, and where multiple modules are required in a single location, plug in modules shall be provided with a Universal Input/Output motherboard.

B. Intelligent Input Module: The Input Module shall provide one or two supervised Class B input circuit capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers. The single input module shall support the following circuit types:

- Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)
- Normally-Open Alarm Delayed Latching (Waterflow Switches)
- Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)
- Normally-Open Active Latching (Supervisory, Tamper Switches)

C. Intelligent Relay Module. Provide addressable control relay circuit modules shall provide one (1) form C dry relay contacts rated at 24Vdc @ 2 amps (pilot duty) to control external applianc-es or equipment. The position of the relay contact shall be confirmed by the system firmware. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers.

D. NAC Control Module: Provide intelligent NAC control module shall provide one (1) supervised Class B output circuit capable of a minimum of 2 personalities, each with a distinct operation. The gang box -mounted version shall be suitable for mounting in North American 2 ½" (64mm) deep 2-gang boxes and 1 ½" (38mm) deep 4" square boxes with 2-gang covers, or European 100mm square boxes. The plug-In version shall plug into a universal multi-module mother-board. - The NAC control module shall support the following operations:

- 24volt NAC circuit
- Audio notification circuit 25v or 70v
- Telephone Power Selector with Ring Tone (Firefighter's Telephone)
- Visual Synchronized Output to Genesis appliances or to NAC Power Supply.

E. FA Elevator Interface Cabinet
1. Provide red metal cabinet enclosure with word FIRE in white letters on the cover. Inside will be four intelligent relays (Primary Recall, Alternate Recall, Fire Hat and Shunt Trip), one monitor input (Shunt Trip AC Power Supervision) and 120vac relay (Shunt Trip AC Power Supervision).
2. Label all the relays and input modules for the function.

2.08 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL38. Boxes shall be fin-ished in red with molded, raised-letter operating instructions in contrasting color; shall show vis-ible indication of operation; and shall be mounted on recessed outlet box. If indicated as sur-face mounted, provide manufacturer's surface back box.
1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with in-tegral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. The manual pull station will have an intelligent module integral of the unit.
3. Station Reset: key operated switch shall match the control panel key.
4. Manual pull stations that initiated an alarm condition by opening the unit are not accepta-ble.

B. Indoor Protective Shield "Stopper Covers": Factory-fabricated clear plastic enclosure. Hinged at the top to permit lifting for access to initiate alarm. Lifting the cover actuates an integral battery powered audible horn (when noted on the drawings) intended to discourage false-alarm opera-tion.

C. Weatherproof Locations: Where shown on the drawings, a weatherproof manual pull station shall be provided of red metal construction with special weatherproof gasket metal red box.
   1. Single-action operation.
   2. Station Reset: key operated switch shall match the control panel key.
   3. The intelligent monitor module will be located within the building and not with the station

2.09 NOTIFICATION APPLIANCES

A. All appliances shall be of the same manufacturer as the Fire Alarm Control Panel specified to insure absolute compatibility between the appliances and the control panels, and to ensure that the application of the appliances are done in accordance with the single manufacturers' instructions.

B. All appliances shall be wall or ceiling mounted red and marking of FIRE and shall be UL 1971 & UL 464 listed Fire Protective Service.

C. Notification Appliances – Visual
   1. Provide strobes with in-out screw terminals shall be provided for wiring. Strobes shall provide a smooth light distribution pattern field selectable candela 15 cd, 30 cd, 75 cd, and 110 cd flash output rating. The strobe (15, 30, 75, 110) candela rating shall be view from the side window to verify the setting. All strobes shall be synchronization to within 10 milliseconds for an indefinite period shall not require the use of separately installed remote synch modules. The strobes shall mount to one-gang electrical box.
   2. The device shall have plastic protective cover for during installation.
   3. The actual candela setting on the visual shall be marked on the appliance.

D. Notification Appliance – Low Frequency Horn 520Hz
   1. Provide low profile wall mount horns at the locations shown on the drawings. The horn shall produce tone sound within the frequency range of 520 Hz ±10% square wave tone and have a permanent marking on the housing that reads "520Hz". The nominal sound level shall be 85dBA in anechoic chamber and 76 dBA in reverberant room, listed to UL 464. The horn shall have a selectable steady or synchronized temporal output. In and out screw terminals shall be provided for wiring. The horn shall mount in a 1-gang box.
   2. The device shall have plastic protective cover during installation.

E. Notification Appliance – Horn/Strobe
   1. Provide low profile wall mount horn/strobes at the locations shown on the drawings. The horn/strobe shall provide an audible output of 95 dBA at 10 ft. when measured in reverberation room per UL-464. Strobes shall provide synchronized flash outputs. The strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 60cd, 75cd & 110cd devices. The horn shall have a selectable steady or synchronized temporal output. In and out screw terminals shall be provided for wiring. Low profile horn/strobes shall mount to one-gang box.
   2. The device shall have plastic protective cover during installation.

2.10 GUARDS FOR PHYSICAL PROTECTION

A. Provide welded mesh of size and shape for the manual pull stations, smoke detectors, notification appliances at location noted on the drawings.

