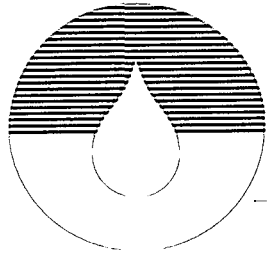


CASE

NUMBER:

99 - 065



*Northern Kentucky
Water Service District*

RECEIVED

APR 08 1999

PUBLIC SERVICE
COMMISSION

April 7, 1999

Honorable Helen Helton
Public Service Commission
730 Schenkel Lane
P.O. Box 615
Frankfort, Kentucky 40602

Re: Case No 99-065
New Laboratory

Dear Honorable Helton,

Enclosed please find the requested document by commission staff in regards to this case. Please forward to Mr. Jim Ries.

Very truly yours,
NOTHERN KENTUCK WATER SERVICE DISTRICT

Ronald J. Barrow, MPA
Asst. General Manger

RJB/ak

PROJECT MANUAL

RECEIVED

APR 08 1999

FUEL VESSEL
DIVISION

NEW WATER QUALITY LABORATORY BUILDING

FOR THE

NORTHERN KENTUCKY

WATER SERVICE DISTRICT

FORT THOMAS WATER TREATMENT PLANT

700 ALEXANDRIA PIKE, FORT THOMAS, KENTUCKY

HUMPERT WOLNITZEK ARCHITECTS, PSC

ARCHITECT

MAXFIELD, SCHWARTZ, LONNEMANN & KOHRS, PSC

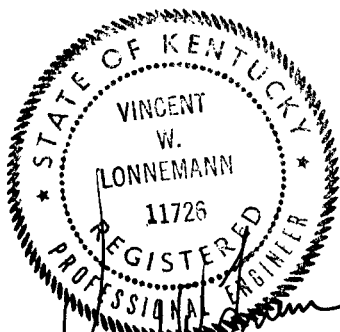
MECHANICAL/ELECTRICAL ENGINEER

TRUMAN P. YOUNG & ASSOCIATES

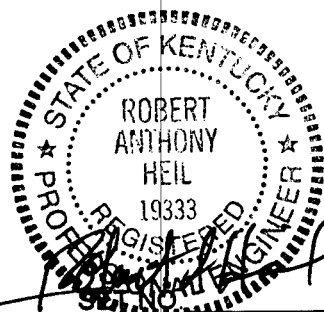
STRUCTURAL ENGINEER



Robert A. Lonnemann



Vincent W. Lonnemann



Robert A. Heil

PROJECT MANUAL

NEW WATER QUALITY LABORATORY BUILDING

FOR THE

NORTHERN KENTUCKY

WATER SERVICE DISTRICT

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TRUMAN P. YOUNG & ASSOCIATES
STRUCTURAL ENGINEER

DECEMBER 14, 1998

SET NO. _____

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SECTION 00150
INVITATION TO BID

THE PROJECT

1.01 PROJECT NAME AND LOCATION

- A. Water Quality Laboratory Building.
- B. 700 Alexandria Pike, Fort Thomas, Kentucky.

1.02 OWNER

- A. NORTHERN KENTUCKY WATER SERVICE DISTRICT.
- B. 700 Alexandria Pike.
- C. Fort Thomas, Kentucky 41075.

1.03 ARCHITECT

- A. HUMPERT WOLNITZEK ARCHITECTS
- B. 501 Main Street, Suite 250
- C. Covington, Kentucky 41011-1329 (606-491-2255)
- D. Direct inquiries to: Bud Blackwell.

1.04 STRUCTURAL ENGINEER

- A. Truman P. Young & Associates, 1216 East McMillan St., Cincinnati, OH 45206 (513-861-5655)

1.05 MECHANICAL / ELECTRICAL ENGINEER

- A. MSLK, 5 West 5th St., Covington, KY 41011 (606-491-8511)

1.06 CONTRACT

- A. A Single Contract for all work will be awarded.

BIDDING DOCUMENTS

2.01 LOCATION AND REQUIREMENTS FOR OBTAINING BIDDING DOCUMENTS

- A. Copies of the Bidding Documents may be obtained after 1:00 PM, December 15, 1998 at the office of the Architect.
- B. Prime Bidders (General Contractors) may obtain Bidding Documents with deposit. ~~There is a 2 set limit per Bidder.~~ *in case of 10.00 per set. make check payable to architect*
- C. All other sub-bidders, major subcontractors and prime bidders desiring additional copies of the bidding

documents must purchase them at cost, plus shipping (if any), from Ohio Blue Print Co., 2348 Gilbert Avenue, Cincinnati, OH 45206 (513-281-9933).

- D. The charge for mailing Bidding Documents is \$25.00 per set, and will be a 3-day delivery. For mailing charge make check payable to "Humpert Wolnitzek Architects".

~~2.02 TYPE AND AMOUNT OF DOCUMENT DEPOSIT~~

- ADD
- A. The Deposit for each set of Bidding Documents is \$50.00. Make checks payable to "Humpert Wolnitzek Architects".
- B. The deposit will be returned to unsuccessful Bidders if the Bidding Documents are returned in good condition within 10 days after receipt of bids. Bid deposits will be returned to non-bidders if Bidding Documents are returned prior to Bid due date.

2.03 LOCATIONS WHERE BIDDING DOCUMENTS ARE AVAILABLE FOR INSPECTION

- A. Bidding Documents may be viewed at the following locations:
1. The Architect's Office.
 2. The Plan Room of:
 - a. F.W. Dodge Corporation
 - b. Allied Construction Services

BIDDING PROCEDURES

3.01 DATE, TIME AND PLACE FOR RECEIVING BIDS

- A. Bids are due on January 15, 1999 at 2:00 PM prevailing time.
- B. Deliver Bids to: The Owner's Office, Fort Thomas Water Treatment Plant, Northern Kentucky Water Service District, 700 Alexandria Pike, Fort Thomas, KY, 41075.

3.02 CONDITIONS FOR SUBMITTING BIDS

- A. Submit bids in duplicate, one original and one exact photocopy.
- B. Bids received by fax or email will not be considered.
- C. Bidders may not withdraw their Bids within sixty (60) days of the actual bid opening.

CONSIDERATION OF BIDS

4.01 BID OPENING

- A. Bids will be opened publicly and read aloud immediately after the deadline for receipt of Bids.

4.02 OWNER'S RIGHTS

- A. The Owner reserves the right to waive any informality, irregularity or defect in any Bids.
- B. The Owner reserves the right to reject any or all Bids.
- C. It is the Owner's intent to award a contract on the basis of the lowest and/or best Bid as determined by the

Owner to be in his best interests.

BONDS

5.01 BID BOND

- A. Bid Security in the amount of 5% of the amount of the Base Bid plus any Alternates is required in the form of a Surety Bond.

5.02 PERFORMANCE BOND AND PAYMENT BOND

- A. The successful bidder will be required to post Performance and Payment Bonds in the amount of 100% of the Construction Cost.

END OF INVITATION

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SECTION 00200

INSTRUCTIONS TO BIDDERS

FORM OF INSTRUCTIONS TO BIDDERS

1.01 SEE AIA DOCUMENT A701 (1987 EDITION), INSTRUCTIONS TO BIDDERS FOLLOWING THIS DOCUMENT.

END OF INSTRUCTIONS TO BIDDERS

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AIA DOCUMENT A701-1997

Instructions to Bidders

TABLE OF ARTICLES

1. DEFINITIONS
2. BIDDER'S REPRESENTATIONS
3. BIDDING DOCUMENTS
4. BIDDING PROCEDURES
5. CONSIDERATION OF BIDS
6. POST-BID INFORMATION
7. PERFORMANCE BOND AND PAYMENT BOND
8. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

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



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INSTRUCTIONS TO BIDDERS

The American Institute
of Architects
1735 New York Avenue, N.W.
Washington, D.C. 20006-5292

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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INSTRUCTIONS TO BIDDERS

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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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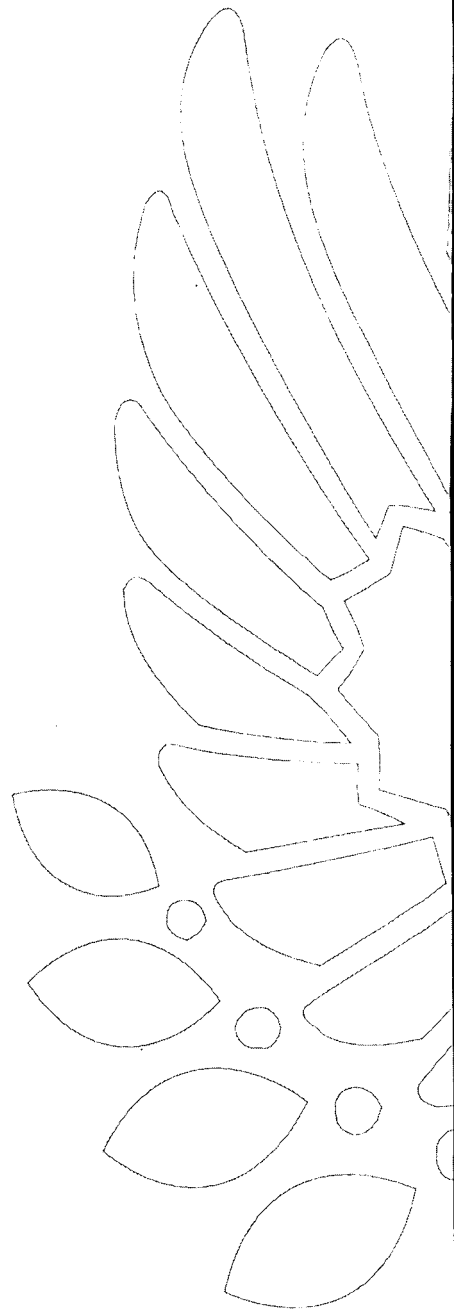


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9/97



SECTION 00410

BID FORM

BID FORM

TO: (THE NORTHERN KENTUCKY WATER SERVICE DISTRICT)

2.01 ADDRESS

- A. 700 Alexandria Pike
- B. Fort Thomas, KY 41075

2.02 PROJECT IDENTIFICATION:

- A. WATER QUALITY LABORATORY BUILDING

2.03 CONTRACT NUMBER:

2.04 DATE: _____ (BIDDER TO ENTER DATE)

2.05 SUBMITTED BY: (BIDDER TO ENTER NAME AND ADDRESS)

- A. Bidder's Full Name _____
 - 1. Address _____
 - 2. City, State, Zip _____

2.06 OFFER

- A. Having examined the Place of The Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by Humpert Wolnitzek Architects for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of:
- B. _____ dollars
(\$ _____), in lawful money of the United States of America.
- C. We have included the required security deposit as required by the Instruction to Bidders.
- D. All applicable federal taxes are included and State of Kentucky taxes are included in the Bid Sum.
- E. All Cash and Contingency Allowances described in Section 01210 are included in the Bid Sum.

2.07 PREVAILING WAGE

- A. Not less than the prevailing hourly wage as determined by the Commisioner of Labor shall be paid to all laborers, workmen, and mechanics performing Work under the Agreement.

2.08 ACCEPTANCE

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

- B. If this bid is accepted by the Northern Kentucky Water Service District within the time period stated above, we will:
 - 1. Execute the Agreement within seven days of receipt of Notice of Award.
 - 2. Furnish the required bonds within seven days of receipt of Notice of Award.
 - 3. Commence work within seven days after written Notice to Proceed of this bid.

- C. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to the Northern Kentucky Water Service District 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.

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

2.09 CONTRACT TIME

- A. If this Bid is accepted, we agree that the Work will be substantially completed by December 15, 1999 and completed and ready for final payment in accordance with will the Contract Documents.

2.10 ADDENDA

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

2.11 BID FORM SIGNATURE(S)

- A. The Corporate Seal of
- B.
- C. (Bidder - print the full name of your firm)
- D. was hereunto affixed in the presence of:
- E.
- F. (Authorized signing officer, Title)
- G. (Seal)
- H.
- I. (Authorized signing officer, Title)
- J. 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 BID FORM

THE AMERICAN INSTITUTE OF ARCHITECTS



AIA Document A310

Bid Bond

KNOW ALL MEN BY THESE PRESENTS, that we _____
(Here insert full name and address or legal title of Contractor)

as Principal, hereinafter called the Principal, and _____
(Here insert full name and address or legal title of Surety)

a corporation duly organized under the laws of the State of _____
as Surety, hereinafter called the Surety, are held and firmly bound unto _____
(Here insert full name and address or legal title of Owner)

as Obligee, hereinafter called the Obligee, in the sum of _____
Dollars (\$ _____),

for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for _____
(Here insert full name, address and description of project)

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this _____ day of _____ 19____

(Witness) { _____ (Principal) (Seal)
_____ (Title)

(Witness) { _____ (Surety) (Seal)
_____ (Title)

INSTRUCTION SHEET

FOR AIA DOCUMENT A310, BID BOND—1970 EDITION

A. GENERAL INFORMATION

1. Purpose

AIA Document A310 establishes the maximum penal amount that may be due the Owner if the Bidder fails to execute the contract and to provide the required performance and payment bonds, if any. It provides assurance that, if a bidder is offered a contract based on its tendered proposal but fails to enter into the contract, then the Owner will be paid the difference in cost to award the contract to the next qualified bidder, so long as the difference does not exceed the maximum penal amount of the bond.

2. Related Documents

The A310 is not incorporated by reference into other AIA documents. For further reference on bonding procedures, see *Construction Bonds and Insurance Guide*, 2nd Edition, by Bernard B. Rothschild, FAIA, published by the AIA. See also AIA Document A501, *Recommended Guide for Competitive Bidding Procedures*; AIA Document 701, *Instructions to Bidders*; AIA Document A771, *Instructions to Interiors Bidders*; and AIA Document G612, *Owner's Instructions Regarding Construction Contract, Insurance and Bonds, and Bidding Procedures*.

3. Use of Non-AIA Forms

AIA Document A310 may be used with any appropriate AIA or non-AIA document. CAUTION SHOULD BE EXERCISED BEFORE ITS USE TO VERIFY ITS COMPLIANCE WITH CURRENT LAWS AND REGULATIONS BY CONSULTING WITH AN ATTORNEY OR A BOND SPECIALIST.

B. COMPLETING THE A310 FORM

1. Modifications

Users are encouraged to consult with an attorney or a bond specialist before completing the A310, particularly concerning the effect of federal, state, and local laws on the terms of this document.

2. Identification of the Parties

The Contractor, the Surety, and the Owner should be identified using their respective full names and addresses or legal titles under which the bond is to be executed. The state in which the Surety is incorporated also should be identified in the space provided.

3. Bond Amount

The dollar amount of the bond should be provided in both written and numerical form.

4. Project Description

The proposed project should be described in sufficient detail to identify (1) the official name or title of the facility, (2) the location of the site, and (3) the proposed building type, size, scope, or usage.

C. EXECUTION OF THE BOND

The bond must be signed by both the Contractor and the Surety. The parties executing (signing) the bond should print their title and impress their corporate seal, if any. Where appropriate, attach a copy of the resolution or bylaw authorizing the individual to act on behalf of the firm or entity. As to the Surety, this usually takes the form of a power of attorney issued by the Surety company to the bond producer (agent) who signs on its behalf.

THE AMERICAN INSTITUTE OF ARCHITECTS



AIA Document A311

Performance Bond

KNOW ALL MEN BY THESE PRESENTS: that

(Here insert full name and address or legal title of Contractor)

as Principal, hereinafter called Contractor, and,

(Here insert full name and address or legal title of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto

(Here insert full name and address or legal title of Owner)

as Obligee, hereinafter called Owner, in the amount of

Dollars (\$ _____),

for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS,

Contractor has by written agreement dated _____

(Here insert full name, address and description of project)

19 _____, entered into a contract with Owner for

in accordance with Drawings and Specifications prepared by

(Here insert full name and address or legal title of Architect)

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

PERFORMANCE BOND

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the Owner.

Whenever Contractor shall be, and declared by Owner to be in default under the Contract, the Owner having performed Owner's obligations thereunder, the Surety may promptly remedy the default, or shall promptly

- 1) Complete the Contract in accordance with its terms and conditions, or
- 2) Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, or, if the Owner elects, upon determination by the Owner and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and Owner, and make available as Work progresses (even though there should be a default or a succession of

defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the contract price," as used in this paragraph, shall mean the total amount payable by Owner to Contractor under the Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.

Any suit under this bond must be instituted before the expiration of two (2) years from the date on which final payment under the Contract falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators or successors of the Owner.

Signed and sealed this

day of

19

		(Principal)	(Seal)
(Witness)	}		(Title)
		(Surety)	(Seal)
(Witness)	}		(Title)

THE AMERICAN INSTITUTE OF ARCHITECTS



AIA Document A311

Labor and Material Payment Bond

THIS BOND IS ISSUED SIMULTANEOUSLY WITH PERFORMANCE BOND IN FAVOR OF THE OWNER CONDITIONED ON THE FULL AND FAITHFUL PERFORMANCE OF THE CONTRACT

KNOW ALL MEN BY THESE PRESENTS: that

(Here insert full name and address or legal title of Contractor)

as Principal, hereinafter called Principal, and,

(Here insert full name and address or legal title of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto

(Here insert full name and address or legal title of Owner)

as Obligee, hereinafter called Owner, for the use and benefit of claimants as hereinbelow defined, in the

amount of

(Here insert a sum equal to at least one-half of the contract price)

Dollars (\$ _____),

for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS,

Principal has by written agreement dated _____

(Here insert full name, address and description of project)

19 _____

, entered into a contract with Owner for

in accordance with Drawings and Specifications prepared by

(Here insert full name and address or legal title of Architect)

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

LABOR AND MATERIAL PAYMENT BOND

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

1. A claimant is defined as one having a direct contract with the Principal or with a Subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.

2. The above named Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expenses of any such suit.

3. No suit or action shall be commenced hereunder by any claimant:

a) Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to any two of the following: the Principal, the Owner, or the Surety above named, within ninety (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial

accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Principal, Owner or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.

b) After the expiration of one (1) year following the date on which Principal ceased Work on said Contract, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

c) Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the Project, or any part thereof, is situated, or in the United States District Court for the district in which the Project, or any part thereof, is situated, and not elsewhere.

4. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

Signed and sealed this

day of

19

	}	<i>(Principal)</i>	<i>(Seal)</i>
<i>(Witness)</i>		<i>(Title)</i>	
	}	<i>(Surety)</i>	<i>(Seal)</i>
<i>(Witness)</i>		<i>(Title)</i>	

SECTION 00500

AGREEMENT

FORM OF AGREEMENT

**1.01 AIA DOCUMENT A101, OWNER-CONTRACTOR AGREEMENT FORM - STIPULATED SUM 1987 EDITION,
FORMS THE BASIS OF CONTRACT BETWEEN THE OWNER AND CONTRACTOR.**

AMENDMENTS TO AGREEMENT FORM

**2.01 THE OWNER'S STANDARD ADDENDUM TO THE OWNER-CONTRACTOR AGREEMENT FORM IS
ATTACHED FOLLOWING THIS PAGE.**

END OF AGREEMENT

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AIA DOCUMENT A101-1997

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a STIPULATED SUM

AGREEMENT made as of the _____ day of _____
in the year _____
(In words, indicate day, month and year)

day of

BETWEEN the Owner:
(Name, address and other information)

and the Contractor:
(Name, address and other information)

The Project is:
(Name and location)

The Architect is:
(Name, address and other information)

The Owner and Contractor agree as follows.

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

AIA Document A201-1997, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

This document has been approved and endorsed by The Associated General Contractors of America.



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ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement and Modifications issued after execution of this Agreement; these form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. An enumeration of the Contract Documents, other than Modifications, appears in Article 8.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except to the extent specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

3.1 The date of commencement of the Work shall be the date of this Agreement unless a different date is stated below or provision is made for the date to be fixed in a notice to proceed issued by the Owner.

(Insert the date of commencement if it differs from the date of this Agreement or, if applicable, state that the date will be fixed in a notice to proceed.)

If, prior to the commencement of the Work, the Owner requires time to file mortgages, mechanic's liens and other security interests, the Owner's time requirement shall be as follows:

3.2 The Contract Time shall be measured from the date of commencement.

3.3 The Contractor shall achieve Substantial Completion of the entire Work not later than _____ days from the date of commencement, or as follows:

(Insert number of calendar days. Alternatively, a calendar date may be used when coordinated with the date of commencement. Unless stated elsewhere in the Contract Documents, insert any requirements for earlier Substantial Completion of certain portions of the Work.)

, subject to adjustments of this Contract Time as provided in the Contract Documents.

(Insert provisions, if any, for liquidated damages relating to failure to complete on time or for bonus payments for early completion of the Work.)



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ARTICLE 4 CONTRACT SUM

4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be _____ Dollars (\$ _____), subject to additions and deductions as provided in the Contract Documents.

4.2 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:
(State the numbers or other identification of accepted alternates. If decisions on other alternates are to be made by the Owner subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

4.3 Unit prices, if any, are as follows:

ARTICLE 5 PAYMENTS

5.1 PROGRESS PAYMENTS

5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

5.1.3 Provided that an Application for Payment is received by the Architect not later than the _____ day of a month, the Owner shall make payment to the Contractor not later than the _____ day of the _____ month. If an Application for Payment is received by the Architect after the application date fixed above, payment shall be made by the Owner not later than _____ days after the Architect receives the Application for Payment.

5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be 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.



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5.1.5 Applications for Payment shall indicate the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

5.1.6 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

- .1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of _____ percent (____ %). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Subparagraph 7.3.8 of AIA Document A201-1997;
- .2 Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), less retainage of _____ percent (____ %);
- .3 Subtract the aggregate of previous payments made by the Owner; and
- .4 Subtract amounts, if any, for which the Architect has withheld or nullified a Certificate for Payment as provided in Paragraph 9.5 of AIA Document A201-1997.

5.1.7 The progress payment amount determined in accordance with Subparagraph 5.1.6 shall be further modified under the following circumstances:

- .1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work, retainage applicable to such work and unsettled claims; and (*Subparagraph 9.8.5 of AIA Document A201-1997 requires release of applicable retainage upon Substantial Completion of Work with consent of surety, if any.*)
- .2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Subparagraph 9.10.3 of AIA Document A201-1997.

5.1.8 Reduction or limitation of retainage, if any, shall be as follows:

(If it is intended, prior to Substantial Completion of the entire Work, to reduce or limit the retainage resulting from the percentages inserted in Clauses 5.1.6.1 and 5.1.6.2 above, and this is not explained elsewhere in the Contract Documents, insert here provisions for such reduction or limitation.)

5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

5.2 FINAL PAYMENT

5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when:

- .1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Subparagraph 12.2.2 of AIA Document A201-1997, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.



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5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

ARTICLE 6 TERMINATION OR SUSPENSION

6.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201-1997.

6.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201-1997.

ARTICLE 7 MISCELLANEOUS PROVISIONS

7.1 Where reference is made in this Agreement to a provision of AIA Document A201-1997 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

7.2 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

(Insert rate of interest agreed upon, if any.)

(Usury laws and requirements under the Federal Truth in Lending Act, similar state and local consumer credit laws and other regulations at the Owner's and Contractor's principal places of business, the location of the Project and elsewhere may affect the validity of this provision. Legal advice should be obtained with respect to deletions or modifications, and also regarding requirements such as written disclosures or waivers.)

7.3 The Owner's representative is:
(Name, address and other information)

7.4 The Contractor's representative is:
(Name, address and other information)

7.5 Neither the Owner's nor the Contractor's representative shall be changed without ten days' written notice to the other party.

7.6 Other provisions:



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ARTICLE 8 ENUMERATION OF CONTRACT DOCUMENTS

8.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated as follows:

8.1.1 The Agreement is this executed 1997 edition of the Standard Form of Agreement Between Owner and Contractor, AIA Document A101-1997.

8.1.2 The General Conditions are the 1997 edition of the General Conditions of the Contract for Construction, AIA Document A201-1997.

8.1.3 The Supplementary and other Conditions of the Contract are those contained in the Project Manual dated _____, and are as follows:

Document	Title	Pages
----------	-------	-------

8.1.4 The Specifications are those contained in the Project Manual dated as in Subparagraph 8.1.3, and are as follows:

(Either list the Specifications here or refer to an exhibit attached to this Agreement.)

Section	Title	Pages
---------	-------	-------

8.1.5 The Drawings are as follows, and are dated _____ unless a different date is shown below:

(Either list the Drawings here or refer to an exhibit attached to this Agreement.)

Number	Title	Date
--------	-------	------



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8.1.6 The Addenda, if any, are as follows:

Number	Date	Pages
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Portions of Addenda relating to bidding requirements are not part of the Contract Documents unless the bidding requirements are also enumerated in this Article 8.

8.1.7 Other documents, if any, forming part of the Contract Documents are as follows:

(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201-1997 provides that bidding requirements such as advertisement or invitation to bid, Instructions to Bidders, sample forms and the Contractor's bid are not part of the Contract Documents unless enumerated in this Agreement. They should be listed here only if intended to be part of the Contract Documents.)

This Agreement is entered into as of the day and year first written above and is executed in at least three original copies, of which one is to be delivered to the Contractor, one to the Architect for use in the administration of the Contract, and the remainder to the Owner.

OWNER *(Signature)*

CONTRACTOR *(Signature)*

(Printed name and title)

(Printed name and title)

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OWNER-CONTRACTOR
AGREEMENT

The American Institute
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1735 New York Avenue, N.W.
Washington, D.C. 20006-5292

SECTION 00700

GENERAL CONDITIONS

FORM OF GENERAL CONDITIONS

1.01 AIA DOCUMENT A201, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, 1987 EDITION, ATTACHED, IS THE GENERAL CONDITIONS BETWEEN THE OWNER AND CONTRACTOR.

SUPPLEMENTARY CONDITIONS

2.01 REFER TO DOCUMENT 00800 FOR AMENDMENTS TO THESE GENERAL CONDITIONS.

END OF DOCUMENT 00700

AIA DOCUMENT A201-1997*General Conditions of the Contract for Construction*

TABLE OF ARTICLES

1. GENERAL PROVISIONS
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13. MISCELLANEOUS PROVISIONS
14. TERMINATION OR SUSPENSION OF THE CONTRACT

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

This document has been approved and endorsed by The Associated General Contractors of America.



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 OF THE CONTRACT FOR
 CONSTRUCTION

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ARTICLE 1 GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents consist of the Agreement between Owner and Contractor (hereinafter the Agreement), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, 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 other documents such as bidding requirements (advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or portions of Addenda relating to bidding requirements).

1.1.2 THE CONTRACT

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

The Project Manual is a volume assembled for the Work which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications.

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



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complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

1.2.2 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 which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

1.3 CAPITALIZATION

1.3.1 Terms capitalized in these General Conditions include those which are (1) specifically defined, (2) the titles of numbered articles and identified references to Paragraphs, Subparagraphs and Clauses in the document or (3) the titles of other documents published by the American Institute of Architects.

1.4 INTERPRETATION

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

1.5 EXECUTION OF CONTRACT DOCUMENTS

1.5.1 The Contract Documents shall be signed by the Owner and Contractor. If either the Owner or Contractor or both do not sign all the Contract Documents, the Architect shall identify such unsigned Documents upon request.

1.5.2 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.

1.6 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

1.6.1 The Drawings, Specifications and other documents, including those in electronic form, prepared by the Architect and the Architect's consultants are Instruments of Service through which the Work to be executed by the Contractor is described. The Contractor may retain one record set. Neither the Contractor nor any Subcontractor, Sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect or the Architect's consultants, and unless otherwise indicated the Architect and the Architect's consultants shall be deemed the authors of them and will retain all common law, statutory and other reserved rights, in addition to the copyrights. All copies of Instruments of Service, except the Contractor's record set, shall be returned or suitably accounted for to the Architect, on request, upon completion of the Work. The Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants. The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants appropriate to and for use in



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the execution of their Work under the Contract Documents. All copies made under this authorization shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants. 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' copyrights or other reserved rights.

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 Subparagraph 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 The Owner shall, at the written request of the Contractor, prior to commencement of the Work and thereafter, furnish to the Contractor reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. Furnishing of such evidence shall be a condition precedent to commencement or continuation of the Work. After such evidence has been furnished, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

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

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 Information or services required of the Owner by the Contract Documents shall be furnished by the Owner with reasonable promptness. Any other information or services relevant to the Contractor's performance of the Work under the Owner's control shall be furnished by the Owner after receipt from the Contractor of a written request for such information or services.

2.2.5 Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, such copies of Drawings and Project Manuals as are reasonably necessary for execution of the Work.

2.3 OWNER'S RIGHT TO STOP THE WORK

2.3.1 If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Paragraph 12.2 or persistently fails to carry out Work in



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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 Subparagraph 6.1.3.

2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

2.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-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 after such seven-day period give the Contractor a second written notice to correct such deficiencies within a three-day period. If the Contractor within such three-day period after receipt of such second notice fails to commence and continue to correct any deficiencies, 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 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 other than the Contractor.

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.1 Since the Contract Documents are complementary, before starting each portion of the Work, the Contractor shall carefully study and compare the various Drawings and other Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Subparagraph 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 construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, any errors, inconsistencies or omissions discovered by the Contractor shall be reported promptly to the Architect as a request for information in such form as the Architect may require.

3.2.2 Any design errors or omissions noted by the Contractor during this review shall be reported promptly to the Architect, but 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. The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations, but any nonconformity discovered by or made known to the Contractor shall be reported promptly to the Architect.



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3.2.3 If the Contractor believes that additional cost or time is involved because of clarifications or instructions issued by the Architect in response to the Contractor's notices or requests for information pursuant to Subparagraphs 3.2.1 and 3.2.2, the Contractor shall make Claims as provided in Subparagraphs 4.3.6 and 4.3.7. If the Contractor fails to perform the obligations of Subparagraphs 3.2.1 and 3.2.2, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. The Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents or for differences between field measurements or conditions and the Contract Documents unless the Contractor recognized such error, inconsistency, omission or difference and knowingly failed to report it to the Architect.

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 resulting loss or damage.

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 The Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order.

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

3.5 WARRANTY

3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract



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Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear 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

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

3.7 PERMITS, FEES AND NOTICES

3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit and other permits and governmental fees, licenses and inspections necessary for proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required when bids are received or negotiations concluded.

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

3.7.3 It is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations. However, if the Contractor observes that portions of the Contract Documents are at variance therewith, the Contractor shall promptly notify the Architect and Owner in writing, and necessary changes shall be accomplished by appropriate Modification.

3.7.4 If the Contractor performs Work knowing it to be contrary to laws, statutes, ordinances, building codes, and rules and regulations without such notice to the Architect and Owner, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

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;
- 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 Clause 3.8.2.1 and (2) changes in Contractor's costs under Clause 3.8.2.2.

3.8.3 Materials and equipment under an allowance shall be selected by the Owner in sufficient time to avoid delay in the Work.



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3.9 SUPERINTENDENT

3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

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 and keep current, for the Architect's approval, a schedule of submittals which is coordinated with the Contractor's construction schedule and allows the Architect reasonable time to review 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

3.11.1 The Contractor shall maintain at the site for the Owner one record copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record field changes and selections made during construction, and one record 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.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

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

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

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

3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required by the Contract Documents the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review by the Architect is subject to the limitations of Subparagraph 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals which 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



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the Contract Documents 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. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Architect without action.

3.12.6 By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

3.12.7 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 which 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 to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed 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 Subparagraph 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 or design criteria required by the Contract Documents.



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3.13 USE OF SITE

3.13.1 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

3.14 CUTTING AND PATCHING

3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner 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 from and about the Project waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials.

3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor.

3.16 ACCESS TO WORK

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

3.17 ROYALTIES, PATENTS AND COPYRIGHTS

3.17.1 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 and to the extent claims, damages, losses or expenses are not covered by Project Management Protective Liability insurance purchased by the Contractor in accordance with Paragraph 11.3, 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



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construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Paragraph 3.18.

3.18.2 In claims against any person or entity indemnified under this Paragraph 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Subparagraph 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 ADMINISTRATION OF THE CONTRACT

4.1 ARCHITECT

4.1.1 The Architect is the person lawfully licensed to practice architecture or an entity lawfully practicing architecture identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Architect" means the Architect or the Architect's authorized representative.

4.1.2 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 new Architect against whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the former Architect.

4.2 ARCHITECT'S 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 (1) during construction, (2) until final payment is due and (3) with the Owner's concurrence, from time to time during the one-year period for correction of Work described in Paragraph 12.2. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with other provisions of the Contract.

4.2.2 The Architect, as a representative of the Owner, will visit the site at intervals appropriate to the stage of the Contractor's operations (1) to become generally familiar with and to keep the Owner informed about the progress and quality of the portion of the Work completed, (2) to endeavor to guard the Owner against defects and deficiencies in the Work, and (3) to determine in general if the Work 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 neither have control over or charge of, nor be responsible 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 Subparagraph 3.3.1.

4.2.3 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.



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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 will have 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 Work in accordance with Subparagraphs 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 with such reasonable promptness as to cause no delay in the Work or in the activities of the Owner, Contractor or separate contractors, while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Paragraphs 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Paragraph 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, will 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, and will issue a final Certificate for Payment upon compliance with the requirements of the Contract Documents.

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.



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The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If no agreement is made concerning the time within which interpretations required of the Architect shall be furnished in compliance with this Paragraph 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretations until 15 days after written request is made for them.

4.2.12 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 initial decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor; will not show partiality to either and will not be liable for results of interpretations or decisions so rendered in good faith.

4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

4.3 CLAIMS AND DISPUTES

4.3.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims must be initiated by written notice. The responsibility to substantiate Claims shall rest with the party making the Claim.

4.3.2 Time Limits on Claims. 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. Claims must be initiated by written notice to the Architect and the other party.

4.3.3 Continuing Contract Performance. Pending final resolution of a Claim except as otherwise agreed in writing or as provided in Subparagraph 9.7.1 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.

4.3.4 Claims for Concealed or Unknown Conditions. If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then notice by the observing party shall be given to the other party promptly before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall so notify the Owner and Contractor in writing, stating the reasons. Claims by either party in opposition to such determination must be made within 21 days after the Architect has given notice of the decision. If the conditions encountered are materially different, the Contract Sum and Contract Time shall be equitably adjusted, but if the Owner and Contractor cannot agree on an adjustment in the Contract Sum or Contract Time, the adjustment shall be referred to the Architect for initial determination, subject to further proceedings pursuant to Paragraph 4.4.



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4.3.5 Claims for Additional Cost. If the Contractor wishes to make Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Paragraph 10.6.

4.3.6 If the Contractor believes additional cost is involved for reasons including but not limited to (1) a written interpretation from the Architect, (2) an order by the Owner to stop the Work where the Contractor was not at fault, (3) a written order for a minor change in the Work issued by the Architect, (4) failure of payment by the Owner, (5) termination of the Contract by the Owner, (6) Owner's suspension or (7) other reasonable grounds, Claim shall be filed in accordance with this Paragraph 4.3.

4.3.7 CLAIMS FOR ADDITIONAL TIME

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

4.3.7.2 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.

4.3.8 Injury or Damage to Person or Property. If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, 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.

4.3.9 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.

4.3.10 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 Subparagraph 4.3.10 shall be deemed to preclude an award of liquidated direct damages, when applicable, in accordance with the requirements of the Contract Documents.

4.4 RESOLUTION OF CLAIMS AND DISPUTES

4.4.1 Decision of Architect. Claims, including those alleging an error or omission by the Architect but excluding those arising under Paragraphs 10.3 through 10.5, shall be referred initially to the Architect for decision. An initial decision by the Architect shall be required as a



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condition precedent to mediation, arbitration or litigation of all Claims between the Contractor and Owner arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Architect with no decision having been rendered by the Architect. The Architect will not decide disputes between the Contractor and persons or entities other than the Owner.

4.4.2 The Architect will review Claims and within ten days of the receipt of the 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 Architect is unable to resolve the Claim if the Architect lacks sufficient information to evaluate the merits of the Claim or if the Architect concludes that, in the Architect's sole discretion, it would be inappropriate for the Architect to resolve the Claim.

4.4.3 In evaluating Claims, the Architect 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 Architect in rendering a decision. The Architect may request the Owner to authorize retention of such persons at the Owner's expense.

4.4.4 If the Architect 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 provide a response on the requested supporting data, advise the Architect when the response or supporting data will be furnished or advise the Architect that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Architect will either reject or approve the Claim in whole or in part.

4.4.5 The Architect will approve or reject Claims by written decision, which shall state the reasons therefor and which shall notify the parties of any change in the Contract Sum or Contract Time or both. The approval or rejection of a Claim by the Architect shall be final and binding on the parties but subject to mediation and arbitration.

4.4.6 When a written decision of the Architect states that (1) the decision is final but subject to mediation and arbitration and (2) a demand for arbitration of a Claim covered by such decision must be made within 30 days after the date on which the party making the demand receives the final written decision, then failure to demand arbitration within said 30 days' period shall result in the Architect's decision becoming final and binding upon the Owner and Contractor. If the Architect renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence, but shall not supersede arbitration proceedings unless the decision is acceptable to all parties concerned.

4.4.7 Upon receipt of a Claim against the Contractor or at any time thereafter, the Architect or 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 Architect or the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

4.4.8 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 prior to resolution of the Claim by the Architect, by mediation or by arbitration.

4.5 MEDIATION

4.5.1 Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Subparagraphs 4.3.10, 9.10.4 and 9.10.5 shall, after initial decision by the Architect or 30 days after submission of the Claim to the Architect, be



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subject to mediation as a condition precedent to arbitration or the institution of legal or equitable proceedings by either party.

4.5.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect. Request for mediation shall be filed in writing with the other party to the Contract and with the American Arbitration Association. The request may be made concurrently with the filing of a demand for arbitration but, in such event, mediation shall proceed in advance of arbitration or legal or equitable 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.

4.5.3 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.

4.6 ARBITRATION

4.6.1 Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Subparagraphs 4.3.10, 9.10.4 and 9.10.5, shall, after decision by the Architect or 30 days after submission of the Claim to the Architect, be subject to arbitration. Prior to arbitration, the parties shall endeavor to resolve disputes by mediation in accordance with the provisions of Paragraph 4.5.

4.6.2 Claims not resolved by mediation shall be decided by arbitration which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association currently in effect. The demand for arbitration shall be filed in writing with the other party to the Contract and with the American Arbitration Association, and a copy shall be filed with the Architect.

4.6.3 A demand for arbitration shall be made within the time limits specified in Subparagraphs 4.4.6 and 4.6.1 as applicable, and in other cases within a reasonable time after the Claim has arisen, and in no event shall it be made after the date when institution of legal or equitable proceedings based on such Claim would be barred by the applicable statute of limitations as determined pursuant to Paragraph 13.7.

4.6.4 Limitation on Consolidation or Joinder. No arbitration arising out of or relating to the Contract shall include, by consolidation or joinder or in any other manner, the Architect, the Architect's employees or consultants, except by written consent containing specific reference to the Agreement and signed by the Architect, Owner, Contractor and any other person or entity sought to be joined. No arbitration shall include, by consolidation or joinder or in any other manner, parties other than the Owner, Contractor, a separate contractor as described in Article 6 and other persons substantially involved in a common question of fact or law whose presence is required if complete relief is to be accorded in arbitration. No person or entity other than the Owner, Contractor or a separate contractor as described in Article 6 shall be included as an original third party or additional third party to an arbitration whose interest or responsibility is insubstantial. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of a Claim not described therein or with a person or entity not named or described therein. The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.



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4.6.5 Claims and Timely Assertion of Claims. 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.

4.6.6 Judgment on Final Award. 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.

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.

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 will promptly reply to the Contractor in writing stating whether or not the Owner or the Architect, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the Owner or Architect to reply promptly shall constitute notice of no reasonable objection.

5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner 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 change a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitute.

5.3 SUBCONTRACTUAL RELATIONS

5.3.1 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



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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 which 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 Paragraph 14.2 and only for those subcontract agreements which 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.

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.

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 Paragraph 4.3.

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 when directed to do so. 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 which apply to the



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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 Owner shall be reimbursed by the Contractor for costs incurred by the Owner which are payable to a separate contractor because of delays, improperly timed activities or defective construction of the Contractor. The Owner shall be responsible to the Contractor for costs incurred by the Contractor because of delays, improperly timed activities, damage to the Work or defective construction of a separate contractor.

6.2.4 The Contractor shall promptly remedy damage wrongfully caused by the Contractor to completed or partially completed construction or to property of the Owner or separate contractors as provided in Subparagraph 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 Subparagraph 3.14.

6.3 OWNER'S RIGHT TO CLEAN UP

6.3.1 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.



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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 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.

7.2.2 Methods used in determining adjustments to the Contract Sum may include those listed in Subparagraph 7.3.3.

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 Subparagraph 7.3.6.

7.3.4 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.

7.3.5 A Construction Change Directive signed by the Contractor indicates the agreement of the Contractor therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

7.3.6 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the method and the adjustment shall be determined by the Architect on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, a reasonable allowance for overhead and profit. In such case, and also under Clause 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Subparagraph 7.3.6 shall be limited to the following:

- .1 costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
- .2 costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
- .3 rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;



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- .4 costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
- .5 additional costs of supervision and field office personnel directly attributable to the change.

7.3.7. The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the 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.

7.3.8 Pending final determination of the total cost of a Construction Change Directive to the Owner, amounts not in dispute for such changes in the Work shall be included in Applications for Payment accompanied by a Change Order indicating the parties' agreement with part or all of such costs. For any portion of such cost that remains in dispute, the Architect will make an interim determination for purposes of monthly certification for payment for those costs. That 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 4.

7.3.9 When the Owner and Contractor agree with the 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 shall be recorded by preparation and execution of an appropriate Change Order.

7.4 MINOR CHANGES IN THE WORK

7.4.1 The Architect will have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly.

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 Paragraph 9.8.

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

8.2 PROGRESS AND COMPLETION

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

8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance. Unless the date of commencement is established by the Contract Documents or a notice to proceed given



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by the Owner, the Contractor shall notify the Owner in writing not less than five days or other agreed period before commencing the Work to permit the timely filing of mortgages, mechanic's liens and other security interests.

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

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 which 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 Paragraph 4.3.

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

ARTICLE 9 PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

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

9.2 SCHEDULE OF VALUES

9.2.1 Before the first Application for Payment, the Contractor shall submit to the Architect a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the 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 for operations completed in accordance with the schedule of values. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and reflecting retainage if provided for in the Contract Documents.

9.3.1.1 As provided in Subparagraph 7.3.8, such applications may include requests for payment on account of changes in the Work which 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 Such applications may not include requests for payment for portions of the Work for which the Contractor does not intend to pay to a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.



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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 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 Subparagraph 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 the Work has progressed to the point indicated and that, to the best of the Architect's knowledge, information and belief, 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 Subparagraph 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 Subparagraph 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



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opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Subparagraph 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 another contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 persistent failure to carry out the Work in accordance with the Contract Documents.

9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

9.6 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.

9.6.2 The Contractor shall promptly pay each Subcontractor, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of such Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in 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 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 Payment to material suppliers shall be treated in a manner similar to that provided in Subparagraphs 9.6.2, 9.6.3 and 9.6.4.

9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

9.6.7 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.



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9.7 FAILURE OF PAYMENT

9.7.1 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 arbitration, 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.

9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

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 Clause 11.4.1.5 and authorized by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and



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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 Subparagraph 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

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 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 Subparagraph 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.

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



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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

10.1.1 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 give notices and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable 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 Clauses 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 Clauses 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 Paragraph 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 load or permit any part of the construction or site to be loaded so as to endanger its safety.

10.3 HAZARDOUS MATERIALS

10.3.1 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 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 verify that it has been 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. 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, which adjustments shall be accomplished as provided in Article 7.

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 Subparagraph 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) and provided that such damage, loss or expense is not due to the sole negligence of a party seeking indemnity.

10.4 The Owner shall not be responsible under Paragraph 10.3 for materials and substances brought to the site by the Contractor unless such materials or substances were required by the Contract Documents.

10.5 If, without negligence on the part of the Contractor, the Contractor is held liable 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.

10.6 EMERGENCIES

10.6.1 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



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extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Paragraph 4.3 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

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

- .1 claims under workers' compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;
- .2 claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- .3 claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 claims for damages insured by usual personal injury liability coverage;
- .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 Paragraph 3.18.

11.1.2 The insurance required by Subparagraph 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the Work until date of final payment and termination of any coverage required to be maintained after final payment.

11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These certificates and the insurance policies required by this Paragraph 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. If any of the foregoing insurance coverages are required to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the final Application for Payment as required by Subparagraph 9.10.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor's information and belief.

11.2 OWNER'S LIABILITY INSURANCE

11.2.1 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

11.3 PROJECT MANAGEMENT PROTECTIVE LIABILITY INSURANCE

11.3.1 Optionally, the Owner may require the Contractor to purchase and maintain Project Management Protective Liability insurance from the Contractor's usual sources as primary coverage for the Owner's, Contractor's and Architect's vicarious liability for construction operations under the Contract. Unless otherwise required by the Contract Documents, the Owner



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shall reimburse the Contractor by increasing the Contract Sum to pay the cost of purchasing and maintaining such optional insurance coverage, and the Contractor shall not be responsible for purchasing any other liability insurance on behalf of the Owner. The minimum limits of liability purchased with such coverage shall be equal to the aggregate of the limits required for Contractor's Liability Insurance under Clauses 11.1.1.2 through 11.1.1.5.

11.3.2 To the extent damages are covered by Project Management Protective Liability insurance, the Owner, Contractor and Architect waive all rights against each other for damages, except such rights as they may have to the proceeds of such insurance. The policy shall provide for such waivers of subrogation by endorsement or otherwise.

11.3.3 The Owner shall not require the Contractor to include the Owner, Architect or other persons or entities as additional insureds on the Contractor's Liability Insurance coverage under Paragraph 11.1.