2.11 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.
   1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
   2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
   3. Rating: 120-V ac, 24-V ac or dc.
   4. Provide EDWARDS-KIDDE, model 1500 series or DH Series.
   5. Coordinate Magnetic Hold opens with the General Trades and Door Hardware Contractors.

2.12 INSPECTION BAR CODES

A. Company shall provide a web-based reporting system for creating, updating and maintaining all service work, inspections, and maintenance performed as part of this specification to Inspection bar codes shall be installed on all initiating devices, annunciators, control panels and power supplies.

B. Inspection bar codes used by the system must utilize Code 3 of 9 or other approved format, and contain a minimum of eight (8) digits that comprise a unique serial identifier within the Web-based Reporting System. There shall be no duplication of serial numbers. Serial number shall be printed below the bar code for identification purposes.

C. Inspection bar codes shall be limited in size to no more than 2 inches in width, and 3/8 inches in height and shall include a Mylar or other protective coating to protect the bar code from fading due to sunlight or exposure.

D. Inspection bar codes shall be installed on each device in such a manner as to require that scanning of the bar code take place no further than 12 inches from the device during inspection.

2.13 WIRE AND CABLE

A. Signaling Line Circuits – Network Data: Twisted pair, not less than No. 16 AWG or as recommended by the manufacturer. Systems which use Shielded Wire requiring continuous foil shields and continuous drain wires are not acceptable, as they may lead to multiple ground faults and communication integrity faults.

B. Signaling Line Circuits – Intelligent Loop: Non-Twisted pair, not less than No. 16 AWG or as recommended by the manufacturer. Systems which use Shielded Wire requiring continuous foil shields and continuous drain wires are not acceptable, as they may lead to multiple ground faults and communication integrity faults. Where 2 Hour Survivability requirements are required, the additional requirements may apply:
   1. Circuit Integrity Cable: Provide as required to meet NFPA or Local Code requirements for any required pathway survivability.
   2. CI Cable shall meet article 760, power limited fire alarm service.

C. Notification Appliance Circuits –
   1. Audio: Twisted pair, not less than No. 16 AWG or as recommended by the manufacturer.
   2. Visual. Non-Twisted pair, not less than No. 14 AWG or as recommended by the manufacturer and required by the voltage drop calculations (it may be No. 12 AWG in some cases).

PART 3 EXECUTION

3.01 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 and NEC Article 760 for installation of fire-alarm equipment.

B. Equipment Mounting: Install fire-alarm control unit on finished floor with tops of cabinets not more than 72 inches above the finished floor.

C. Smoke- or Heat-Detector Spacing:
   1. Comply with NFPA72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
   2. Comply with NFPA72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
   3. Smooth ceiling spacing shall not exceed 30 feet.
   4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A [or Appendix B] in NFPA 72.
   5. HVAC: Locate detectors not closer than 5 feet from air-supply diffuser or return-air opening.
   6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.

D. Duct Smoke Detectors: Comply with NFPA72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.

E. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.

F. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

G. Notification Appliance Devices: Install between 80 and 96 inches on the wall, consult applicable NFPA 72 Chapter for specific mounting heights of Visual Strobes, Audible Devices and Combinations Audible/Visual Devices.

H. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches above the finished floor.

I. Remote Annunciator or Local Operator Console: Install with top of panel not more than 56 inches above the finished floor.

3.02 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 8 Section "Door Hardware." Connect hardware and devices to fire-alarm system.
   1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
   1. Alarm-initiating connection to smoke-control system (smoke management) at firefighter smoke-control system panel.
   2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
   3. Smoke dampers in air ducts of designated air-conditioning duct systems.
   4. Alarm-initiating connection to elevator recall system and components.
   5. Alarm-initiating connection to activate emergency lighting control.
   6. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
   7. Supervisory connections at valve supervisory switches.
   8. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
   9. Supervisory connections at elevator shunt trip breaker.
   10. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
   11. Supervisory connections at fire-pump engine control panel.

3.03 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 16 Section "Electrical Identification."

B. Install framed instructions provided by Fire Alarm Distributor in a location visible from fire-alarm control unit.

C. All initiating devices shall have bar code label installed visibly on the device. This bar code shall be used for digital inspection of the fire alarm system using Building Reports.Com.

3.04 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.05 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by Architect, Engineer and authorities having jurisdiction.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:
   1. Visual Inspection: Conduct visual inspection prior to testing.
      a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
      b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA72; retain the "Initial/Reacceptance" column and list only the installed components.
   2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA72.
   3. Test visible appliances for the public operating mode according to manufacturer's written instructions.
   4. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA72.

E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

F. Fire-alarm system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

I. Annual Test and Inspection: During the warranty period, each year test fire-alarm system complying with visual and testing inspection requirements in NFPA72. Use forms developed for initial tests and inspections.

J. Detector Sensitivity Testing: During the warranty period, each year the contractor is to perform detector sensitivity testing and provide report to the Owner. Unless, the system is UL Listed to perform automatic sensitivity testing without any manual intervention and should detector fall outside of sensitivity window, the system will automatically indicate a devices trouble. A copy of UL letter is to be provided as proof of system operation

3.06 DEMONSTRATION

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

END OF SECTION