11.4 PROPERTY INSURANCE

11.4.1 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 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 Paragraph 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Paragraph 11.4 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

11.4.1.1 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.

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

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

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

11.4.1.5 Partial occupancy or use in accordance with Paragraph 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial



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occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

11.4.2 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.

11.4.3 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.

11.4.4 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.

11.4.5 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 Subparagraph 11.4.7 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.

11.4.6 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 Paragraph 11.4. 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.

11.4.7 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 Paragraph 11.4 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.



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11.4.8 A loss insured under 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 Subparagraph 11.4.10. 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.

11.4.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or in accordance with an arbitration award in which case the procedure shall be as provided in Paragraph 4.6. 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.

11.4.10 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 as provided in Paragraphs 4.5 and 4.6. The Owner as fiduciary shall, in the case of arbitration, make settlement with insurers in accordance with directions of the arbitrators. If distribution of insurance proceeds by arbitration is required, the arbitrators will direct such distribution.

11.5 PERFORMANCE BOND AND PAYMENT BOND

11.5.1 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.

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

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 required in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

12.1.2 If a portion of the Work has been covered which 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, 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.



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12.2 CORRECTION OF WORK

12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

12.2.1.1 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 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 Paragraph 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 Subparagraph 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner 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 Paragraph 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 performance 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 Paragraph 12.2.

12.2.3 The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

12.2.4 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 which is not in accordance with the requirements of the Contract Documents.

12.2.5 Nothing contained in this Paragraph 12.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the one-year period for correction of Work as described in Subparagraph 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.



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12.3 ACCEPTANCE OF NONCONFORMING WORK

12.3.1 If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

13.1.1 The Contract shall be governed by the law of the place where the Project is located.

13.2 SUCCESSORS AND ASSIGNS

13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Subparagraph 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 an institutional lender providing construction financing for the Project. In such event, the lender shall assume 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

13.3.1 Written notice shall be deemed to have been duly served if delivered in person to the individual or 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 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 thereunder, except as may be specifically agreed in writing.

13.5 TESTS AND INSPECTIONS

13.5.1 Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the 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 tests, inspections or approvals which do not become requirements until after bids are received or negotiations concluded.

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 Subparagraph 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 Subparagraph 13.5.3, shall be at the Owner's expense.



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13.5.3 If such procedures for testing, inspection or approval under Subparagraphs 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, 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.

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

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

13.7 COMMENCEMENT OF STATUTORY LIMITATION PERIOD

13.7.1 As between the Owner and Contractor:

- 1 Before Substantial Completion.** As to acts or failures to act occurring prior to the relevant date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than such date of Substantial Completion;
- 2 Between Substantial Completion and Final Certificate for Payment.** As to acts or failures to act occurring subsequent to the relevant date of Substantial Completion and prior to issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of the final Certificate for Payment; and
- 3 After Final Certificate for Payment.** As to acts or failures to act occurring after the relevant date of issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of any act or failure to act by the Contractor pursuant to any Warranty provided under Paragraph 3.5, the date of any correction of the Work or failure to correct the Work by the Contractor under Paragraph 12.2, or the date of actual commission of any other act or failure to perform any duty or obligation by the Contractor or Owner, whichever occurs last.



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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 which requires all Work to be stopped;
- 2** an act of government, such as a declaration of national emergency which 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 Subparagraph 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 Subparagraph 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 Paragraph 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

14.1.3 If one of the reasons described in Subparagraph 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 and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead, profit 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 persistently failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Subparagraph 14.1.3.

14.2 TERMINATION BY THE OWNER FOR CAUSE

14.2.1 The Owner may terminate the Contract if the Contractor:

- 1 persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- 2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- 3 persistently disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction; or
- 4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

14.2.2 When any of the above reasons exist, the Owner, upon certification by the Architect that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- 1 take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- 2 accept assignment of subcontracts pursuant to Paragraph 5.4; and
- 3 finish the Work by whatever reasonable method the Owner may deem expedient. Upon 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 Subparagraph 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.



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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 Architect, 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 Subparagraph 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.



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SECTION 00800
SUPPLEMENTARY CONDITIONS

INTENT

- 1.01 THESE SUPPLEMENTARY CONDITIONS AMEND AND SUPPLEMENT THE GENERAL CONDITIONS DEFINED IN DOCUMENT 00700 AND OTHER PROVISIONS OF THE CONTRACT DOCUMENTS AS INDICATED BELOW. ALL PROVISIONS WHICH ARE NOT SO AMENDED OR SUPPLEMENTED REMAIN IN FULL FORCE AND EFFECT.
- 1.02 THE TERMS USED IN THESE SUPPLEMENTARY CONDITIONS WHICH ARE DEFINED IN THE GENERAL CONDITIONS HAVE THE MEANINGS ASSIGNED TO THEM IN THE GENERAL CONDITIONS.

MODIFICATIONS TO AIA A201

2.01 ARTICLE 3.6 - TAXES

A. Add the following subparagraph:

1. 3.6.2: The Owner will obtain rebate on taxes and duties paid by the Contractor on certain Products or items. Provide administrative assistance and cooperation to the Owner in this regard.

ADDITIONAL ARTICLE _____ - DEFINITIONS

- 3.01 PRODUCTS: MEANS NEW MATERIAL, MACHINERY, COMPONENTS, EQUIPMENT, FIXTURES, AND SYSTEMS FORMING THE WORK, BUT DOES NOT INCLUDE MACHINERY AND EQUIPMENT USED FOR PREPARATION, FABRICATION, CONVEYING AND ERECTION OF THE WORK. PRODUCTS MAY ALSO INCLUDE EXISTING MATERIALS OR COMPONENTS REQUIRED FOR REUSE.
- 3.02 FURNISH OR SUPPLY: TO SUPPLY AND DELIVER, UNLOAD, INSPECT FOR DAMAGE.
- 3.03 INSTALL: TO UNPACK, ASSEMBLE, ERECT, APPLY, PLACE, FINISH, CURE, PROTECT, CLEAN, AND READY FOR USE.
- 3.04 PROVIDE: TO FURNISH OR SUPPLY, PLUS INSTALL.
- 3.05 PROJECT MANUAL: THE PROJECT MANUAL IS THE VOLUME USUALLY ASSEMBLED FOR THE WORK WHICH INCLUDES THE BID DOCUMENTS, CONTRACT DOCUMENTS, AND SPECIFICATIONS.

END OF DOCUMENT 00800

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SECTION 01100

SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Water Quality Laboratory Building.
- B. Owner's Name: Northern Kentucky Water Service District.
- C. Architect's Name: Humpert Wolnitzek Architects
- D. The Project consists of the construction of a two story laboratory building and site improvements.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00500 - Agreement.

1.03 WORK BY OWNER

- A. Items noted NIC (Not in Contract) will be supplied and installed by Northern Kentucky Water Service District after Substantial Completion. Some items include:
 - 1. Movable cabinets.
 - 2. Furnishings.
 - 3. Small equipment.
 - 4. Window blinds.

1.04 OWNER OCCUPANCY

- A. The Northern Kentucky Water Service District intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Northern Kentucky Water Service District to minimize conflict and to facilitate Northern Kentucky Water Service District's operations.
- C. Schedule the Work to accommodate Northern Kentucky Water Service District occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: as to be determined during preconstruction meeting.
- B. Arrange use of site and premises to allow:
 - 1. Northern Kentucky Water Service District occupancy.
 - 2. Work by Others.
- C. Restoration of Site:
 - 1. Restore all areas of the Site disturbed by the Work of the Project to the condition existing prior to commencement of the Work or replace with new construction.

1.06 WORK SEQUENCE

- A. Coordinate construction schedule and operations with Northern Kentucky Water Service District.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01200

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Change procedures.

1.02 RELATED SECTIONS

- A. Document 00500 - Agreement: Contract Sum, retainages, payment period, monetary values of unit prices.
- B. Document 00700 - General Conditions: Additional requirements for progress payments, final payment, changes in the Work.
- C. Document 00800 - Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.
- D. Section 01210 - Allowances: Payment procedures relating to allowances.

1.03 SCHEDULE OF VALUES

- A. 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.
- B. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- C. 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.
- D. Include in each line item, the amount of Allowances specified in this Division.
- E. Include within each line item, a direct proportional amount of Contractor's overhead and profit.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Present required information on electronic media printout.
- C. Form: Contractor's electronic media driven form including continuation sheets when required.
- D. 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 under this Application.
 - 6. Total Completed to Date of Application.
 - 7. Percentage of Completion.
 - 8. Balance to Finish.

9. Retainage.
- E. Execute certification by signature of authorized officer.
- F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed.
- G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.
- H. Submit three copies of each Application for Payment.
- I. Include the following with the application:
 1. Transmittal letter as specified for Submittals in Section 01300.
 2. Construction progress schedule, revised and current as specified in Section 01300.
 3. Partial release of liens from major Subcontractors and vendors.

1.05 MODIFICATION PROCEDURES

- A. The Architect/Engineer 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 Architect's Supplemental Instructions form.
- B. Construction Change Directive: Architect/Engineer may issue a document, signed by the Owner, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. The document will describe changes in the Work, and will designate method of determining any change in Contract Sum or Contract Time.
 2. Promptly execute the change in Work.
- C. Proposal Request: The Architect/Engineer may issue a document which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 10 days.
- D. Execution of Change Orders: Architect/Engineer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract on AIA G701.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01210

ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cash allowances.
- B. Contingency allowance.

1.02 RELATED SECTIONS

- A. Section 01200 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CASH ALLOWANCES

- A. Costs Included in Cash Allowances: Cost of Product to Contractor or Subcontractor, less applicable trade discounts delivery to site.
- B. Costs Not Included in Cash Allowances: Product handling at the site, including unloading, uncrating, and storage; protection of Products from elements and from damage; and labor for installation and finishing. Overhead, profit and other anticipated costs are not included in Cash Allowances; they are part of the Contract Sum.
- C. Architect/Engineer Responsibilities:
 - 1. Consult with Contractor for consideration and selection of Products, suppliers.
 - 2. Select Products in consultation with Owner and transmit decision to Contractor.
 - 3. Prepare Change Order.
- D. Contractor Responsibilities:
 - 1. Assist Architect/Engineer in selection of Products, suppliers.
 - 2. Obtain proposals from suppliers and offer recommendations.
 - 3. On notification of selection by Architect/Engineer execute purchase agreement with designated supplier.
 - 4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
 - 5. Promptly inspect Products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
- E. Differences in costs will be adjusted by Change Order.

1.04 CONTINGENCY ALLOWANCE

- A. Contractor's costs for Products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.
- B. Funds will be drawn from the Contingency Allowance only by Change Order.
- C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.05 ALLOWANCES SCHEDULE

- A. Section 08710 - DOOR HARDWARE: Include the stipulated sum of \$7,750 for purchase and delivery of hardware material.
- B. Section 09680 - CARPET: Include the stipulated sum of \$1,500 for purchase and delivery of carpet, (include other materials in Contract Sum).
- C. Contingency Allowance: Include the stipulated sum/price of \$5,000 for use upon Owner's instructions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01300

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preconstruction meeting.
- B. Site mobilization meeting.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Submittals for review, information, and project closeout.
- F. Number of copies of submittals.
- G. Submittal procedures.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

- A. Humpert Wolnitzek Architects will schedule a meeting after Notice of Award.
- B. Attendance Required:
 - 1. Northern Kentucky Water Service District.
 - 2. Humpert Wolnitzek Architects.
 - 3. General Contractor.
- C. Agenda:
 - 1. Execution of Northern Kentucky Water Service District - 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 in Contract, Owner, Contractor, and the Humpert Wolnitzek Architects.
 - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 7. Scheduling.
 - 8. Scheduling activities of a Geotechnical Engineer.
- D. Record minutes and distribute copies within two days after meeting to participants, with as requested copies to Humpert Wolnitzek Architects, Northern Kentucky Water Service District, participants, and those affected by decisions made.

3.02 SITE MOBILIZATION MEETING

- A. Humpert Wolnitzek Architects will schedule a meeting at the Project site prior to beginning of construction.
- B. Attendance Required:
 - 1. Northern Kentucky Water Service District.
 - 2. Humpert Wolnitzek Architects.
 - 3. General Contractor's Superintendent.
 - 4. Major Subcontractors.
- C. Agenda:
 - 1. Use of premises by Northern Kentucky Water Service District.
 - 2. Northern Kentucky Water Service District 's requirements.
 - 3. Construction facilities and controls provided by Northern Kentucky Water Service District.
 - 4. Temporary utilities provided by Northern Kentucky Water Service District.
 - 5. Survey and building layout.
 - 6. Security and housekeeping procedures.
 - 7. Schedules.
 - 8. Application for payment procedures.
 - 9. Procedures for testing.
 - 10. Procedures for maintaining record documents.
 - 11. Requirements for start-up of equipment.
 - 12. Inspection and acceptance of equipment put into service during construction period.
- D. Record minutes and distribute copies within two days after meeting to participants, with as requested copies to Humpert Wolnitzek Architects, Northern Kentucky Water Service District, participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum two week intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Northern Kentucky Water Service District, Humpert Wolnitzek Architects, 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 which 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 as requested copies to Humpert Wolnitzek Architects, Northern Kentucky Water Service District, participants, and those affected by decisions made.

3.04 CONSTRUCTION PROGRESS SCHEDULE

- A. Within 10 days after date established in Notice to Proceed, submit preliminary schedule.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 10 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

3.05 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 Humpert Wolnitzek Architects for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed only for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01780 - CLOSEOUT SUBMITTALS.

3.06 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 the Humpert Wolnitzek Architects 's knowledge as contract administrator or for the Northern Kentucky Water Service District. No action will be taken.

3.07 SUBMITTALS FOR PROJECT CLOSEOUT

- A. When the following are specified in individual sections, submit them at project closeout:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Other types as indicated.
- B. Submit for the Northern Kentucky Water Service District 's benefit during and after project completion.

3.08 NUMBER OF COPIES OF SUBMITTALS

- A. Documents for Review:
 - 1. Small size sheets, not larger than 8-1/2 x 11 inches: Submit the number of copies which the requires, plus two copies which will be retained by the Humpert Wolnitzek Architects.
 - 2. Larger sheets, not larger than 36 x 48 inches: Submit one reproducible transparency and one opaque reproduction.
- 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 Humpert Wolnitzek Architects.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to unless specifically so stated.

3.09 SUBMITTAL PROCEDURES

- A. Transmit each submittal with standard transmittal form.
- B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- C. Identify Project,, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- D. Apply '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.
- E. Deliver submittals to Humpert Wolnitzek Architects at business address.
- F. Schedule submittals to expedite the Project, and coordinate submission of related items.
- G. For each submittal for review, allow 15 days excluding delivery time to and from the.
- H. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- I. Provide space for and Humpert Wolnitzek Architects review stamps.
- J. When revised for resubmission, identify all changes made since previous submission.
- K. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- L. Submittals not requested will not be recognized or processed.

END OF SECTION

SECTION 01400

QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Control of installation.
- B. Testing and inspection services.
- C. Manufacturers' field services.

1.02 RELATED SECTIONS

- A. Section 01300 - Administrative Requirements: Submittal procedures.
- B. Section 01425 - Reference Standards.
- C. Section 01600 - Product Requirements: Requirements for material and product quality.

1.03 SUBMITTALS

- A. Design Data: Submit for the Humpert Wolnitzek Architects 's knowledge as contract administrator or for the Northern Kentucky Water Service District, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- B. Test Reports: After each test/inspection, promptly submit two copies of report to Humpert Wolnitzek Architects and to.
 - 1. Test reports are submitted for the Humpert Wolnitzek Architects 's knowledge as contract administrator or for the Northern Kentucky Water Service District, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and or installation/application subcontractor to Humpert Wolnitzek Architects, in quantities specified for Product Data.
 - 1. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Northern Kentucky Water Service District 's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.04 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

- C. Obtain copies of standards where required by product specification sections.
- D. Should specified reference standards conflict with Contract Documents, request clarification from the Humpert Wolnitzek Architects before proceeding.
- E. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Humpert Wolnitzek Architects shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.05 TESTING AND INSPECTION AGENCIES

- A. Northern Kentucky Water Service District will employ and pay for services of an independent testing agency to perform specified testing.
- B. Employment of agency in no way relieves of obligation to perform Work in accordance with requirements of Contract Documents.

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 Humpert Wolnitzek 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 TESTING AND INSPECTION

- A. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Humpert Wolnitzek Architects and 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 Humpert Wolnitzek Architects and of observed irregularities or non-conformance of Work or Products.
 - 5. Perform additional tests and inspections required by Humpert Wolnitzek Architects.
 - 6. Submit reports of all tests/inspections specified.

- B. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of.
 - 4. Agency has no authority to stop the Work.

- C. Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used which 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 Humpert Wolnitzek Architects and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 - 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by beyond specified requirements.
 - 6. Arrange with Northern Kentucky Water Service District 's agency and pay for additional samples, tests, and inspections required by beyond specified requirements.

- D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by the Humpert Wolnitzek Architects. Payment for re-testing will be charged to the by deducting testing charges from the Contract Sum/Price.

3.03 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 workmanship, start-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.

3.04 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not conforming to specified requirements.

- B. If, in the opinion of the Humpert Wolnitzek Architects, it is not practical to remove and replace the Work, the Humpert Wolnitzek Architects will direct an appropriate remedy or adjust payment.

END OF SECTION

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SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary telephone service.
- 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 SECTIONS

- A. Section 01510 - Temporary Utilities.

1.03 TEMPORARY UTILITIES - SEE SECTION 01510

1.04 TELEPHONE SERVICE

- A. Provide, maintain, and pay for telephone service to field office at time of project mobilization.
- B. Provide, maintain and pay for facsimile service to field office at time of project mobilization.

1.05 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Use of existing facilities is not permitted.
- C. Maintain work site daily in clean and sanitary condition.

1.06 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Provide protection for plants designated to remain. Replace damaged plants.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.07 FENCING

- A. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.08 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and Northern Kentucky Water Service District's operations from unauthorized entry, vandalism, or theft.

1.09 VEHICULAR ACCESS AND PARKING

- A. Coordinate access and haul routes with governing authorities and Northern Kentucky Water Service District.
- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide means of removing mud from vehicle wheels before entering streets.
- D. The Designated existing on-site roads may be used for construction traffic.
- E. Provide temporary parking areas to accommodate construction personnel. If site space is not adequate, the Owner shall designate additional off-site parking.
- F. Existing parking areas may not be used for construction parking.
- G. Do not allow vehicle parking on existing pavement or driveways.
- H. Designate one parking space for Northern Kentucky Water Service District and Humpert Wolnitzek Architects use.

1.10 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.~~ Dispose of waste off-site twice each month.
- C. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 PROJECT IDENTIFICATION

- A. Provide project identification sign of design and construction indicated on Drawings.
- B. Erect on site at location established by Humpert Wolnitzek Architects.
- C. No other signs are allowed without Northern Kentucky Water Service District permission except those required by law.

1.12 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 8 persons.
- C. Locate offices a minimum distance of 15 feet from existing and new structures.

1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Final Application for Payment inspection.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01510
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary Utilities: Electricity, lighting, heat, ventilation, and water.

1.02 RELATED SECTIONS

- A. Section 01500 - Temporary Facilities and Controls: Telephone service for administrative purposes.

1.03 TEMPORARY ELECTRICITY

- A. Connect to Northern Kentucky Water Service District 's existing power service.
 - 1. Do not disrupt Northern Kentucky Water Service District 's need for continuous service.
 - 2. Exercise measures to conserve energy.
 - 3. Provide separate metering and reimburse Northern Kentucky Water Service District for cost of energy used.
- B. Provide temporary electric feeder from existing building electrical service at location as directed.
- C. Complement existing power service capacity and characteristics as required.
- D. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. 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. Provide and maintain lighting for construction operations to achieve a minimum lighting level of 1 watt/sq ft .
- 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. Provide heating devices and heat as needed to maintain specified conditions for construction operations.
- B. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.06 TEMPORARY WATER SERVICE

- A. Cost of Water Used: By Northern Kentucky Water Service District.
- B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.
- C. Connect to existing water source.
 - 1. Exercise measures to conserve water.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01600
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 and procedures.
- E. Spare parts and maintenance materials.

1.02 RELATED SECTIONS

- A. Document 00200 - Instructions to Bidders: Product options and substitution procedures prior to bid date.

1.03 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.
- 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 PRODUCTS

- A. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- B. Motors: Refer to Section 15170, NEMA MG 1 Type. Specific motor type is specified in individual specification sections.
- C. 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.
- D. 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 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Provide spare parts, maintenance, and extra products 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 PROCEDURES

- A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- C. A request for substitution constitutes a representation that the 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 which may be required for the Work to be complete with no additional cost to Northern Kentucky Water Service District.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
- D. 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 Humpert Wolnitzek Architects will notify in writing of decision to accept or reject request.

3.02 TRANSPORTATION AND HANDLING

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

3.03 STORAGE AND PROTECTION

- A. Store and protect products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.
- C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- D. For exterior storage of fabricated products, place on sloped supports above ground.
- E. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- G. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01700
EXECUTION 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 Northern Kentucky Water Service District personnel.
- H. Closeout procedures, except payment procedures.

1.02 RELATED SECTIONS

- A. Section 01300 - Administrative Requirements: Submittals procedures.
- B. Section 01400 - Quality Requirements: Testing and inspection procedures.
- C. Section 01500 - Temporary Facilities and Controls: .
- D. Section 01780 - Closeout Submittals: Project record documents, operation and maintenance data, warranties.

1.03 QUALIFICATIONS

- A. For survey work employ a land surveyor registered in Fort Thomas, Kentucky and acceptable to Humpert Wolnitzek Architects. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.04 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.
- C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

- E. Erosion and Sediment Control: Plan and execute construction 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. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- F. Noise Control: Provide methods, means, and facilities to minimize noise from equipment and noise produced by construction operations.
- G. Pest Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- I. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

1.05 COORDINATION

- A. Coordinate work of alterations and renovations to expedite completion sequentially and to accommodate occupancy requirements.
- B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- C. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown 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, 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.
- G. After Northern Kentucky Water Service District occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Northern Kentucky Water Service District's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary,

referring to existing work as a standard.

- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01600.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Beginning new work means acceptance of existing conditions.
- B. Verify that demolition is complete in alterations areas and areas are ready for installation of new work.
- C. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- D. Examine and verify specific conditions described in individual specification sections.
- 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. Remove debris and abandoned items from area and from concealed spaces.
- B. Prepare surfaces and remove surface finishes to provide for proper installation of new work and finishes.
- C. Clean substrate surfaces prior to applying next material or substance.
- D. Seal cracks or openings of substrate prior to applying next material or substance.
- E. 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 Humpert Wolnitzek Architects four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of installation, 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 Humpert Wolnitzek Architects, Northern Kentucky Water Service District, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Humpert Wolnitzek Architects of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- E. Promptly report to Humpert Wolnitzek Architects the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Humpert Wolnitzek Architects.
- G. Utilize recognized engineering survey practices.
- H. 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.
- I. Periodically verify layouts by same means.
- J. 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.
- B. Make neat transitions. Patch work to match adjacent work in texture and appearance.

3.06 CUTTING AND PATCHING

- A. Execute cutting and patching including excavation and fill to complete the work, to uncover work 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.
- B. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing.
- C. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- E. Restore work with new Products in accordance with requirements of Contract Documents.
- F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

- G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07840, to full thickness of the penetrated element.
- H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

3.07 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 rubbish from site periodically and dispose off-site.

3.08 PROTECTION OF INSTALLED WORK

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

3.09 STARTING SYSTEMS

- 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 which 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 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.

3.10 DEMONSTRATION AND INSTRUCTION

- A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

3.11 ADJUSTING

- A. Adjust operating Products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See Section 15990 and 01400.

3.12 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
 - 1. Clean areas to be occupied by Northern Kentucky Water Service District prior to final completion before Northern Kentucky Water Service District occupancy.
- B. 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.
- C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- D. Replace filters of operating equipment.
- E. Clean debris from roofs, gutters, downspouts, and drainage systems.
- F. Clean site; sweep paved areas, rake clean landscaped surfaces.
- G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

3.13 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Humpert Wolnitzek Architects and Northern Kentucky Water Service District.
- B. Accompany Architect on preliminary inspection to determine items to be listed for completion or correction in's Notice of Substantial Completion.
- C. Notify Humpert Wolnitzek Architects when work is considered ready for Substantial Completion.
- D. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Humpert Wolnitzek Architects's review.
- E. Northern Kentucky Water Service District will occupy portions of the building as specified in Section 01100.
- F. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Northern Kentucky Water Service District-occupied areas.

- G. Notify Humpert Wolnitzek Architects when work is considered finally complete.
- H. Complete items of work determined by Humpert Wolnitzek Architects's final inspection.

END OF SECTION

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SECTION 01780
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 SECTIONS

- A. Section 01300 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Section 01700 - Execution 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 Humpert Wolnitzek Architects with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Humpert Wolnitzek 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 Northern Kentucky Water Service District, submit completed documents within ten days after acceptance.
 - 3. Submit 1 copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Humpert Wolnitzek 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 Northern Kentucky Water Service District 's permission, submit documents within ten days after acceptance.
 - 2. Make other submittals within ten 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 ten 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 Northern Kentucky Water Service District.
- 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. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 3. Field changes of dimension and detail.
 - 4. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. 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 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. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

- 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 charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- K. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- L. Include test and balancing reports.
- M. Additional Requirements: As specified in individual product specification sections.

3.04 OPERATION AND MAINTENANCE MANUALS

- A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- B. Prepare data in the form of an instructional manual.
- C. 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 Humpert Wolnitzek Architects,, 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.
 - 3. Part 3: Project documents and certificates, including the following:
 - a. Shop drawings and product data.
 - b. Air and water balance reports.
 - c. Certificates.

3.05 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work. Except for items put into use with Northern Kentucky Water Service District 's permission, leave date of beginning of time of warranty until the 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 x 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 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 02230

SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Removal of surface debris.
- B. Removal of trees, shrubs, and other plants indicated.
- C. Removal of sod.
- D. Removal of paving, curbs, and other site improvements.

1.02 RELATED SECTIONS

- A. Section 02310 - Grading: Topsoil removal.

1.03 PROJECT CONDITIONS

- A. Conform to applicable regulations relating to environmental requirements and disposal of debris.
- B. Coordinate clearing work with utility companies.
- C. Protect utilities to remain from damage.
- D. Protect trees, plants, and other features designated to remain as final landscaping.
- E. Protect bench marks, survey control points, and existing structures from damage or displacement.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PREPARATION

- A. Locate and identify utilities to remain.
 - 1. Take precautions to not interrupt continuous utility service to all buildings.
- B. Tag existing plants designated to remain.

3.02 CLEARING

- A. Clear areas required for access to site and execution of Work.
- B. Remove trees, shrubs, and stumps within marked areas.
- C. Remove existing sod without disturbing topsoil.

3.03 REMOVAL

- A. Remove portions of paving; as indicated. Neatly saw cut edges at right angle to surface.
- B. Remove debris from site.

END OF SECTION

SECTION 02310

GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Removal and storage of topsoil.
- B. Rough grading the site.
- C. Replacement of topsoil and finish grading.
- D. Restoration of all areas disturbed by construction.

1.02 RELATED SECTIONS

- A. Section 02230 - Site Clearing.
- B. Section 02315 - Excavation.
- C. Section 02316 - Fill and Backfill: Filling and compaction.
- D. Section 02921 - Seeding: Finish ground cover.

1.03 PROJECT CONDITIONS

- A. Protect above- and below-grade utilities that remain.
- B. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.
- C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil: See Section 02316.
- B. Other Fill Materials: See Section 02316.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.

- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect utilities that remain, from damage.

3.03 ROUGH GRADING

- A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
- B. Do not remove topsoil when wet.
- C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
- D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.
- E. When excavating through roots, perform work by hand and cut roots with sharp axe.
- F. See Section 02316 for filling procedures.
- G. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.04 SOIL REMOVAL AND STOCKPILING

- A. Stockpile excavated topsoil on site.
- B. Stockpile subsoil to be re-used on site; remove remainder from site.
- C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

3.05 FINISH GRADING

- A. Before Finish Grading:
 - 1. Verify building and trench backfilling have been inspected.
 - 2. Verify subgrade has been contoured and compacted.
- B. Remove debris, roots, branches, stones, in excess of 1 inch in size. Remove soil contaminated with petroleum products.
- C. Where topsoil is to be placed, scarify surface to depth of 3 inches.
- D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 6 inches.
- E. Place topsoil in areas where seeding, sodding, and planting are indicated.
- F. Place topsoil where required to level finish grade.
- G. Place topsoil to nominal depth of 4 inches.
- H. Place topsoil during dry weather.
- I. Remove roots, weeds, rocks, and foreign material while spreading.
- J. Near plants and buildings spread topsoil manually to prevent damage.

- K. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- L. Lightly compact placed topsoil.

3.06 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.
- B. Top Surface of Finish Grade: Plus or minus 1/2 inch.

3.07 CLEANING AND PROTECTION

- A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.
- B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

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SECTION 02315

EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Excavating for building volume below grade, footings, slabs-on-grade, paving, site structures, and utilities within the building.
- B. Trenching for utilities outside the building to utility main connections.

1.02 RELATED SECTIONS

- A. Section 02310 - Grading: Soil removal from surface of site.
- B. Section 02316 - 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.
- B. Protect plants, lawns, rock outcroppings, and other features to remain.
- C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Locate, identify, and protect utilities that remain and protect from damage.

3.02 EXCAVATING

- A. Excavate to accommodate new structures and construction operations.
- B. Notify Humpert Wolnitzek Architects of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- C. Slope banks of excavations deeper than 3 feet to angle of repose or less until shored.
- D. Do not interfere with 30 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. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 02316.
- H. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- I. Remove excavated material that is unsuitable for re-use from site.
- J. Stockpile excavated material to be re-used in area designated on site in accordance with Section 02310.
- K. Remove excess excavated material from site.

3.03 FIELD QUALITY CONTROL

- A. See Section 01400 - 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 02316
FILL AND BACKFILL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Filling, backfilling, and compacting for building volume below grade, footings, slabs-on-grade, paving, site structures, and utilities within the building.
- B. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 RELATED SECTIONS

- A. Section 02310 - Grading: Site grading.
- B. Section 02315 - Excavation: Removal and handling of soil to be re-used.

1.03 REFERENCES

- A. ASTM D 698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 1991.
- B. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 1990 (Reapproved 1996).
- C. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 1994.
- D. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 1991.
- E. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 1988 (Reapproved 1993).

1.04 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Subgrade Elevations: 4 inches below finish grade elevations indicated on drawings, unless otherwise indicated.

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Compaction Density Test Reports.

1.06 PROJECT CONDITIONS

- A. Provide sufficient quantities of fill to meet project schedule and requirements. When necessary, store materials on site in advance of need.

- B. Verify that survey bench marks and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. General Fill: Subsoil excavated on-site.
 - 1. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
- B. Granular Fill: Pit run washed stone; free of shale, clay, friable material and debris.
 - 1. Evenly graded mixture of gravel, with 95 to 100 percent passing a 1-1/2" sieve and not more than 5 percent passing a No. 4 sieve. No. 467 washed river gravel complies.
- C. Sand: Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.
- D. Topsoil: See Section 02310.

2.02 ACCESSORIES

- A. Geotextile Fabric: Non-biodegradable, non-woven.
- B. Vapor Retarder: 10 mil thick, polyethylene.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 02310 for additional requirements.

3.02 PREPARATION

- A. Scarify subgrade surface to a depth of 4 inch 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. Employ a placement method that does not disturb or damage other work.
- C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- D. Maintain optimum moisture content of fill materials to attain required compaction density.

- E. Granular Fill: Place and compact materials in equal continuous layers not exceeding 4 inches compacted depth.
- F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.
- G. Slope grade away from building minimum 12 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- H. Correct areas that are over-excavated.
 - 1. Load-bearing foundation surfaces: Fill with concrete.
 - 2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.
- I. Compaction Density Unless Otherwise Specified or Indicated:
 - 1. Under paving, slabs-on-grade, footings, and similar construction: 97 percent of maximum dry density.
 - 2. At other locations: 90 percent of maximum dry density.
- J. Reshape and re-compact fills subjected to vehicular traffic.

3.04 FILL AT SPECIFIC LOCATIONS

- A. Use general fill unless otherwise specified or indicated.
- B. Under Interior Slabs-On-Grade:
 - 1. Use granular fill.
 - 2. Depth: varies 4 to 7 inches deep.
 - 3. Compact to 95 percent of maximum dry density.
- C. At Foundation Walls, Footings, and Elevator Pit (interior conditions):
 - 1. Use concrete fill.
 - 2. Fill up to subgrade elevation.
 - 3. Do not backfill against unsupported foundation walls.
- D. Over Subdrainage Piping at Foundation Perimeter:
 - 1. Cover pipe with geotextile fabric and use granular fill.
 - 2. Fill up to subgrade elevation.
 - 3. Compact to 95 percent of maximum dry density.
- E. Over Buried Utility Piping and Conduits in Trenches:
 - 1. Fill up to subgrade level under slabs and for 15' outside building walls with concrete fill.
 - 2. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.
- F. At Lawn Areas:
 - 1. Use general fill.
 - 2. Fill up to 4 inches below finish grade elevations.
 - 3. Compact to 90 percent of maximum dry density.
 - 4. See Section 02310 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 1/2 inch from required elevations.

3.06 FIELD QUALITY CONTROL

- A. See Section 01400 - Quality Requirements, for general requirements for field inspection and testing.
- B. Compaction density testing will be performed on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.
- C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor").
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- E. Frequency of Tests: As needed to assure specified results.

3.07 CLEAN-UP

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 02361

SOIL TREATMENT FOR TERMITE CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Chemical soil treatment.

1.02 REFERENCES

- A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; United States Code; 1947 (Revised 1988).

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.
- C. Warranty: Submit warranty and ensure that forms have been completed in Northern Kentucky Water Service District's name.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing this type of work and:
 1. Having minimum of 2 years documented experience.
 2. Approved by manufacturer of treatment materials.
 3. Licensed in Fort Thomas, Kentucky.

1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable code for requirements for application, application licensing, and authority to use toxicant chemicals, and comply with EPA regulations.
- B. Provide certificate of compliance from authority having jurisdiction indicating approval of toxicants.

1.06 SEQUENCING

- A. Apply toxicant immediately prior to installation of vapor barrier under slabs-on-grade.

1.07 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year installer's warranty against damage to building caused to termites.
 1. Include coverage for repairs to building and to contents damaged due to building damage. Repair damage and, if required, re-treat.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Toxicant Chemical: EPA approved; synthetically color dyed to permit visual identification of treated soil.
- B. Diluent: Recommended by toxicant manufacturer.

2.02 MIXES

- A. Mix toxicant to manufacturer's instructions.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.
- B. Verify final grading is complete.

3.02 APPLICATION

- A. Spray apply toxicant in accordance with manufacturer's instructions.
- B. Apply toxicant at following locations:
 - 1. Under Slabs-on-Grade.
 - 2. At Both Sides of Foundation Surface.
 - 3. Soil Within 5 feet of Building Perimeter For a Depth of 3 feet.
- C. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.
- D. Re-treat disturbed treated soil with same toxicant as original treatment.
- E. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

END OF SECTION

SECTION 02741

BITUMINOUS CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aggregate base course.
- B. Double course bituminous concrete paving.
- C. Surface sealer.

1.02 RELATED SECTIONS

- A. Section 02310 - Grading: Preparation of site for paving and base.
- B. Section 02316 - Fill and Backfill: Compacted subgrade for paving.
- C. Section 03300-Cast-in-place Concrete: Concrete curbs.

1.03 REFERENCES

- A. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types; The Asphalt Institute; 1994, Sixth Edition.
- B. AI MS-19 - A Basic Asphalt Emulsion Manual; The Asphalt Institute; Third Edition.
- C. ASTM D 946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction; 1982 (Reapproved 1993).

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Kentucky Highways standard.
- B. Mixing Plant: Conform to State of Kentucky Highways standard.
- C. Obtain materials from same source throughout.

1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable code for paving work on public property.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Asphalt Cement: ASTM D 946.
- ~~B.~~ Aggregate for Base Course: In accordance with State of Kentucky Highways standards.
- C. Aggregate for Binder Course: In accordance with State of Kentucky Highways standards.
- D. Aggregate for Wearing Course: In accordance with State of Kentucky Highways standards.
- E. Fine Aggregate: In accordance with State of Kentucky Highways standards.
- F. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.
- G. Primer: In accordance with State of Kentucky Highways standards.
- H. Tack Coat: Homogeneous, medium curing, liquid asphalt.
- I. Seal Coat: AI MS-19, sand type.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

- ~~A.~~ Base Course: State of Kentucky Highways standards.
- B. Binder Course: State of Kentucky Highways standards.
- C. Wearing Course: State of Kentucky Highways standards.
- D. Submit proposed mix design of each class of mix for review prior to beginning of work.

2.03 SOURCE QUALITY CONTROL

- A. Test mix design and samples in accordance with AI MS-2.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

~~3.02~~ **BASE COURSE**

- A. Place and compact base course.

~~3.03~~ **PREPARATION - PRIMER**

- A. Apply primer in accordance with manufacturer's instructions.
- B. Apply primer on aggregate base or subbase at uniform rate of 1/3 gal/sq yd.

- C. Use clean sand to blot excess primer.

~~3.04~~ **PREPARATION - TACK COAT**

- A. Apply tack coat in accordance with manufacturer's instructions.
- B. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 1/3 gal/sq yd.

3.05 PLACING ASPHALT PAVEMENT - DOUBLE COURSE

- ~~A.~~ Place asphalt binder course within 24 hours of applying primer or tack coat.
- B. Place binder course to 4 inch compacted thickness.
- C. Place wearing course within two hours of placing and compacting binder course.
- D. Place wearing course to 2 inch compacted thickness.
- E. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
- F. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

~~3.06~~ **SEAL COAT**

- A. Apply seal coat to surface course in accordance with AI MS-19.

3.07 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
- B. Compacted Thickness: Within 1/4 inch of specified or indicated thickness.
- C. Variation from True Elevation: Within 1/2 inch.

3.08 FIELD QUALITY CONTROL

- A. See Section 01400 - Quality Requirements, for general requirements for quality control.
- B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.

3.09 PROTECTION

- A. Immediately after placement, protect pavement from mechanical injury for 3 days or until surface temperature is less than 140 degrees F.

END OF SECTION

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SECTION 02751

PORTLAND CEMENT CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete sidewalks, integral curbs, and isolated curbs.

1.02 RELATED SECTIONS

- A. Section 02310 - Grading: Preparation of site for paving and base and preparation of subsoil at pavement perimeter for planting.
- B. Section 02316 - Fill and Backfill: Compacted subbase for paving.
- C. Section 03300 - Cast-In-Place Concrete.
- D. Section 07900 - Joint Sealers: Sealant for joints.

1.03 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 1996.
- B. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 1989.
- C. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 1988.
- D. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 1996a.
- E. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 1996.
- F. ASTM C 94 - Standard Specification for Ready-Mixed Concrete; 1996.
- G. ASTM C 173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 1994a.
- H. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 1997.
- I. ASTM D 1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction; 1984 (Reapproved 1996).

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Obtain cementitious materials from same source throughout.
- C. Follow recommendations of ACI 306R when concreting during cold weather.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.01 FORM MATERIALS

- A. Wood form material, profiled to suit conditions.
- B. Joint Filler: Preformed; sponge rubber or cork (ASTM D 1752).
 - 1. Thickness: 1/2 inch.

2.02 REINFORCEMENT

- A. Reinforcing Steel and Wire Fabric: Types specified in Section 03300.
- B. Dowels: ASTM A 615/A 615M Grade 40 (300); deformed billet steel bars; unfinished finish.

2.03 CONCRETE MATERIALS

- A. Concrete Materials: As specified in Section 03300.

2.04 ACCESSORIES

- A. Curing Compound: ASTM C 309, Type 1, Class A.
- B. Joint Sealer: Type R as specified in Section 07900.

2.05 CONCRETE MIX DESIGN

- A. Concrete Properties:
 - 1. Compressive Strength, per ASTM C 39 at 28 days: 4,000 psi.
 - 2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
 - 3. Total Air Content: 7 percent, per ASTM C 173.
 - 4. Maximum Slump: 4 inches.

2.06 MIXING

- A. Transit Mixers: Comply with ASTM C 94.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.02 SUBBASE

- A. See Section 02316 - Fill and Backfill for preparation of subbase and placement of granular fill.

3.03 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Coat surfaces of catch basin and other frames with oil to prevent bond with concrete pavement.
- C. Notify Humpert Wolnitzek Architects minimum 24 hours prior to commencement of concreting operations.

3.04 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.05 REINFORCEMENT

- A. Place reinforcement at midheight of slabs-on-grade.
- B. Interrupt reinforcement at expansion joints.

3.06 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Ensure reinforcement, inserts, embedded parts, formed joints and joint fillers are not disturbed during concrete placement.
- C. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

3.07 JOINTS

- A. Align curb, gutter, and sidewalk joints.
- B. Place 1/2 inch wide expansion joints at 25 foot intervals and to separate paving from vertical surfaces and other components and in pattern indicated.
 - 1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.
 - 2. Secure to resist movement by wet concrete.
- C. Provide scored joints:
 - 1. At 5 feet intervals.
 - 2. Between sidewalks and curbs.
 - 3. Between curbs and pavement.

3.08 FINISHING

- A. Sidewalk Paving: Light broom, radius to 3/4 inch radius, and trowel joint edges.
- B. Curbs and Gutters: Light broom.
- C. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.09 JOINT SEALING

- A. See Section 07900 for joint sealer requirements.

3.10 TOLERANCES

- A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.
- B. Maximum Variation From True Position: 1/4 inch.

3.11 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01400.
 - 1. Provide free access to concrete operations at project site and cooperate with appointed firm.
- B. Compressive Strength Tests: ASTM C 39. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 25 cu yd or less of concrete placed.
 - 1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
 - 2. Perform one slump test for each set of test cylinders taken.
- C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.12 PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.
- B. Do not permit pedestrian traffic over pavement for 7 days minimum after finishing.

END OF SECTION

SECTION 02834

MODULAR CONCRETE RETAINING WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete modular block retaining wall units installed to the lines and grades shown on the construction drawings and as specified herein, including preparing foundation soil, furnishing and installing leveling pad, unit fill, geogrid reinforcement, and backfill.

1.02 RELATED SECTIONS

- A. Section 02316 - Excavation.
- B. Section 02316 - Fill and Backfill.

1.03 REFERENCES

- A. AASHTO HB-16 - Standard Specifications for Highway Bridges; American Association of State Highway and Transportation Officials; 1996, 16th Edition.
- B. ASTM C 331 - Standard Specification for Lightweight Aggregates for Concrete Masonry Units; 1994.
- C. ASTM D 698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 1991.
- D. ASTM D 1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 1991.
- E. NCMA TR-127A - Design Manual for Segmental Retaining Walls; National Concrete Masonry Association; 1996, Second Edition; including Test Method SWRU-1.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's product data for proposed materials and method of installation.
- C. Samples: Submit samples of each product used in the work of this section.
- D. Certifications: Submit a manufacturer's certification, prior to start of work, that the retaining wall system components meet the requirements of this specification.
- E. Submit engineering plans prepared by a professional engineer experienced with Mechanically Stabilized Earth retaining wall systems and registered in Fort Thomas, Kentucky. Perform engineering designs, techniques, and material evaluations in accordance with the KEYSTONE Design Manual, 1995, NCMA Design Manual For Segmental Retaining Walls, 1997, or AASHTO Standard Specifications for Highway Bridges, Section 5.8, whichever is applicable.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Check the materials upon delivery to assure that proper materials have been received.

- B. Prevent excessive mud, wet cement, epoxy, and similar materials (which may affix themselves) from coming in contact with the materials.
- C. Protect the materials from damage. Do not incorporate damaged materials into the retaining wall structure.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Provide modular concrete retaining wall units and accessory materials fabricated by authorized licensed manufacturers of Keystone Retaining Wall Systems, 4444 West 78th Street, Minneapolis, MN 55435. ASD. Telephone 612-897-1040; FAX 612-897-3858.
- B. Substitutions: See Section 01600 - Product Requirements.

2.02 MODULAR CONCRETE RETAINING WALL UNITS

- A. Modular Concrete Units -- Architectural Requirements:
 - 1. Unit color: Manufacturer's standard color.
 - 2. Face finish: Sculptured rock face in angular multiplanar configuration. Other face finishes will not be allowed without written approval.
 - 3. Bond configuration: Running, with bonds nominally located at midpoint vertically adjacent units, in both straight and curved alignments.
 - 4. Exposed surfaces of units shall be free of chips, cracks or other imperfections when viewed from a distance of 20 feet under diffused lighting.
 - 5. Corners: Provide 90 degree corners, finished two sides, where indicated.
 - 6. Cap units: Provide solid cap units with parallel sides for straight walls and convex walls, angular sides for concave walls.
- B. Modular Concrete Units -- Structural and Geometric Requirements:
 - 1. Compressive strength: 3000 psi, minimum.
 - 2. Absorption: 8 percent maximum for standard weight aggregates.
 - 3. Unit width to height ratio: 2.25 to 1.
 - 4. Unit depth: 20 inches, minimum.
 - 5. Unit weight: 90 lb per unit, minimum, for standard weight aggregates.
 - 6. Inter-unit shear strength: 1500 lb/lf, minimum, at 2 psi normal pressure.
- C. Modular Concrete Units -- Constructibility Requirements:
 - 1. Vertical setback: 1/8 inch plus/minus per course (near vertical) or 1-1/4 inch plus/minus per course per the design drawings.
 - 2. Alignment and grid positioning mechanism: Fiberglass pins, two per unit minimum.

2.03 ACCESSORIES

- A. Shear Connectors: 1/2 inch diameter thermoset isophthalic polyester resin-pultruded fiberglass reinforcement rods.
 - 1. Minimum flexural strength of 128,000 psi and short beam shear of 6,400 psi.
 - 2. Strength of shear connectors between vertical adjacent units shall be applicable over a design temperature range of minus 10 degrees F to plus 100 degrees F.
- B. Construction Adhesive: Keystone Kapseal as supplied by manufacturer of modular concrete units.

2.04 FILL MATERIALS

- A. Base Leveling Pad Material: Compacted crushed stone base, non-reinforced concrete, or subsoil as shown on the drawings.
- B. Unit Fill: Clean 1-inch minus crushed stone or crushed gravel meeting the gradation listed below.
 - 1. 1 inch sieve, 100 percent passing.
 - 2. 3/4 inch sieve, 75 to 100 percent passing.
 - 3. No. 4 sieve, 0 to 10 percent passing.
 - 4. No. 50 sieve, 0 to 5 percent passing.
- C. Pea rock (3/8 to 1/2 inch round stone) is not acceptable for unit fill.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that layout dimensions are correct and substrate is in proper condition for installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 EXCAVATION

- A. Excavate to the lines and grades shown on the construction drawings. Obtain the Humpert Wolnitzek Architects 's approval of excavation prior to placement of leveling material or fill soils.
- B. Be careful not to disturb embankment and foundation materials beyond lines shown.

3.03 BASE LEVELING PAD

- A. Compact granular leveling pad material to a minimum of 95 percent of the maximum density as determined by ASTM D 698 or 90 percent of the maximum density as determined by ASTM D 1557 (Modified Proctor).
- B. Prepare leveling pad to ensure full contact to the base surface of the concrete units.

3.04 MODULAR UNIT INSTALLATION

- A. Place first course of units on the leveling pad, and alignment and level checked. Use pins or molded surfaces of modular concrete units for alignment control; do not attempt alignment from rockface split surface.
- B. Ensure that all units are in full contact with base and properly seated.
- C. Install fiberglass connecting pins and fill all voids in and around the modular units with unit fill material. Tamp or rod unit fill to ensure that all voids are completely filled.
- D. Sweep excess material from top of units and install the next course. Ensure that each course is completely unit filled, backfilled and compacted prior to proceeding to next course.
- E. Place each subsequent course ensuring that pins protrude into adjoining courses a minimum of 1 inch. Two pins are required per unit. Push next course unit forward, away from the fill zone, locking against the pins in the previous course and backfill as the course is completed. Repeat procedure to the extent of wall height.
- F. Follow wall erection and unit fill placement closely with any other backfilling required.

- G. Position vertically adjacent modular concrete units as recommended by the manufacturer (in running bond pattern).
- H. Do not install units more than two courses high before wall unit fill, backfill placement and compaction.
- I. Use 1 cubic foot, minimum, of unit fill for each square foot of wall face. Place unit fill within cores of, between, and behind units to meet this requirement.
- J. Erect whole, or cut, units on curves and corners with running bond approximately centered on units above and below.
- K. Cap Installation: Apply adhesive to top surface of unit below and place cap unit into position over projecting pins from units below.

3.05 UNREINFORCED BACKFILL PLACEMENT

- A. Place and compact backfill in lifts not to exceed 8 inches.
- B. Compact backfill to 95 percent of the maximum density as determined by ASTM D 698.
- C. Place the top 8 inches of the structure fill using low permeability soil.
- D. Use only lightweight hand-operated equipment within 3 ft from the tail of the modular concrete units.
- E. At the end of each day's operation, slope the last lift of reinforced backfill away from the wall units to direct runoff away from wall face. Do not allow surface runoff from adjacent areas to enter the wall construction site.

END OF SECTION

SECTION 02921

SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Seeding, mulching and fertilizer.
- B. Maintenance.

1.02 RELATED SECTIONS

- A. Section 02316 - Fill and Backfill: Topsoil material.

1.03 DEFINITIONS

- A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Proposed seed mixture.

1.05 REGULATORY REQUIREMENTS

- A. Comply with regulatory agencies for fertilizer and herbicide composition.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.
- B. Deliver fertilized in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.07 MAINTENANCE SERVICE

- A. Furnish maintenance of seeded areas for 1-1/2 months from Date of Substantial Completion.
- B. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

PART 2 PRODUCTS

2.01 SEED MIXTURE

- A. Seed Mixture:

1. Mixture as recommended by Installer, but containing primarily Kentucky Blue Grass and Creeping Red Fescue.

2.02 ACCESSORIES

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.
- B. Fertilizer: Commercial brand; recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated by analysis.
- C. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.
- D. Erosion Fabric: Jute matting, open weave.
- E. Herbicide: Non-damaging to grass.
- F. Stakes: Softwood lumber, chisel pointed.
- G. String: Inorganic fiber.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this Section.

3.02 PREPARATION

3.03 FERTILIZING

- A. Apply fertilizer in accordance with manufacturer's instructions.
- B. Apply after smooth raking of topsoil and prior to roller compaction.
- C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.
- D. Mix thoroughly into upper 2 inches of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

3.04 SEEDING

- A. Apply seed at a rate of 5 lbs per 1000 sq ft evenly in two intersecting directions. Rake in lightly.
- B. Do not seed areas in excess of that which can be mulched on same day.
- C. Do not sow immediately following rain, when ground is too dry, or during windy periods.
- D. Roll seeded area with roller not exceeding 112 lbs.
- E. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.

- F. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.05 SEED PROTECTION

- A. Identify seeded areas with stakes and string around area periphery. Set string height to 30 inches. Space stakes at 120 inches.
- B. Cover seeded slopes where grade is 4 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.
- C. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 12 inch overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.
- D. Secure outside edges and overlaps at 36 inch intervals with stakes.
- E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

3.06 MAINTENANCE

- A. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.
- B. Neatly trim edges and hand clip where necessary.
- C. Immediately remove clippings after mowing and trimming.
- D. Water to prevent grass and soil from drying out.
- E. Roll surface to remove minor depressions or irregularities.
- F. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- G. Immediately reseed areas which show bare spots.
- H. Protect seeded areas with warning signs during maintenance period.

END OF SECTION

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SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete formwork.
- B. Elevated concrete slabs.
- C. Floors and slabs on grade.
- D. Concrete foundation walls and stairs and ramps.
- E. Concrete reinforcement.
- F. Joint devices associated with concrete work.
- G. Concrete curing.

1.02 RELATED SECTIONS

- A. Section 02751 - Portland Cement Concrete Paving: Sidewalks, curbs and gutters.
- B. Section 07900 - Joint Sealers.

1.03 REFERENCES

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991.
- B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 1996.
- C. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 1989.
- D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 1989.
- E. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 1991.
- F. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 1988.
- G. ACI 308 - Standard Practice for Curing Concrete; American Concrete Institute International; 1992.
- H. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary; American Concrete Institute International; 1995.
- I. ASTM A 185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement; 1994.

- J. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 1996a.
- K. ASTM C 33 - Standard Specification for Concrete Aggregates; 1993.
- L. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 1996.
- M. ASTM C 94 - Standard Specification for Ready-Mixed Concrete; 1996.
- N. ASTM C 150 - Standard Specification for Portland Cement; 1996.
- O. ASTM C 171 - Standard Specification for Sheet Materials for Curing Concrete; 1997.
- P. ASTM C 173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 1994a.
- Q. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete; 1995.
- R. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 1997.
- S. ASTM C 494 - Standard Specification for Chemical Admixtures for Concrete; 1992.
- T. ASTM C 618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete; 1996a.
- U. ASTM C 881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 1990.
- V. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 1983 (reapproved 1991).

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Acquire cement from same source and aggregate from same source for entire project.
- C. Follow recommendations of ACI 305R when concreting during hot weather.
- D. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.01 FORMWORK

- A. Form Materials: 's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
 - 1. Form Facing for Exposed Finish Concrete: 's choice of materials that will provide smooth, stain-free final appearance.

2. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
3. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.02 REINFORCEMENT

- A. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420).
 1. Deformed billet-steel bars.
 2. Unfinished.
- B. Welded Steel Wire Fabric: ASTM A 185, plain type.
 1. Flat Sheets.
 2. Mesh Size and Wire Gage: As indicated on drawings.
- C. Reinforcement Accessories:
 1. Tie Wire: Annealed, minimum 16 gage.
 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C 150, Type I - Normal Portland type.
- B. Fine and Coarse Aggregates: ASTM C 33.
- C. Fly Ash: ASTM C 618, Class F.
- D. Water: Clean and not detrimental to concrete.

2.04 ADMIXTURES

- A. Air Entrainment Admixture: ASTM C 260.
- B. Chemical Admixtures: ASTM C 494, Type A - Water Reducing, and other types identified in mix designs to suit job conditions.
 1. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

2.05 CONCRETE ACCESSORIES

- A. Dovetail Anchor Slots: Formed steel sheet, galvanized, with temporary filler to prevent concrete intrusion during placement. Provide #305 Dovetail Slot, 20 gage, hot dip galvanized manufactured by Hohman & Barnard, Inc..
- B. Epoxy Bonding System: ASTM C 881, type as required by project conditions.
- C. Vapor Retarder: 6 mil thick clear polyethylene film, type recommended for below grade application.
- D. Moisture-Retaining Cover: ASTM C 171; regular curing paper, white curing paper, clear polyethylene, white polyethylene, or white burlap-polyethylene sheet.
- E. Liquid Curing Compound: ASTM C 309, Type 1, clear or translucent.

2.06 JOINT DEVICES AND MATERIALS

- A. Joint Filler: ASTM D 1751; Asphalt impregnated fiberboard or felt, 1/4 inch thick; tongue and groove profile.
- B. Sealant and Primer: As specified in Section 07900.

2.07 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 Humpert Woinitzek Architects for preparing and reporting proposed mix designs.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
- D. Normal Weight Concrete:
 - 1. Compressive Strength, per ASTM C 39 at 28 days: As indicated on drawings.
 - 2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
 - 3. Water-Cement Ratio: Maximum 40 percent by weight.
 - 4. Total Air Content: for exterior concrete, 6 percent, per ASTM C 173.
 - 5. Maximum Slump: 4 inches.
 - 6. Maximum Aggregate Size: to suit use or 3/4 inch.

2.08 MIXING

- A. Transit Mixers: Comply with ASTM C 94.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
- B. Verify that forms are clean before applying release agent.
- C. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.
- D. Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches and seal watertight by taping edges and ends.

3.03 INSTALLING REINFORCEMENT

- A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

- B. Install wire fabric in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Notify Humpert Wolnitzek Architects not less than 24 hours prior to commencement of placement operations.
- D. Ensure reinforcement, inserts, and waterstops will not be disturbed during concrete placement.
- E. Repair vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.
- F. Separate slabs on grade from vertical surfaces with 1/2 inch thick joint filler.
- G. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to Section 07900 for finish joint sealer requirements.
- H. Install joint devices in accordance with manufacturer's instructions.
- I. Apply sealants in joint devices in accordance with Section 07900.
- J. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- K. Place concrete continuously between predetermined expansion, control, and construction joints.
- L. Do not interrupt successive placement; do not permit cold joints to occur.
- M. Place floor slabs in saw cut pattern indicated.
- N. Saw cut joints within 24 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.
- O. Screed floors level, maintaining surface flatness of maximum 1/4 inch in 10 ft.

3.05 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. 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. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.

- D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
 - 1. Steel trowel surfaces that will receive carpeting, resilient flooring, seamless flooring, thin set quarry tile, and thin set ceramic tile.
 - 2. Steel trowel surfaces that will be left exposed.
- E. 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 308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 - 1. Normal concrete: Not less than 7 days.
- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
- D. Surfaces Not in Contact with Forms:
 - 1. Start initial curing 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.
 - 2. Begin final curing after initial curing but before surface is dry.
 - a. Moisture-retaining cover: Seal in place with waterproof tape or adhesive.
 - b. Curing compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.07 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01400.
- 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 C 39. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 25 cu yd 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.

3.08 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Humpert Wolnitzek Architects and 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 Humpert Wolnitzek Architects. The cost of additional testing shall be borne by when defective concrete is identified.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Humpert Wolnitzek Architects for each individual area.

END OF SECTION

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SECTION 04720

CAST STONE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Customized cast stone components for installation in masonry.
- B. Anchors and accessories.

1.02 RELATED SECTIONS

- A. Section 04810 - Unit Masonry Assemblies.
- B. Section 07900 - Joint Sealers.

1.03 REFERENCES

- A. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary; American Concrete Institute International; 1995.
- B. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 1996a.
- C. ASTM C 33 - Standard Specification for Concrete Aggregates; 1993.
- D. ASTM C 150 - Standard Specification for Portland Cement; 1996.
- E. ASTM C 494 - Standard Specification for Chemical Admixtures for Concrete; 1992.
- F. ASTM C 642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete; 1997.
- G. ASTM C 979 - Standard Specification for Pigments for Integrally Colored Concrete; 1982 (reapproved 1993).
- H. ASTM C 1194 - Standard Test Method for Compressive Strength of Architectural Cast Stone; 1991 (reapproved 1995).
- I. ASTM C 1195 - Standard Test Method for Absorption of Architectural Cast Stone; 1991 (reapproved 1995).
- J. CSI-TM - Technical Manual; Cast Stone Institute; current edition.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Test results of cast stone components made previously by the manufacturer.
- C. Shop Drawings: Include profiles, cross sections, exposed faces, arrangement of joints, anchoring methods, and anchors.
- D. Verification Samples: Pieces of actual cast stone components not less than 1 ft in length, illustrating range

of color and texture to be anticipated in components furnished for the project.

1.05 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** A current producer member of the Cast Stone Institute, with a minimum of five years of experience in producing cast stone of the types required for this project.
 - 1. Plant must have adequate capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the Work.
 - 2. Products previously produced by plant and exposed to weather must exhibit satisfactory appearance.
- B. **Standards:** Comply with requirements of current edition of CSI-TM: Cast Stone Institute Technical Manual.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. **Delivery:** Deliver cast stone components secured to shipping pallets and protected from damage and discoloration.
- B. **Storage and Handling:** Store cast stone components on project site to prevent contact with earth. Handle carefully to avoid chipping and cracking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide cast stone components fabricated by Edwards Precast Concrete Co., Dubuque, Iowa.
- B. Indiana Limestone is an acceptable alternate.
- C. **Substitutions:** See Section 01600 - Product Requirements.

2.02 CAST STONE COMPONENTS

- A. Provide cast stone components with the following properties:
 - 1. Compressive strength: 6500 psi minimum at 28 days, per ASTM C 1194.
 - 2. Absorption: 6 percent maximum at 28 days, per ASTM C 1195 or ASTM C 642.
- B. **Surface Texture:** Fine grained, similar to natural stone. No bugholes or air voids are permitted.
- C. **Color and Finish:** Match color of brick as selected by Humpert Wolnitzek Architects 's office. Finish to be smooth.

2.03 MATERIALS

- A. **Portland Cement:** ASTM C 150, Type I or Type III, white or gray as required to match Architect's sample.
- B. **Coarse Aggregate:** ASTM C 33, except for gradation; granite, quartz, or limestone.
- C. **Fine Aggregate:** ASTM C 33, except for gradation; natural or manufactured sands.
- D. **Pigments:** ASTM C 979, inorganic iron oxides.
- E. **Admixtures:** ASTM C 494.
- F. **Water:** Potable.

- G. Reinforcing Bars: ASTM A 615/A 615M, galvanized or epoxy coated when covered by less than 1-1/2 inch of cast stone material.

2.04 ACCESSORY PRODUCTS

- A. Anchors: Non-corrosive type, sized for conditions. Provide of brass, hot-dip galvanized steel, or Type 304 stainless steel.
- B. Sealant: As specified in Section 07900.

2.05 FABRICATION

- A. Shapes: Unless otherwise indicated on drawings, provide suitable wash on exterior sills, copings, projecting courses, and components with exposed top surfaces and drips on projecting components.
- B. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses.
1. Comply with ACI 318.
 2. Provide reinforcement of not less than 1/4 of one percent of cross section area.
- C. Curing and Finishing:
1. Cure components with a direct fired steam generator at a minimum temperature of 105 degrees F for a minimum of 6 hours, within 12 hours of fabrication.
 2. Cure components in the presence of carbon monoxide and carbon dioxide to promote carbonation at the surface, for efflorescence control.
 3. Remove cement film from exposed surfaces prior to packaging for shipment.
- D. Tolerances: Fabricate cast stone components within the following tolerances:
1. Plus or minus 1/8 inch in all dimensions.
 2. Maximum bow, camber, or twist: length/360.

PART 3 EXECUTION

3.01 INSTALLATION

- A. General: Install cast stone components in conjunction with masonry, complying with requirements of Section 04810.
- B. Setting:
1. Drench cast stone components with clear, running water immediately prior to installation.
 2. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
 3. Set cast stone components in a full bed of mortar unless otherwise detailed.
 4. Fill vertical joints with mortar.
 5. Make all joints 3/8 inch, except as otherwise detailed.
 6. Rake mortar joints 3/4 inch for pointing. Sponge the face of each stone to remove excess mortar.
 7. Tuck point joints to a slight concave profile.
- C. Sealant Joints:
1. Comply with requirements of Section 07900.
 2. Prime the ends of cast stone components, insert properly sized foam backing rod, and install sealant using sealant gun.
 3. Provide sealant joints at the following locations and as otherwise detailed:
 - a. At control and expansion joints.

3.02 TOLERANCES

- A. Comply with requirements of CSI-TM: Cast Stone Institute Technical Manual.
- B. Set cast stone components within 1/8 inch of plane of adjacent component.
- C. Make joints consistent within tolerance of plus 1/16 inch and minus 1/8 inch.

3.03 ADJUSTING, CLEANING, AND PROTECTION

- A. Repair obvious chips with matching touchup material provided by the manufacturer.
- B. Clean cast stone components by wetting with clear running water.
- C. Apply a solution of Sure Clean 600 by ProSoCo Products, Inc. or equivalent, complying with manufacturer's instructions.
- D. Protect cast stone components from splashing and from damage by other operations at the project site.

END OF SECTION

SECTION 04810
UNIT MASONRY ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete Block.
- B. Clay Facing Brick.
- C. Clay Tile
- D. Ceramic Glazed Structural Clay Facing Tile.
- E. Mortar and Grout.
- F. Reinforcement and Anchorage.
- G. Flashings.
- H. Lintels.
- I. Accessories.

1.02 RELATED SECTIONS

- A. Section 05500 - Metal Fabrications: Loose steel lintels.
- B. Section 07212 - Board and Batt Insulation: Insulation for cavity spaces.
- C. Section 07900 - Joint Sealers: Backing rod and sealant at control and expansion joints.

1.03 REFERENCES

- A. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 1995a.
- B. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 1995.
- C. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 1996a.
- D. ASTM C 90 - Standard Specification for Load-Bearing Concrete Masonry Units; 1996a.
- E. ASTM C 126 - Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units; 1996.
- F. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar; 1993.
- G. ASTM C 150 - Standard Specification for Portland Cement; 1996.
- H. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes; 1991 (reapproved 1992).

- I. ASTM C 212 - Standard Specification for Structural Clay Facing Tile; 1996.
- J. ASTM C 270 - Standard Specification for Mortar for Unit Masonry; 1996a.
- K. ASTM C 404 - Standard Specification for Aggregates for Masonry Grout; 1995.
- L. ASTM C 476 - Standard Specification for Grout for Masonry; 1995.
- M. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 1995.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and each type of anchorage device.
- C. Samples: Submit four samples of Structural Tile and Structural Glazed Tile units to illustrate color, texture, and extremes of color range.

1.05 MOCK-UP

- A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high, which includes mortar and accessories, structural backup, flashings, and anchors.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

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.
- B. Handle and store ceramic glazed masonry units in protective cartons or trays. Do not remove from protective packaging until ready for installation.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

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 x 8 inches and nominal depths as indicated on the drawings for specific locations.
 - 2. Load-Bearing Units: ASTM C 90.
 - a. Both hollow and solid block, as indicated.
 - b. Type I - Moisture-controlled; lightweight.
 - c. Exposed faces: Manufacturer's standard color and texture.

2.02 BRICK UNITS

- A. Manufacturers:
1. Darlington Brick & Clay Products Company; Product #75, M4217, Utility size brick.
 2. Yankee Hill Brick & Tile; Product MM#1707, Utility Size Brick.
 3. Taylor Clay Products Inc.: Product French Gray, Modular, Smooth, Utility nsize brick.
 4. Substitutions: See section 01600 - Product requirements.
- B. Facing Brick: ASTM C 216, Type FBS, Grade SW.

2.03 CLAY TILE UNITS

- A. Manufacturers:
1. Stark Ceramics, Inc.
 2. Substitutions: See section 01600 - Product requirements.
- B. Structural Clay Facing Tile: ASTM C 212, Type FTX; Standard Class; single-face units; end-construction type.
1. Color and texture: Paintable CMU textured.
- C. Ceramic Glazed Structural Clay Facing Tile: ASTM C 126; Grade S (Select); Type I (single-faced units).
1. Color and texture: to be selected from manufacturer's standard color line.
 2. Size: 8W Series, thickness as indicated.
 3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn without chipping to produce equivalent effect.

2.04 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I; color as required to produce approved color sample.
1. Hydrated Lime: ASTM C 207, Type S.
 2. Mortar Aggregate: ASTM C 144.
 3. Grout Aggregate: ASTM C 404.
- B. Water: Clean and potable.

2.05 REINFORCEMENT AND ANCHORAGE

- A. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420) deformed billet bars; galvanized (if any).
- B. Single Wythe Joint Reinforcement: Truss type; ASTM A 82 steel wire, hot dip galvanized after fabrication to ASTM A 153/A 153M, Class B; 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.
- C. Multiple Wythe Joint Reinforcement: Tab type; fabricated with moisture drip; adjustable; ASTM A 82 steel wire, hot dip galvanized after fabrication to ASTM A 153/153M, Class B; 0.1483 inch side rods with 0.1875 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.
- D. Flexible Anchors: 4-piece anchors that permit differential movement between masonry and building frame.
1. Concrete frame: dovetail anchors of bent steel strap, 1 x 1-1/2 inch size x 12 ga / 0.1046 inch thick, with triangular wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B-2.
 2. Steel frame: Formed sheet anchors for welding to frame, 14 ga / 0.0747 inch thick, with triangular wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B-2.
 3. Manufacturers:

- a. Hohmann & Barnard, Inc.; Product matching Masonry Veneer Anchor system.
 - b. Substitutions: See Section 01600 - Product Requirements.
- E. Masonry Veneer Anchors: 4-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B-2.
- 1. Anchor plates: Not less than 14 ga / 0.0747 inch thick, designed for fastening to backup through sheathing by two fasteners.
 - 2. Wire ties: triangular shape, 0.1875 inch thick.
 - 3. Vertical adjustment: Not less than 2 inches.
 - a. Hohman and Barnard; Products: DW-10-X Anchor, Byna-Tie, Seismiclip, 0.1875 inch Continuous Joint Reinforcement Wire and #10 Stainless Steel Self-Drilling Self-Tapping Screws.

2.06 FLASHINGS

- A. Copper/Kraft Paper Flashings: 3 oz/sq ft sheet copper bonded to fiber reinforced asphalt treated Kraft paper. Provide Copper Fabric manufactured by Afco Products Inc..
- B. Lap Sealant: Butyl type as specified in Section 07900.

2.07 ACCESSORIES

- A. Joint Filler: Closed cell Neoprene; oversized 50 percent to joint width; self expanding; 3/8 inch wide x by maximum lengths available.
 - 1. Manufacturers:
 - a. Hohmann & Barnard, Inc.; Product #NS.
 - b. Substitutions: See Section 01600 - Product Requirements.
- B. Building Paper: ASTM D 226, Type I ("No.15") asphalt felt.
- C. Cavity Vents (Weeps): 100% Recycled Polyester with a 90% open mesh; 2.5" x 4" x 0.5"; match mortar color; insect resistant; and 1" x 10" cavity joint filler to prevent mortar from clogging weeps.
 - 1. Manufacturers:
 - a. Mortar Net (1-800-664-6638); Products: Weep Vents and Mortar Net
 - b. Substitutions: See Section 01600 - Product Requirements.
- D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.08 LINTELS

- A. Precast Concrete Lintels: Fire rated type, 8 x 8 inch size, 4,000 psi strength at 28 days.

2.09 MORTAR AND GROUT MIXES

- A. Mortar for Unit Masonry: ASTM C 270, using the Proportion Specification.
 - 1. Limit Cementitious materials in mortar to Portland cement - lime.
 - 2. Exterior, loadbearing masonry: Type S.
 - 3. Exterior, non-loadbearing masonry: Type S.
 - 4. Interior, loadbearing masonry: Type S.
- B. Grout: ASTM C 476. Consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- C. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.

3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

3.03 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Concave.
- D. Brick Units:
 - 1. Bond: Running. *ONE ONE*
 - 2. Coursing: ~~Three units~~ and ~~three mortar joints~~ to equal ~~8~~ inches. *8"*
 - 3. Mortar Joints: Concave.
- E. Clay Tile Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Concave.

3.04 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar as work progresses.
- E. Interlock intersections and external corners.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform 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.

3.05 WEEPS

- A. Install weeps in veneer and cavity walls at 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls.

3.06 CAVITY WALL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weeps.
- B. Build inner wythe ahead of outer wythe to receive cavity insulation and air/vapor barrier adhesive.

3.07 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 joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.

3.08 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- 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 joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.

3.09 REINFORCEMENT AND ANCHORAGES - CAVITY WALL 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 openings.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.

3.10 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.
 - 1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry or turn up at least 4 inches to form watertight pan at non-masonry construction.
 - 2. Remove or cover protrusions or sharp edges that could puncture flashings.
 - 3. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Extend laminated flashings to within 1/4 inch of exterior face of masonry.

- C. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.

3.11 LINTELS

- A. Install loose steel lintels over openings.
- B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled. See Structural Drawings for Masonry Lintel reinforcement.
- C. Maintain minimum 8 inch bearing on each side of opening.

3.12 GROUTED COMPONENTS

- A. Lap splices minimum 24 bar diameters.
- B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- C. Place and consolidate grout fill without displacing reinforcing.
- D. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

3.13 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control and expansion joints.
- B. Size control joint in accordance with Section 07900 for sealant performance.
- C. Form expansion joint as detailed.

3.14 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 Joint Thickness: 1/16 inch in 3 ft.

3.15 CLEANING

- A. Remove excess mortar and mortar smears as work progresses.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

3.16 PROTECTION OF FINISHED WORK

- A. Without damaging completed work, provide protective boards at exposed external corners which are subject to damage by construction activities.

END OF SECTION

SECTION 05120
STRUCTURAL STEEL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural steel framing members, support members, sag rods, and struts.
- B. Base plates, anchorages.
- C. Grouting under base plates.

1.02 REFERENCES

- A. AISC M016 - ASD Manual of Steel Construction; American Institute of Steel Construction, Inc.; 1989, Ninth Edition.
- B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.; 1992.
- C. AISC S329 - Allowable Stress Design Specification for Structural Joints Using ASTM A325 or A490 Bolts; American Institute of Steel Construction, Inc.; 1985, Reaffirmed 1994.
- D. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 1996.
- E. ASTM A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 1996.
- F. ASTM A 108 - Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality; 1995.
- G. ASTM A 242/A 242M - Standard Specification for High-Strength Low-Alloy Structural Steel; 1993a.
- H. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength; 1994.
- I. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 1996.
- J. ASTM A 325M - Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric); 1993.
- K. ASTM A 490 - Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength; 1993.
- L. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 1993.
- M. ASTM A 514/A 514M - Standard Specification for High-Yield Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding; 1994a.
- N. ASTM A 563 - Standard Specification for Carbon and Alloy Steel Nuts; 1994.
- O. ASTM A 563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric); 1993.

- P. ASTM C 1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 1997.
- Q. ASTM F 436 - Standard Specification for Hardened Steel Washers; 1993.
- R. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 1993.
- S. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; 1996.

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
 - 2. Connections.
 - 3. Indicate cambers and loads.
 - 4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
- D. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.04 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC M016.
- B. Comply with Section 10 of AISC S303 for architecturally exposed structural steel.
- C. Fabricator: Company specializing in performing the work of this section with minimum 5 years of documented experience.
- D. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Structural Steel Members: ASTM A 36/A 36M.
- B. High-Strength, Corrosion-Resistant Structural Steel: ASTM A 242/A 242M.
- C. Cold-Formed Structural Tubing: ASTM A 500, Grade B.
- D. Steel Bars: ASTM A 108.
- E. Steel Plate: ASTM A 514/A 514M.
- F. Pipe: ASTM A 53, Grade B, Finish black.
- G. Sag Rods: ASTM A 36/A 36M.

- H. Carbon Steel Bolts and Nuts: ASTM A 307, Grade A.
- I. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, plain.
- J. High-Strength Structural Bolts: ASTM A 490, with matching ASTM A 563 nuts and ASTM F 436 washers; Type 1 alloy steel.
- K. Anchor Bolts: ASTM A 307, Grade C.
- L. High-Strength Anchor Bolts: ASTM A 325, Type 1 plain.
- M. Welding Materials: AWS D1.1; type required for materials being welded.
- N. Sliding Bearing Plates: Teflon coated.
- O. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C 1107 and capable of developing a minimum compressive strength of 7,000 psi at 28 days.

2.02 FABRICATION

- A. Shop fabricate to greatest extent possible.
- B. Fabricate connections for bolt, nut, and washer connectors.
- C. Develop required camber for members.

2.03 FINISH

- A. Leave structural steel members un-primed.

2.04 SOURCE QUALITY CONTROL AND TESTS

- A. Welded Connections: Visually inspect all shop-welded connections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

- A. Erect structural steel in compliance with AISC S303.
- B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- C. Field weld components indicated on drawings and shop drawings.
- D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with AISC S329.
- E. Do not field cut or alter structural members without approval of Humpert Wolnitzek Architects.

- F. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

- A. Welded Connections: Visually inspect all field-welded connections.

END OF SECTION

SECTION 05210

STEEL JOISTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Open web steel joists, with bridging, attached seats and anchors.
- B. Supplementary framing for floor and roof openings greater than 18 inches.

1.02 REFERENCES

- A. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 1995.
- B. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength; 1994.
- C. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; 1996.
- D. FS TT-P-664 - Primer Coating, Alkyd, Corrosion-Inhibiting, Lead and Chromate Free, VOC-Compliant; Federal Specifications and Standards; Revision D, 1988.
- E. SJI (SPEC) - Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders; Steel Joist Institute; 1994, Fortieth Edition.
- F. SJI Technical Digest No. 9 - Handling and Erection of Steel Joists and Joist Girders; Steel Joist Institute; 1987.
- G. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1995 (Part of Steel Structures Painting Manual, Vol. Two).

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate standard designations, joist coding, configurations, sizes, spacings, cambers, locations of joists, joist leg extensions, bridging, connections, and attachments.
- C. Welders' Certificates: Submit manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.04 QUALITY ASSURANCE

- A. Perform Work, including that for headers and other supplementary framing, in accordance with SJI Standard Specifications Load Tables and SJI Technical Digest No.9.
- B. Manufacturer Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.
- C. Erector Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.

1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Transport, handle, store, and protect products to SJI requirements.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Open Web Joists: SJI Type K Joists:
 - 1. Provide bottom chord extensions as indicated.
 - 2. End bearing of 2-1/2 inches on steel supports.
 - 3. End bearing of 4 inches on masonry supports.
 - 4. Finish: Shop primed.
- B. Anchor Bolts, Nuts and Washers: ASTM A307, galvanized to ASTM A 153/A 153M.
- C. Welding Materials: AWS D1.1; type required for materials being welded.
- D. Shop and Touch-Up Primer: FS TT-P-664, lead- and chromate-free.

2.02 FINISH

- A. Shop prime joists as specified.
- B. Prepare surfaces to be finished in accordance with SSPC-SP 2.

PART 3 EXECUTION

3.01 ERECTION

- A. Erect joists with correct bearing on supports.
- B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.
- C. Coordinate placement of anchors in concrete construction for securing bearing plates.
- D. After joist alignment and installation of framing, field weld joist seats to bearing plates.
- E. Install supplementary framing for floor and roof openings greater than 18 inches.
- F. Do not permit erection of decking until joists are braced bridged, and secured or until completion of erection and installation of permanent bridging and bracing.
- G. Do not field cut or alter structural members without approval of joist manufacturer.

3.02 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 05310

STEEL DECK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof deck.
- B. Metal form deck.
- C. Supplementary framing for openings up to and including 18 inches.

1.02 REFERENCES

- A. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 1996.
- B. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; 1996.
- C. AWS D1.3 - Structural Welding Code - Sheet Steel; American Welding Society; 1989.
- D. SDI 29 - Design Manual for Composite Decks, Form Decks, Roof Decks and Cellular Floor Deck Systems with Electrical Distribution; Steel Deck Institute; 1995.

1.03 PERFORMANCE REQUIREMENTS

- A. Select and design metal deck in accordance with SDI 29.
- B. Calculate to structural working stress design and structural properties specified.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittals procedures.
- B. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.
- C. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.
- D. Certificates: Certify that meet or exceed specified requirements.
- E. Submit manufacturer's installation instructions.
- F. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Cut plastic wrap to encourage ventilation.
- B. Store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Steel Deck:
 - 1. United Steel Deck, Inc.
 - 2. Vulcraft Steel Deck.
 - 3. Wheeling Corrugating Co.

2.02 STEEL DECK

- A. Roof Deck: Non-composite type, fluted steel sheet:
 - 1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), with G60/Z180 galvanized coating.
 - a. Grade as required to meet performance criteria.
 - 2. Structural Properties: See Structural Drawings.
 - 3. Nominal Height: 1-1/2 inch.
 - 4. Profile: Fluted; SDI WR.
 - 5. Formed Sheet Width: 36 inch.
 - 6. Side Joints: See Structural Drawings.
 - 7. End Joints: See Structural Drawings.
- B. Metal Form Deck: Corrugated sheet steel, with provision for ventilation of concrete:
 - 1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS) Grade 33, with G90/Z275 galvanized coating.
 - a. Grade as required to meet performance criteria.
 - 2. Minimum Metal Thickness, Excluding Finish: 28 gage.
 - 3. Nominal Height: 9/16 inch.
 - 4. Formed Sheet Width: 24 inch.
 - 5. Side Joints: See structural drawings.
 - 6. End Joints: See structural drawings.

2.03 ACCESSORY MATERIALS

- A. Welding Materials: AWS D1.1.
- B. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.

2.04 FABRICATED DECK ACCESSORIES

- A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, thickness as shown on Structural Drawings or minimum 22 gage thick sheet steel; of profile and size as indicated; finished same as deck.
- B. Roof Drain Pans: 14 gage sheet steel, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.
- C. Floor Drain Pans: 14 gage sheet steel, flat bottom, sloped sides, recessed 1-1/2 inches below floor deck

surface, bearing flange 3 inches wide, sealed watertight.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions prior to beginning work.

3.02 INSTALLATION

- A. Erect metal deck in accordance with SDI 29 and manufacturer's instructions. Align and level.
- B. On steel supports provide minimum 1-1/2 inch bearing.
- C. Fasten deck to steel support members at ends and intermediate supports as indicated on the Structural Drawings. Welding: Use fusion welds.
- D. Mechanically fasten side laps at midspan. For Roof Deck use (1) #10 TEKS.
- E. Weld deck in accordance with AWS D1.3.
- F. At deck openings from 6 inches to 18 inches in size, provide 2 x 2 x 1/4 inch steel angle reinforcement. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.
- G. Where deck changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Fusion weld 12 inches on center maximum.
- H. At floor edges, install concrete stops upturned to top surface of slab, to contain wet concrete. Provide stops of sufficient strength to remain stationary without distortion.
- I. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.
- J. Close openings above walls and partitions perpendicular to deck flutes with single row of foam cell closures.
- K. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.
- L. Position floor drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

END OF SECTION

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SECTION 05400

COLD FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Formed steel joist framing and bridging.

1.02 RELATED SECTIONS

1.03 REFERENCES

- A. AISI SG-673 - Cold-Formed Steel Design Manual; American Iron and Steel Institute; 1986, 1989 Addendum.
- B. ASTM A 123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 1989a.
- C. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 1996.
- D. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; 1996.
- E. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).

1.04 SYSTEM DESCRIPTION

- A. See Structural Drawings.

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.

1.06 QUALITY ASSURANCE

- A. Calculate structural properties of framing members in accordance with requirements of AISI SG-673.
- B. Manufacturer: Company specializing in manufacturing the types of products specified in this section, and with minimum 5 years of experience.
- C. Installer: Company specializing in performing the work of this section with minimum 5 years of experience.

PART 2 PRODUCTS

2.01 FRAMING MATERIALS

- A. Galvanized Joists and Purlins: ASTM A 653/A 653M.
 - 1. Base Metal: Structural Steel (SS), Grade 33.

2. Gage and depth: As indicated on the drawings.
3. Galvanized finish: G90/Z275.

2.02 ACCESSORIES

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.
- B. Plates, Gussets, Clips: Formed Sheet Steel, 0.06 inch thickness; finish to match framing components.
- C. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type II - Organic.

2.03 FASTENERS

- A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: ASTM A 123, hot dip galvanized to 1.25 oz/sq ft.
- B. Anchorage Devices: Power actuated, Drilled expansion bolts, and Screws with sleeves.
- C. Welding: In conformance with AWS D1.1.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that building framing components are ready to receive work.

3.02 INSTALLATION OF JOISTS AND PURLINS

- A. Install framing components in accordance with manufacturer's instructions.

END OF SECTION

SECTION 05500
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel items.

1.02 RELATED SECTIONS

1.03 REFERENCES

- A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 1996.
- B. ASTM A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 1996.
- C. ASTM A 283/A 283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 1993a.
- D. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 1996.
- E. ASTM A 325M - Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric); 1993.
- F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 1993.
- G. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; 1996.
- H. SSPC-Paint 15 - Steel Joist Shop Paint; Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).
- I. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).
- J. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1995 (Part of Steel Structures Painting Manual, Vol. Two).

1.04 SUBMITTALS

- A. See Section 01300 - 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.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A 36/A 36M.
- B. Plates: ASTM A 283.
- C. Pipe: ASTM A 53, Grade B Schedule 40, black finish.
- D. Fasteners: as detailed.
- E. Bolts, Nuts, and Washers: ASTM A 325.
- F. Welding Materials: AWS D1.1; type required for materials being welded.
- G. Shop and Touch-Up Primer: SSPC-Paint 15, Type I - Red Oxide.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

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. 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. Ship's Ladder: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish; as detailed on drawings.
 - 1. Side Rails: 3/8 x 2 inches members spaced at 20 inches.
 - 2. Rungs: one inch diameter solid round bar spaced 12 inches on center.
 - 3. Space rungs 7 inches from wall surface.
- B. Lintels: As detailed; galvanized finish.

2.04 FINISHES - STEEL

- A. Prime paint all steel items.
- 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.

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 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.

3.03 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. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 ERECTION 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

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SECTION 05510

METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural steel stair framing and supports.
- B. Pan treads to receive concrete fill, and landings.
- C. Integral balusters and handrails.
- D. Handrails at walls.

1.02 RELATED SECTIONS

- A. Section 03300 - Cast-In-Place Concrete: Concrete fill in stair pans and landings; mesh reinforcement for landings.
- B. Section 09900 - Paints and Coatings: Paint finish.

1.03 REFERENCES

- A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 1996.
- B. ASTM A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 1997.
- C. ASTM A 283/A 283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 1993a.
- D. ASTM A 611 - Standard Specification for Structural Steel (SS), Sheet, Carbon, Cold-Rolled; 1997.
- E. ASTM E 935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 1993.
- F. ASTM E 985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 1996.
- G. SSPC-Paint 15 - Steel Joist Shop Paint; Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).
- H. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1995 (Part of Steel Structures Painting Manual, Vol. Two).

1.04 DESIGN REQUIREMENTS

- A. Design and fabricate stair assembly to support a uniform live load of 100 lb/sq ft and a concentrated load of 300 lb/sq ft with deflection of stringer or landing framing not to exceed 1/180 of span. Test in accordance with ASTM A 935.
- B. Design and fabricate railing assemblies in accordance with ASTM E 985.

- C. Design railing assemblies, wall rails, and attachments to resist lateral force of 75 lbs at any point without damage or permanent set. Test in accordance with ASTM A 935.

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

1.06 QUALITY ASSURANCE

- A. Perform design and prepare shop drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the place where the Project is located.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Steel Sections: ASTM A 36/A 36M.
- B. Steel Plates: ASTM A 283.
- C. Pipe: ASTM A 53, Grade B Schedule 40, black finish.
- D. Ungalvanized Steel Sheet: ASTM A 611, Grade C, Type 1.
- E. Shop and Touch-Up Primer: SSPC-Paint 15, Type I - Red Oxide.

2.02 FABRICATION - GENERAL

- A. Fit and shop assemble components in largest practical sections, for delivery to site.
- B. Fabricate components 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.
- F. Fabricate components accurately for anchorage to each other and to building structure.

2.03 FABRICATION - PAN STAIRS AND LANDINGS

- A. Form treads and risers with minimum 12 gage sheet steel stock.
- B. Secure tread pans to stringers with clip angles; welded in place.
- C. Form stringers with rolled steel channels, 12 inches deep.

- D. Form landings with minimum 12 gage sheet stock. Reinforce underside with angles to attain design load requirements.
- E. Form balusters with 1/2 inch square steel sections, welded to stringers.
- F. Prime paint components.

2.04 FINISHING

- A. Prepare surfaces to be primed in accordance with SSPC-SP 2.
- B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- C. Do not prime surfaces in direct contact with concrete or where field welding is required.
- D. Prime paint items with one coat.

END OF SECTION

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SECTION 06114

WOOD BLOCKING AND CURBING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof nailers and cants.
- B. Telephone and electrical panel boards.

1.02 REFERENCES

- A. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes; American Wood-Preservers' Association; 1997.
- B. AWPA C20 - Structural Lumber -- Fire Retardant Treatment by Pressure Processes; American Wood-Preservers' Association; 1996.
- C. PS 1 - Construction and Industrial Plywood; National Institute of Standards and Technology (Department of Commerce); 1995.
- D. SPIB (GR) - Standard Grading Rules for Southern Pine Lumber; Southern Pine Inspection Bureau, Inc.; 1994.

PART 2 PRODUCTS

2.01 DIMENSION LUMBER

- A. Grading Agency: Southern Pine Inspection Bureau, Inc. (SPIB).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Miscellaneous Blocking, Furring, and Nailers:
 - 1. Lumber: S4S, No. 2 or Standard Grade.

2.02 CONSTRUCTION PANELS

- A. Miscellaneous Panels:
 - 1. Concealed Plywood: PS 1, C-C Plugged, exterior grade.
 - 2. Electrical Component Mounting: APA rated sheathing, fire retardant treated.

2.03 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Fasteners: Hot-dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
 - 2. Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete.

2.04 FACTORY WOOD TREATMENT

- A. Fire Retardant Treatment: AWP Treatment C20, Exterior Type, Chemically treated and pressure impregnated; capable of providing a maximum flame spread/smoke development rating of 25 / 200.
- B. Pressure Treatment of Lumber Above Grade: AWP Treatment C2 using waterborne preservative to 0.25 lb/cu ft retention.
 - 1. Kiln dry after treatment to maximum moisture content of 19 percent.
 - 2. Treat wood in contact with roofing, flashing, or waterproofing.
 - 3. Treat wood in contact with masonry or concrete.
 - 4. Treat wood less than 18 inches above grade.

PART 3 EXECUTION

3.01 FRAMING INSTALLATION

- A. Set members level and plumb, in correct position.
- B. Place horizontal members with crown side up.
- C. Construct curb members of single pieces.
- D. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.
- E. Coordinate curb installation with installation of decking and support of deck openings.
- F. Provide miscellaneous members as indicated or as required to support finishes, fixtures, specialty items, and trim.

3.02 INSTALLATION OF CONSTRUCTION PANELS

- A. Install telephone and electrical panel back boards made of plywood or other acceptable structural panels at locations indicated. Size back boards to be minimum 48 inches beyond size of telephone and electrical panels.

END OF SECTION

SECTION 06410
CUSTOM CABINETS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Special fabricated cabinet units.
- B. Countertops.
- C. Cabinet hardware.
- D. Prefinished surfaces.
- E. Preparation for installing utilities.

1.02 REFERENCES

- A. AWI P-200 - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute; 1997, Seventh Edition, Version 1.0.
- B. FS MMM-A-130 - Adhesive, Contact; Federal Specifications and Standards; Revision B, 1974, and Amendment 3, 1976.
- C. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 1995.
- D. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 1994.

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
- C. Product Data: Provide data for hardware accessories.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with AWI P-200, Custom quality.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Protect units from moisture damage.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. During and after installation of work of this section, maintain the same temperature and humidity conditions in building spaces as will occur after occupancy.

PART 2 PRODUCTS

2.01 WOOD MATERIALS

- A. Softwood Lumber: NIST PS 20; Graded in accordance with AWI P-200, Custom; average moisture content of 6 percent; species and grade as follows:
 - 1. Cabinet Frame: Species any, Grade Custom.
 - 2. Internal Construction: Species any, Grade Custom.

2.02 PANEL MATERIALS

- A. Particleboard: ANSI A208.1; AWI P-200 standard, composed of wood chips, medium density, made with waterproof resin binders; of grade to suit application; sanded faces, located as follows:
 - 1. Door and Drawer Fronts: Species any, Grade Custom.
 - 2. Drawer Construction: Species any, Grade Custom.

2.03 LAMINATE MATERIALS

- A. Manufacturers:
 - 1. Formica Corp.
 - 2. Nevamar Corp.
 - 3. Wilsonart International, Inc.
 - 4. Substitutions: See Section 01600 - Product Requirements.
- B. Plastic Laminate: NEMA LD 3, HGS; color as selected; textured, low gloss finish.
- C. Laminate Backing Sheet: 0.020 inch Backing Sheet grade, undecorated plastic laminate.

2.04 ACCESSORIES

- A. Adhesive: FS MMM-A-130 contact adhesive.
- B. Fasteners: Size and type to suit application.
- C. Concealed Joint Fasteners: Threaded steel.
- D. Grommets: Plastic material for cut-outs.

2.05 HARDWARE

- A. Shelf Standards and Rests: Formed steel channels and rests, cut for fitted rests spaced at 1 inch centers; chrome finish.
- B. Drawer and Door Pulls: "U" shaped pull, aluminum with satin finish, 4 inch centers.
- C. Catches: Magnetic.
- D. Drawer Slides: Galvanized steel construction, ball bearings separating tracks, full extension type.

- E. Hinges: Knuckle disappearing type, steel with chrome finish.

2.06 FABRICATION

- A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
- B. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- C. Door and Drawer Fronts: 3/4 inch thick; overlay style.
- D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- E. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
- F. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
- G. Mechanically fasten back splash to countertops with steel brackets at 16 inches on center.
- H. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

- A. Set and secure casework in place; rigid, plumb, and level.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- E. Secure cabinet to floor using appropriate angles and anchorages.

3.03 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 07170

BENTONITE WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Bentonite clay waterproofing panels and accessories.
- B. Bentonite waterstop.
- C. Protection boards.

1.02 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product criteria, characteristics, accessories, jointing and seaming methods, and termination conditions.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Northern Kentucky Water Service District's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

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

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Maintain bentonite products dry. Protect with waterproof cover.

1.05 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water.
 - 1. Exception: Where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.
 - 2. For warranty repair work, remove and replace materials concealing waterproofing.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. CETCO; Product Volclay Type 1 Panels.
- B. Other Acceptable Manufacturers:
 - 1. Mameco International, Inc.
 - 2. Paramount Technical Products, Inc.

2.02 MATERIALS

- A. Bentonite: Granulated pure, dry, bentonite clay comprised of 90 percent minimum sodium montmorillonite; 90 percent minimum passing No. 20 mesh sieve and 10 percent maximum passing No. 200 mesh sieve.
- B. Single-Ply Panels: Single corrugated core, smooth faced Kraft paper panels, core filled with bentonite clay granules.
 - 1. Nominal Panel Size: 48 x 48 x 3/16 inches.
 - 2. Minimum Bentonite Fill: 1 lb/sq ft.
 - 3. Minimum Panel Weight: 18 lbs.
- C. Joint Packing: Water soluble plastic filled with bentonite clay granules; 2 inch diameter x 24 inches long.
- D. Joint Seal: Moist and hydrated bentonite clay gel using water and glycol for below-freezing application and water for above-freezing application.
- E. Concrete Joint Waterstop: An expanding bentonite based, flexible strip adhered in place with adhesive.

2.03 ACCESSORIES

- A. Adhesive: Manufacturer's recommended type.
- B. Polyethylene Sheet: 4 mil thick.
- C. Protection Board: 1/8 inch thick biodegradable hardboard.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify substrate surfaces are smooth and durable; free of matter detrimental to application of waterproofing system.
- C. Verify items which penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

- A. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.
- B. Remove concrete fins, projections, and form ties.
- C. Fill holes, cracks, honeycombs, and voids with bentonite gel seal, minimum 1/8 inch thick, extending minimum 3 inches beyond defect.

3.03 APPLICATION - GENERAL

- A. Install panels in accordance with manufacturer's instructions.
- B. Cut panels parallel to corrugations to prevent bentonite loss.
- C. Seal construction joints with joint seal.

3.04 APPLICATION - VERTICAL SURFACES

- A. Install single-ply panels with masonry nails, starting at base of foundation.
- B. Fold panels around corners with corrugations vertical. Install unfolded panels with corrugations horizontal.
- C. Lap adjoining panels 1-1/2 inches.
- D. Stagger vertical joints minimum 16 inches on succeeding courses.
- E. Install one extra layer of panels at external corners.
- F. Place joint packing continuous along junction of wall and footing. Secure to prevent movement.

3.05 INSTALLATION - PROTECTION BOARD

- A. Place protection board directly over waterproofing; butt joints.
- B. Scribe and cut boards around projections, penetrations, and interruptions.

3.06 PROTECTION

- A. Do not permit traffic over unprotected or uncovered waterproofing.
- B. Cover installed waterproofing with temporary polyethylene sheeting. Remove sheeting just before backfilling begins.

END OF SECTION

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SECTION 07190
WATER REPELLENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water repellents applied to exterior masonry surfaces.

1.02 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description.

1.03 ENVIRONMENTAL REQUIREMENTS

- A. Protect liquid materials from freezing.
- B. Do not apply water repellent when ambient temperature is lower than 50 degrees F or higher than 100 degrees F.
- C. Do not apply water repellents when wind velocity is higher than 5 mph.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Water Repellent: Methyl methacrylate polymer; colorless.
 - 1. Solids by Volume: 7 percent, minimum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify joint sealants are installed and cured.
- C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

3.02 PREPARATION

- A. Do not start work until masonry mortar substrate is cured a minimum of 60 days.
- B. Remove loose particles and foreign matter.
- C. Remove oil or foreign substance with a chemical solvent which will not affect water repellent.
- D. Scrub and rinse surfaces with water and let dry.

3.03 APPLICATION

- A. Apply water repellent in accordance with manufacturer's instructions.

3.04 PROTECTION OF ADJACENT WORK

- A. Protect adjacent surfaces not intended to receive water repellent.
- B. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

END OF SECTION

SECTION 07212

BOARD AND BATT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Board insulation at cavity wall construction and perimeter foundation wall.
- B. Batt insulation for filling crevices in exterior wall and roof.

1.02 REFERENCES

- A. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 1995.
- B. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 1995.

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 BOARD INSULATION MATERIALS

- A. Extruded Polystyrene Board Insulation: ASTM C 578, Type IV; Extruded expanded polystyrene board with natural skin surfaces; with the following characteristics:
 - 1. Board Size: 24 x 96 inch.
 - 2. Board Thickness: 1-1/2 inches.
 - 3. Board Edges: Square.
 - 4. Thermal Conductivity (k factor) at 25 degrees F: 0.18.
 - 5. Manufacturers:
 - a. The Dow Chemical Co.
 - b. Owens Corning Corp.
 - c. Tenneco Building Products.
 - 6. Substitutions: See Section 01600 - Product Requirements.

2.02 BATT INSULATION MATERIALS

- A. Batt Insulation: ASTM C 665; preformed glass fiber batt; friction fit, conforming to the following:
 - 1. Facing: Faced on one side with asphalt treated mesh reinforced Kraft paper.
 - 2. Manufacturers:
 - a. Certainteed Corp.
 - b. Johns Manville Corp.

- c. Owens Corning Corp.
- 3. Substitutions: See Section 01600 - Product Requirements.

2.03 ACCESSORIES

- A. Adhesive: Type recommended by insulation manufacturer 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 and adhesive.
- 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 inch wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
 - 1. Tape seal joints.
 - 2. Extend sheet full height of joint.
- B. Apply adhesive to back of boards:
 - 1. Three continuous beads per board length.
 - 2. Full bed 1/8 inch thick.
- C. Install boards horizontally on foundation perimeter.
 - 1. Place boards to maximize adhesive contact.
 - 2. Butt edges and ends tightly to adjacent boards and to protrusions.
- D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION AT CAVITY WALLS

- A. Install boards to fit snugly between wall ties.
- B. Install boards horizontally on walls.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.04 BATT INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.05 PROTECTION OF FINISHED WORK

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

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SECTION 07221
ROOF INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof insulation and installation.
- B. Support system and installation.

1.02 RELATED SECTIONS

- A. Section 07550 - Modified Bituminous Membrane Roofing.

1.03 REFERENCES

- A. FS HH-I-558 - Insulation, Blocks, Boards, Blankets, Felts, Sleeving, (Pipe and Tube Covering), and Pipe Fitting Covering, Thermal (Mineral Fiber, Industrial Type); Federal Specifications and Standards; Revision B.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's specifications and installation instructions.
- C. Shop Drawings: Include layout and location of structural steel roof framing members, details and locations of support system components, and specific data about insulation, including:
 - 1. R value.
 - 2. Approximate thickness.
 - 3. Facing type.

1.05 REGULATORY REQUIREMENTS

- A. Conform to requirements of local building code.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened packaging, with identifying tags or labels intact and legible.
- B. Coordinate scheduling for timely deliveries and prompt installation of materials.
- C. Store insulation and support system in a dry, protected area. If storage area is outdoors, store material off the ground and protected by a suitable waterproof cover. If installation is delayed for an extended period, open bag ends to allow for ventilation.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Handle and install insulation system only under conditions and temperatures that allow the facing material to remain workable.
- B. Coordinate insulation placement to assure that material can be covered promptly with roof panels. Do not

leave insulation exposed overnight or to inclement weather.

1.08 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's standard warranty.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Products of this section are based on insulations as manufactured by the Celotex Corporation.
- B. Other acceptable manufacturers:
 - 1. Apache Products Company.
 - 2. GAF Materials Corporation.
- C. Substitutions: See Section 01600 - Product Requirements.

2.02 MATERIALS

- A. Polyisocyanurate Insulation: Celotex Hy-Therm AP Roof Insulation.
 - 1. Comply with FS HH-I-1972/Gen. 1.
 - 2. Comply with Factory Mutual: Class 1 Approval per FMRC Standard 4450/4470.
 - 3. Board Size: 48 x 96 inch
 - 4. Thickness: 2 1/2".
 - 5. Board Edges: Square.
 - 6. Thermal Conductivity (k factor): 0.16.
 - 7. Board Density: 1.8 lb/cu ft.
- B. Substitutions: See Section 01600 - Product Requirements.
- C. Fiberboard Roof Insulation: Celotex Regular Fiberboard Roof Insulation - one faces finished with mineral fiber, asphalt and kraft paper, with the following characteristics:
 - 1. Comply with ASTM C208 Class C and ASTM C209
 - 2. Comply with Factory Mutual: Class 1 Approval per FMRC Standard 4450/4470.
 - 3. Board Size: 48 x 96 inch.
 - 4. Thickness: 1/2".
 - 5. Board Edges: Square.
 - 6. Thermal Conductivity (k factor): 0.38.
- D. Substitutions: See Section 01600 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that roof framing system is complete and ready to receive insulation system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install roof insulation in strict accordance with manufacturer's instructions and approved shop drawings.

END OF SECTION

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SECTION 07411
METAL ROOF PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Work described in this section includes preformed metal roofing system complete with clips, perimeter and penetration flashing, closures, gutters, and downspouts.

1.02 RELATED SECTIONS

- A. Section 05120 - Structural Steel
- B. Section 05210 - Steel Joists
- C. Section 05310 - Steel Decks
- D. Section 05400 - Cold Formed Metal Framing

1.03 REFERENCES

- A. American Iron and Steel Institute (AISI):1986 - Specification for the Design of Cold-Formed Steel Structural Members.
- B. American Society for Testing and Materials (ASTM):A792-96 - Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- C. B209-96 - Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- D. A653-96 - Specification for Steel Sheet Zinc-coated (galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip process.
- E. D1056-91 - Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
- F. D3575-84 - Test Methods for Flexible Cellular Materials made from Olefin Polymers.
- G. E1680-95 - Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.
- H. E1592-95 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
- I. E1646-95 - Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
- J. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): 1993 Architectural Sheet Metal Manual, 5th edition.
- K. Underwriters' Laboratories (UL): Standard UL - 580 Tests for Wind-Uplift Resistance of Roof Assemblies Standard UL - 263 Tests for Fire Resistanc Standard UL - 790 Class A Fire Rating
- L. Factory Mutual Research (FM): Standard FM 4471 Tests for Wind-Uplift Resistance of Roof Assemblies.

1.04 PERFORMANCE REQUIREMENTS

- A. Thermal Movement:
1. Completed metal roofing and flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, producing excess stress on structure, anchors or fasteners, or reducing performance ability.
 2. Interface between panel and clip shall provide for unlimited thermal movement in each direction along the longitudinal direction.
 3. Location of metal roofing rigid connector shall be at roof ridge unless otherwise approved and designed per job conditions by specified manufacturer.
- B. Uniform wind load capacity. Installed roof system shall withstand positive and negative design wind loading pressures complying with:
1. ASCE 7-95.
 2. Safety Factor of 2.5 reduced for wind to 1.875.
 3. Category I Building with a Importance Factor of 0.87.
 4. Wind Speed of 90 mph.
 5. Ultimate Pullout Value is 428 lbs./screw of the two fasteners holding the clip to the substrate or framing system.
 6. Exposure Category of C.
 7. Mean Roof Height 15 ft.
 8. Minimum Building Width 20 ft.
- C. Design Pressures:
- | | Negative |
|-----------------------------------|----------|
| 1. Roof Panel - Zone 1 (mid-roof) | 19.9psf |
| 2. Ridges & Eaves - Zone 2 | 24.5psf |
| 3. Corners - Zone 3 | 44.4psf |
- D. Capacity shall be determined using pleated airbag method in accordance with
1. (7.1) Roof test specimens shall be either full length or representative of the main body of the roof, free from edge restraint or perimeter attachments, continuous over one or more supports, and containing at least five panel modules for standing seam roof.
 2. (7.1.2) No attachments shall be permitted at sides or end perimeter other than those that occur uniformly throughout roof. Side and end seals shall be flexible and in no way restrain crosswise distortion of panels.
 3. (7.2.1) Panels and accessories shall be production materials of same type and thickness proposed for use on project.
- E. Installed roof system shall carry positive uniform design loads with a maximum system deflection of $L/180$ as measured at the rib (web) of the panel.
- F. Underwriters' Laboratories, Inc., (UL), wind uplift resistance classification: Roof assembly shall be classified as Class UL90, as defined by UL 580.
- G. Underwriters' Laboratories, Inc., (UL) fire resistance P ratings for roof assemblies. Underwriters' Laboratories, Inc., (UL) Class A fire rating per UL 790.
- H. Water penetration (dynamic pressure): No water penetration, other than condensation, when exposed to dynamic rain and 70 mph wind velocities for not less than five minutes duration, when tested in accord with principles of AAMA 501.1.
- I. Factory Mutual Research (FM), wind uplift resistance classification: Roof assembly shall be classified as FM 1-120 (this classification is for RMS-12 panel, 22 gauge steel only).
- J. Capacities for gauge, span or loading other than those tested may be determined by interpolation of test

results within the range of test data. Extrapolation for conditions outside test range are not acceptable.

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data:
 - 1. Include manufacturer's detailed material and system description, sealant and closure installation instructions, engineering performance data and finish specifications.
 - 2. Indicate fastener types and spacings; and provide fastener pullout values.
 - 3. Submit copy of manufacturer's minimum design load calculations according to ASCS-7-95.
- C. Shop drawings:
 - 1. Show roofing system with flashings and accessories in plan and elevation; sections and details.
 - 2. Include metal thickness' and finishes, panel lengths, joining details, anchorage details, flashings and special fabrication provisions for termination and penetrations; purlin and girt locations, thermal expansion provisions and special supports.
 - 3. Indicate relationships with adjacent and interfacing work.
 - 4. Shop drawings must be completed by the metal panel manufacturer's engineering department.
 - 5. Any and/or all changes recommended by the successful bidder must be approved by the manufacturer in writing prior to submittal.

1.06 QUALITY ASSURANCE

- A. INSTALLER QUALIFICATIONS:
 - 1. Engage an experienced metal roofing contractor (erector) to install standing seam system who has a minimum of three (3) years experience specializing in the installation of structural standing seam metal roof systems.
 - 2. Contractor must be certified by manufacturer specified as supplier of structural standing seam system and obtain written certification from manufacturer that installer is approved for installation of specified system. If requested, contractor must supply owner with a copy of this certification.
 - 3. Successful contractor is required to maintain a full-time supervisor/foreman who is on the job-site at all times during installation of new roof system. Foreman must have a minimum of five (5) years experience with the installation of system similar to that specified.
 - 4. Successful contractor must obtain all components of roof system from a single manufacturer including any roll good materials if required. Any secondary products that are required which cannot be supplied by the specified manufacturer must be recommended and approved in writing by primary manufacturer prior to bidding.
 - 5. If required, fabricator/installer shall submit work experience and evidence of adequate financial responsibility. The owners representative reserves the right to inspect fabrication facilities in determining qualifications.
- B. MANUFACTURERS QUALIFICATIONS: The materials outlined in the Material and Method Specifications are the type of materials that should be used on this project. Bidder will not be allowed to supply panels formed at the job-site on portable rollformers; metal panels must be pre manufactured and engineered for this project. Bidder will not be allowed to change materials after the bid opening date. If the bidder wishes to propose an alternate manufacturer and/or material than that specified, the following manufacturer criteria must be submitted with the bid.
 - 1. Submit certified test reports from a testing laboratory that bear the stamp of a registered P.E. to show compliance with specified performance criteria. Test reports must meet the specified negative uplift pressures as listed per this specification for the gauge, panel width and clip spacing specified as confirmed by manufacturers ASTM-E 1592 test results.
 - 2. Tests shall have been made for identical systems within the ranges of specified performance criteria.
 - 3. Empirical calculations for roof performance shall only be acceptable for positive loads.
 - 4. Indicate fastener types and spacings and provide fastener pullout values.

5. Submit copy of UL 90 classification in accordance with UL 580 test procedure.
6. Submit copy of certification from manufacturer stating that specified system has been tested in accordance with ASTM-1592 requirements by an independent Engineering Firm. All test results must be submitted including Air (ASTM E 283 & E1680) and Water (ASTM E 331 & E 1646) Infiltration Tests and meet or exceed those listed in Section 1.8 (Design and Performance Criteria)
7. A list of a minimum of five (5) jobs where the proposed alternate material was used under similar conditions. The reference list shall include date of project, size of project, address and contact telephone number.
8. A financial statement demonstrating a current ratio of 2:1 (current assets to current liabilities).
9. A written statement from the manufacturer stating that they will provide the building owner with a daily site inspection for a minimum of one (1) hour by an experienced, full time employee of the company.
10. A written statement from a corporate officer of the manufacturing company stating that he or she has reviewed the specifications and confirms that the proposed system meets or exceeds all performance requirements listed as well as meets the panel size, gauge, weight, clip design, sealant design, uplift pressures and height of the vertical seam.
11. A copy of manufacturer's 30 year warranty.
12. Submit sample of panel section, at least 6" x 6" showing seam profile and also a sample of color selected.
13. Submit sample of panel clip.
14. Submit sample of purlin (Z) and/or bearing plate if required.
15. Submit sample of base sheet, roll goods and/or mastics if required.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Protect components during fabrication and packing from mechanical abuse, stains, discoloration, and corrosion.
- B. Provide protective interleaving between contact areas of exposed surfaces to prevent abrasion during shipment, storage, and handling.
- C. Store materials off ground providing for drainage; under cover providing for air circulation; and protected from wind movement, foreign material contamination, mechanical damage, cement, lime or other corrosive substances.
- D. Handle materials to prevent damage to surfaces, edges and ends of roofing sheets and sheet metal items. Damaged material shall be rejected and removed from the site.
- E. Protect panels from wind-related damages.
- F. Inspect materials upon delivery. Reject and remove physically damaged or marred material from project site.

1.08 PROJECT CONDITIONS

- A. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage requirements for preformed metal roofing system.
- B. Protection:
 1. Provide protection or avoid traffic on completed roof surfaces.
 2. Do not overload roof with stored materials.
 3. Support no roof-mounted equipment directly on roofing system.
- C. Ascertain that work of other trades which penetrates the roof or is to be made watertight by the roof is in place and approved prior to installation of roofing.

1.09 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Owner shall receive ONE (1) WARRANTY from manufacturer of roof panels covering ALL of the following criteria. Multiple warranties are NOT acceptable.
 - 1. Manufacturer's 30 year limited watertight warranty.
 - 2. 20 year coverage on finish including checking, crazing, peeling, chalking, fading and/or adhesion.
 - 3. 20 year material coverage.
 - 4. Warranty shall commence on date of substantial completion.
 - 5. Installer shall provide manufacturer with 2 year warranty covering roofing system installation and watertightness.

1.10 PART 2 PRODUCTS

- A. METAL ROOFING SYSTEM:
- B. Whenever a particular make of material, trade name and/or manufacturer's name is specified herein, it shall be regarded as being indicative of the minimum standard of quality required. A bidder who proposes to quote on the basis of an alternate material and/or system will only be considered if the proposed alternate is submitted on time and is documented as being equivalent or superior in quality to the specified system as described in these specifications. Additionally, all manufacturer and contractor/fabricator guidelines must be met as specified.
- C. Product names for the metal roof panel system and waterproofing materials used in this section shall be based on performance requirements from materials manufactured by the Garland Company, Cleveland, OH. and form the basis of the contract documents. Any proposed alternate systems must meet or exceed the following listed characteristics and be submitted for approval 10 days prior to bid opening.
 - 1. Panel material: **24 ga., Galvalume steel, type AZ-55, grade 50 B, smooth as per ASTM A792-96.
 - 2. Flashing and flat stock material: Fabricate in profiles indicated on drawings of same material, thickness, and finish as roof system, unless indicated otherwise.
- D. Configuration: Standing seams incorporating mechanically interlocked, concealed anchor clips allowing unlimited thermal movement, and of configuration which will prevent entrance or passage of water.
 - 1. Panel/Cap configuration must have a total of four (4) layers of steel surrounding anchor clip for prevention of water infiltration and increased system strength designed to limit potential for panel blow-off.
 - 2. Profile of panel shall have mesa's every 1/2" o.c. continuous throughout panel which are a minimum of 1.5" wide. These will absorb thermal stresses, reduce oil canning in panel and increase load carrying capacity.
 - 3. Exposed fasteners, screws and/or roof mastic is unacceptable and will be rejected. System configuration only allows for exposed fasteners at panel overlap (if required) and trim details (as per manufacturer's guidelines)
 - 4. Panels must be furnished in continuous lengths from ridge to eave with no overlaps unless approved by manufacturer to length of run.
 - 5. Seam must be 2-3/8" minimum height for added upward pressures and aesthetic appeal. Seam shall have continuous anchor reveals to allow anchor clips to resist positive and negative loading and allow unlimited expansion and contraction of panels due to thermal changes. Integral (not mechanically sealed) seams are not acceptable.
- E. Concealed Anchor Clips: Clips must be 16 guage, 40,000 p.s.i. (G-90 galvanized steel) ONE (1) piece clip with projecting legs for additional panel alignment and provision for unlimited thermal movement in each direction along the longitudinal dimension.
 - 1. Two-piece (2) clips are NOT acceptable.
 - 2. Clip design must isolate sealant in panel cap from clip to insure that no sealant damage occurs from

the clip during expansion and contraction.

3. Clip must maintain a clearance of a minimum of 3/8" between panel and substrate for proper ventilation to help prevent condensation on underside of panel and eliminate the contact of panel fastener head to panel.
- F. Batten Seam Styles: Aluminum alloy 6061-T6, minimum thickness .060"
- G. Seam cap: Snap-on cap shall be a minimum of 1" wide "T" shaped of continuous length up to 45 feet according to job condition and field seamed by means of manufacturer's standard seaming machine.
1. Cap shall be designed to receive continuous double bead of hot applied, foamed in place gasketing sealant which will not come in contact with the anchor clip to allow unlimited thermal movement of panel without damage to cap sealant.
- H. Sealant shall be non-fatigue, nitrogen injected water barrier.
- I. Standing Seam Panel Width: (18")

1.11 ACCESSORIES:

- A. Gable anchor clips: Standing Seam and Batten Seam styles aluminum alloy 6061-T6 minimum thickness .090".
- B. Fasteners:
1. Concealed fasteners: Corrosion resistant steel screws designed to meet structural loading requirements. The normal minimum screw size shall be #14.
 2. Exposed fasteners: Corrosion resistant steel screws (cadmium or zinc coatings are not acceptable) of R-MER SPAN series stainless steel with neoprene sealing washer, or 3/16" diameter waterproof rivets.
- C. Closures: Factory pre-cut closed cell foam meeting ASTM D3575-93 a cross-linked closed cell polyolefin foam, enclosed in metal channel matching panels when used at hip and ridge.
- D. Panel joint (endlap) sealant: Non-curing modified isobutylene tri-polymer tape of thickness to fully adhere to both surfaces being joined with indicated service life of 20 years.
- E. Provide all miscellaneous accessories for complete installation.

1.12 FABRICATION

- A. Shop fabricate metal roofing and flashing components to the maximum extent possible, forming metal work with clear, sharp, straight, and uniform bends and rises. Hem exposed edges of flashings.
- B. Form flashing components from full single width sheet in minimum 10'-0" sections. Provide mitered corners, joined using closed end pop rivets and joint sealant.
- C. Fabricate roofing and related sheet metal work in accord with approved shop drawings and applicable standards.

PART 3 EXECUTION

2.01 EXAMINATION AND PREPARATION

- A. Verify the alignment and placement of the building structure and substrate. Correct any objectionable warp, waves or buckles in the substrate before proceeding with installation of the preformed metal roofing. The installed roof panels will follow the contour of the structure and may appear irregular if not corrected.

- B. Establish straight side and crosswise benchmarks.
- C. Use proper size and length fastener for strength requirements. Approximately 5/16" is allowable for maximum fastener head size beneath the panel.
- D. Rectangular Roofs shall be checked for square and straightness. Gable ends may not be straight; set a true line for the gable clips and flashing with stringline.
- E. Measure the roof lengthwise to confirm panel lengths, overhangs, coverage of flashings at eaves and ridges and verify clearances for thermal movement.

2.02 INSTALLATION

- A. All details will be shown on manufacturer's shop drawings to successful bidder; install roofing and flashings in accordance with approved shop drawings and manufacturer's product data, within specified erection tolerances.
- B. Install insulation as per manufacturers recommendations if required.
- C. Directly over insulation, install a 40 mil layer of Ice & Water Shield per the metal manufacturer's shop drawings.
- D. Directly over the Ice & Water Shield, install 3" x 5" (16 gauge) pre-punched bearing plates with the 16 gauge one piece panel clips. All clips will be set on bearing plates over the two pre-slotted holes and fastened through the insulation and into the deck based on the following spacing pattern.
 - 1. Clip spacing must be 5'-4" for Zone 1 (field)
 - 2. Clip spacing must be 4'-9" for Zone 2 (eave, ridge etc.)
 - 3. Clip spacing must be 3'-2" for Zone 3 (corners)
- E. Installation of Roof Panels: Roof panels can be installed by starting from either end and working towards the opposite end. Due to the symmetrical design of the specified panel system, it is also acceptable to start from the middle of the roof and work toward each end.
 - 1. A stainless steel pop rivet shall be secured through the anchor reveal of the panel leg and extend into the arms of the panel clip located at the ridge of the system. This is done at each arm of the clip along the ridge. The panel is then anchored at both sides of the clip. Be sure to capture all drilling debris during this operation with a rag or cloth placed on the panels at the drilling operation.
 - 2. The seam caps are shipped with two rolls of factory applied hot melt sealant located inside the caps. To install the caps, hook one side of the cap over the panel edge and rotate over the opposite panel leg. For ease of installation, start at one end of the panel and work toward the opposite end.
 - 3. A hand crimping tool is used to crimp the cap around the top of two adjacent panels
 - 4. Caps shall then be permanently seamed with manufacturers mechanical seamer.
- F. Isolate dissimilar metals and masonry or concrete from metals with bituminous coating. Use gasketed fasteners where required to prevent corrosive action between fastener, substrate, and panels.
- G. Limit exposed fasteners to extent indicated on shop drawings.
- H. Anchorage shall allow for temperature expansion/contraction movement without stress or elongation of panels, clips, or anchors. Attach clips to structural substrate using fasteners of size and spacing as determined by manufacturer's design analysis to resist specified uplift and thermal movement forces.
- I. Seal laps and joints in accordance with roofing system manufacturer's product data.
- J. Coordinate flashing and sheet metal work to provide weathertight conditions at roof terminations. Fabricate

and install in accordance with standards of SMACNA Manual.

- K. Provide for temperature expansion/contraction movement of panels at roof penetrations and roof mounted equipment in accordance with system manufacturer's product data and design calculations.
- L. Installed system shall be true to line and plane and free of dents, and physical defects with a minimum of oil canning.
- M. Form joints in linear sheet metal to allow for 1/4" minimum expansion at 20'-0" o.c. maximum and 8'-0" from corners.
- N. At joints in linear sheet metal items, set sheet metal items in two 1/4" beads of butyl sealant. Extend sealant over all metal surfaces. Mate components for positive seal. Allow no sealant to migrate onto exposed surfaces.
- O. Remove damaged work and replace with new, undamaged components.
- P. Touch up exposed fasteners using paint furnished by roofing panel manufacturer and matching exposed panel surface finish.
- Q. Clean exposed surfaces of roofing and accessories after completion of installation. Leave in clean condition at date of substantial completion. Touch up minor abrasions and scratches in finish.

END OF SECTION

SECTION 07550

MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Modified bituminous roofing membrane, protected membrane application.
- B. Base flashings.
- C. Roofing cant strips, accessories, and walkway pads.

1.02 RELATED SECTIONS

- A. Section 06100 - Rough Carpentry: Wood nailers and cant strips.
- B. Section 07221 - Roof Insulation.
- C. Section 07620 - Sheet Metal Flashing and Trim: Counterflashings and fascia gravelstops.
- D. Section 07724 - Roof Hatches: Counterflashings.

1.03 REFERENCES

- A. ASTM D 1079 - Terminology Relating to Roofing, Waterproofing, and Bituminous Materials
- B. ASTM D - 1227 Specification for Emulsified Asphalt Used as a Protective Coating for Roofing
- C. ASTM D 451 - Test Method for Sieve Analysis of Granular Mineral Surfacing for Asphalt Roofing Products.
- D. ASTM D 1863 - Standard Specification for Mineral Aggregate Used on Built-Up Roofs; 1993 (Reapproved 1996).
- E. ASTM D 2178 - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing; 1997a.
- F. ASTM D 2824 - Specification for Aluminum-Pigmented Asphalt Roof Coating
- G. ASTM D - 4601 Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing
- H. ASTM D - 5147 1991 Test Method for Sampling and Testing Modified Bituminous Sheet Materials
- I. ASTM E - 108 Test Methods for Fire Test of Roof Coverings
- J. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.
- K. FM DS 1-28 - Insulated Steel Deck Construction; Factory Mutual Research Corporation; 1991.
- L. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; National Roofing Contractors Association; Fourth Edition.
- M. UL (RMSD) - Roofing Materials and Systems Directory; Underwriters Laboratories Inc.; current edition.

- N. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating membrane and bitumen materials, base flashing materials.
- C. Shop Drawings: Indicate joint or termination detail conditions.
- D. Manufacturer's Installation Instructions: Indicate special procedures.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Northern Kentucky Water Service District 's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with NRCA Roofing and Waterproofing Manual.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 5 years of documented experience.
- C. Applicator Qualifications: Company specializing in performing the work of this section with minimum 5 years experience and approved by manufacturer.

1.06 PRE-INSTALLATION MEETING

- A. Convene one week before starting work of this section.
- B. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.
- B. Store products in weather protected environment, clear of ground and moisture.

1.08 PROJECT CONDITIONS

- A. Coordinate the work with installation of associated counterflashings installed by other sections as the work of this section proceeds.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply roofing membrane during unsuitable weather or when a 40% chance of precipitation is expected.
- B. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

- D. All work must be fully completed on each day. Phased construction will not be accepted.

1.10 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a two year period after Date of Substantial Completion.
- C. Membrane manufacturer will provide an annual inspection for the life of the warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Products specified in this section are as manufactured by The Garland Company.

2.02 GENERAL

- A. When a particular trade name or performance standard is specified it shall be indicative of a standard required.
- B. Any item or materials submitted as an alternate to the manufacturer specified must comply in all respects as to the quality and performance, including job site investigation of the brand name specified. The Architect/Owner shall be the sole judge as to whether or not an item submitted as an equal is truly equal. Should the contractor choose to submit on the equal basis, he shall assume all risk involved, monetary or otherwise, should the Architect/Owner find it unacceptable.

2.03 DESCRIPTION

- A. Modified bituminous roofing work including but not limited to:
1. Two plies of ASTM D-2178 Type IV glass fiber roofing felt bonded to the prepared substrate with hot bitumen.
 2. The hot bitumen will consist of ASTM D-312 Type IV special steep asphalt.
 3. All flashings will be set in bitumen and will be one ply of Type IV felt covered by an additional layer of modified bitumen membrane.
 4. The modified membrane will be: STRESSPLY "E" FR, 80 mil SIS/SBS (Styrene-Isoprene-Styrene/Styrene-Butadiene-Styrene) rubber modified roofing with fire retardant characteristics and a reinforced dual fiberglass scrim and polyester mat.
 5. The surfacing will be ASTM D-1863 roofing aggregate consisting of pea gravel.
- B. BITUMINOUS MATERIALS.
1. Asphalt Primer: V.O.C. compliant, ASTM D-41.
 2. Asphalt Roofing Mastic: V.O.C. compliant, ASTM D-2822, Type II.
 3. Asphalt: Shall meet ASTM Specification D-312 Type IV.
- C. SHEET MATERIALS
1. FELT PLIES: Fiberglass Felts: ASTM D-2178, TYPE IV.
 2. BASE FLASHING PLY: Type IV Fiberglass Felt.
 3. MODIFIED FLASHING PLY: STRESSPLY "E" FR
 4. MODIFIED MEMBRANE: STRESSPLY "E" FR
 - a. TENSILE STRENGTH (ASTM D-5147)
 - 1) 2 in/min. @ 73.4 ± 3.6 °F MD 275 lbf/in. CMD 335 lbf/in.
 - 2) (50 mm/min. @ 23 ± 3 °C) (MD 48.0 kN/m) (CMD 58.5 kN/m)
 - b. ELONGATION at MAXIMUM TENSILE (ASTM D-5147)

- 1) 2 in/min. @ 73.4 ± 3.6 °F MD 6.0%
- 2) (50 mm/min. @ 23 ± 3 °C) CMD 6.0%
- c. TEAR STRENGTH (ASTM D-5147)
 - 1) 2 in/min. @ 73.4 ± 3.6 °F MD 525 lbf. CMD 650 lbf.
 - 2) (50 mm/min. @ 23 ± 3 °C) (MD 2335 N) (CMD 2900 N)
- d. LOW TEMPERATURE FLEX. (ASTM D-5147)
 - 1) passes -35 °F (-37 °C)
5. RELATED MATERIALS
 - a. Roof Insulation: Reference Section 07221 - Roof Insulation for requirements.
 - b. Roof Insulation Fasteners: Reference Section 07221 - Roof Insulation for requirements.
 - c. Nails and Fasteners: Non-ferrous metal or galvanized steel, except that hard copper nails shall be used with copper; aluminum or stainless steel nails shall be used with aluminum; and stainless steel nails shall be used with stainless steel. Nails and fasteners shall be flush-driven through flat metal discs of not less than 1-inch diameter. Metal discs may be omitted when one piece composite nails or fasteners with heads not less than 1-inch diameter are used.
 - d. Metal Discs: Flat discs or caps of zinc-coated sheet metal not lighter than 28 gauge and not less than 1-inch in diameter. Discs shall be formed to prevent dishing. Bell or cup-shaped caps are not acceptable.
 - e. Walk-way Pads: As recommended and furnished by the membrane manufacturer.
 - 1) Ultra-Shield Walkway Pad
 - a) Tensile Strength (ASTM D-412, D-2240) 525-550 PSI
 - b) Elongation (ASTM D-412, D-2240) 70-80%
 - c) Tear Strength (ASTM D-624) 100-117 lbs./in.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 GENERAL INSTALLATION REQUIREMENTS

- A. Cooperate with manufacturer, inspection and test agencies engaged or required to perform services in connection with installing modified bitumen roofing system.
- B. Insurance/Code Compliance: Where required, install and test modified bitumen roofing system to comply with governing regulations and specified insurance requirements.
- C. Protect other work from spillage of modified bitumen roofing materials, and prevent liquid materials from entering or clogging drains and conductors. Replace or restore other work damaged by installations of modified bituminous roofing system work.
- D. Coordinate installing roofing system components so that insulation and roofing plies are not exposed to precipitation or left exposed overnight. Provide cut offs at end of each day's work to cover exposed ply sheets and insulation with two (2) plies of #15 organic felt set in full moppings of bitumen and with joints and

edges sealed with roofing cement. Remove cut offs immediately before resuming work.

- E. Asphalt Bitumen Heating: Heat and apply bitumen according to EVT Method as recommended by NRCA. Do not raise temperature above minimum normal fluid-holding temperature necessary to attain EVT (plus 5 °F at point of application) more than 1 hour prior to time of application. Determine flash point, finished blowing temperature, EVT, and fire-safe handling temperature of bitumen either by information from manufacturer or by suitable test. Do not exceed recommended temperature limits during bitumen heating. Do not heat to a temperature higher than 25° below flash point. Discard bitumen that has been held at temperature exceeding finishing blowing temperature (FBT) for more than 3 hours. Keep kettle lid closed except when adding bitumen.
- F. Bitumen Mopping Weights: For interply mopping, apply bitumen at the rate of approximately 25 lb of asphalt per roof square (plus or minus 25 percent on a total job average basis).
- G. Substrate Joint Penetrations: Prevent bitumen from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.
- H. Apply roofing materials as specified herein unless recommended otherwise by manufacturer's instructions. Keep roofing materials dry before and during application. Do not permit phased construction. Complete application of roofing plies, modified sheet and flashing in a continuous operation. Begin and apply only as much roofing in one day as can be completed that same day.
- I. Cut-Offs: At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets and insulation. Provide temporary covering of two (2) plies of #15 organic roofing felt set in full moppings of bitumen with joints and edges sealed.
- J. FELT Ply Installation
 1. Fiberglass Plies: Install (2) two fiberglass ply sheets in 25 lbs. per square of bitumen shingled uniformly to achieve two plies throughout over the prepared substrate. Shingle in proper direction to shed water on each area of roof.
 2. Lap ply sheet ends eight inches. Stagger end laps twelve inches minimum.
 3. Extend plies two inches beyond top edges of cants at wall and projection bases.
 4. Install base flashing ply to all perimeter and projections details.
- K. HPR Modified Membrane Application
 1. The modified membrane shall then be solidly bonded to the base layers with specified asphalt at the rate of 30 to 35 lbs. per 100 square feet.
 2. The roll must push a puddle of asphalt in front of it with asphalt slightly visible at all side laps. Care should be taken to eliminate air entrapment under the membrane.
 3. Apply pressure to all seams to ensure that the laps are solidly bonded to substrate.
 4. Subsequent rolls of modified shall be installed across the roof as above with a minimum of 4" side laps and 8" end laps. The end laps shall be staggered. The modified membrane shall be laid in the same direction as the underlayers, but the laps shall not coincide with the laps of the base layers.
 5. Apply asphalt no more than five feet ahead of each roll being embedded.
 6. Extend membrane 2" beyond top edge of all cants in full moppings of the specified asphalt as shown on the drawings.
- L. Flashing Membrane Installation (GENERAL)
 1. All curb, wall and parapet flashings shall be sealed with an application of mastic and mesh on a daily basis. No condition should exist that will permit moisture entering behind, around, or under the roof or flashing membrane.
 2. Prepare all walls, penetrations and expansion joints to be flashed and where shown on the drawings, with asphalt primer at the rate of one gallon per 100 square feet. Allow primer to dry tack free.
 3. The modified membrane will be used as the flashing membrane and will be adhered to an underlying base flashing ply with specified asphalt unless otherwise noted in these specifications and nailed off 8"

- O.C. at all vertical surfaces.
4. The entire sheet of flashing membrane must be solidly adhered to the substrate.
 5. Seal all vertical laps of flashing membrane with a three course application of Flashing Bond and fiberglass mesh.
 6. Counter flashing, cap flashings, expansion joints, and similar work to be coordinated with modified bitumen roofing work are specified in other sections.
 7. Roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices to be coordinated with modified bituminous roof system work are in other sections.

M. APPLICATION OF SURFACING

1. **Aggregate Surfacing**
 - a. Apply surfacing materials in the quantities specified (500 lbs. per square for aggregate - 400 lbs. per square for slag) after felt flashings, tests, repairs, and corrective actions have been completed and approved. Uniformly embed aggregate in a flood coat of bitumen at a rate of 60 lbs per square coverage. This project shall require the application of a double flood coat and gravel.
 - b. Aggregate shall be dry and placed in a manner required to form a compact, embedded overlay. To aid in proper embedment, aggregate may be lightly rolled, provided that there is not damage to the built-up roofing membrane.
2. **CLEANING**
 - a. Remove drippage of bitumen from all walls, windows, floors, ladders, and finished surfaces.
 - b. In areas where finished surfaces are soiled by asphalt or any other sources of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their instructions.
3. **FINAL INSPECTION**
 - a. At completion of roofing installation and associated work, meet with Installer, installer of associated work, Owner, roofing system manufacturer's representative, and other representatives directly concerned with the performance of the roofing system.
 - b. Walk roof surface areas of the building, inspect perimeter building edges as well as flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each party attending.
 - c. The Roofing System Manufacturer reserves the right to request a thermographic scan of the roof during final inspection to determine if any damp or wet materials have been installed. The thermographic scan shall be provided by the Roofing Contractor at a negotiated price.
 - d. If core cuts verify the presence of damp or wet materials, the Roofing Contractor shall be required to replace the damaged areas at his own expense.
 - e. Repair or replace (as required) deteriorated or defective work found at time above inspection to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
 - f. The Contractor is to notify the Owner upon completion of corrections.
 - g. Following the final inspection, acceptance will be made in writing by the material manufacturer.

END OF SECTION

SECTION 07620

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flashings, counterflashings, gutters, and downspouts.

1.02 RELATED SECTIONS

- A. Section 07411 - Metal Roof Panels
- B. Section 07900 - Joint Sealers.

1.03 REFERENCES

- A. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 1996.
- B. ASTM B 370 - Standard Specification for Copper Sheet and Strip for Building Construction; 1992.
- C. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 1993.
- D. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 1993, Fifth Edition.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.
- B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials which may cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

- A. Pre-Finished Galvanized Steel: ASTM A 653/A 653M, with G90/Z275 zinc coating; 0.02 inch core steel, shop pre-coated with modified silicone coating of color as selected.
- B. Copper: ASTM B370, cold rolled 16 oz/sq ft thick; natural finish.

2.02 ACCESSORIES

- A. Fasteners: Stainless steel, with soft neoprene washers.
- B. Wedges: Lead, spaced 16" on center.
- C. Protective Backing Paint: Zinc chromate alkyd.
- D. Sealant: Type A specified in Section 07900.
- E. Plastic Cement: ASTM D 4586, Type I.

2.03 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Tin edges of copper sheet to be soldered. Solder shop formed metal joints. After soldering, remove flux. Wipe and wash solder joints clean. Weather seal joints.
- F. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- G. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

2.04 GUTTER AND DOWNSPOUT FABRICATION

- A. Gutters: SMACNA Architectural Sheet Metal Manual, Rectangular profile.
- B. Downspouts: Rectangular profile.
- C. Accessories: Profiled to suit gutters and downspouts.
 - 1. Anchorage Devices: In accordance with SMACNA requirements.
 - 2. Gutter Supports: Brackets.
 - 3. Downspout Supports: Brackets.
- D. Downspout Boots: Cast iron.
- E. Seal metal joints.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Conform to drawing details:
 - 1. See drawings for *SMACNA Architectural Sheet Metal Manual* references for required details.
- B. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
- C. Apply plastic cement compound between metal flashings and masonry.
- D. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- E. Seal metal joints watertight.
- F. Secure gutters and downspouts in place using concealed fasteners.
- G. Slope gutters 1/4 inch per foot minimum.
- H. Connect downspouts to downspout boots. Grout connection watertight.

END OF SECTION

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SECTION 07724

ROOF HATCH AND EXPLOSION VENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 REFERENCES

- A. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.
- B. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on unit construction, sizes, configuration, jointing methods and locations when applicable, and attachment method.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Roof Hatches:
 - 1. BilcoCo.; Product as detailed on drawings.
- B. Equivalent products by other manufacturers, as judged by the Architect, are acceptable.
- C. Substitutions: See Section 01600 - Product Requirements.

2.02 ROOF HATCHES

- A. Unit: Single leaf type, listed by FM.
 - 1. Size as indicated on the drawings.
- B. Integral Steel Curb: 14 gage galvanized steel with 1.0 inch rigid glass fiber insulation; integral cap flashing to receive roof flashing; extended flange for mounting.
- C. Flush Aluminum Cover: 11 gage mill finish aluminum; 1 inch glass fiber insulation; 18 gage aluminum interior liner; continuous neoprene gasket to provide weatherproof seal.
- D. Hardware: Cadmium plated finish:
 - 1. Compression spring operator and shock absorbers.
 - 2. Steel manual pull handle for interior operation.
 - 3. Steel hold open arm with vinyl covered grip handle for easy release.
 - 4. Automatic opening upon explosion pressures of between 25 lb/sf and 30 lb/sf on the underside of the cover.
 - 5. Hinges: Manufacturer's recommended type.
- E. Accessories: Safety Railing, pop-up style extending above the curb.

2.03 FABRICATION

- A. Fabricate components free of visual distortion or defects. Weld corners and joints.
- B. Provide for removal of condensation occurring within components or assembly.
- C. Fit components for weather tight assembly.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Coordinate with installation of roofing system and related flashings for weather tight installation.
- C. Apply bituminous paint on surfaces of units in contact with cementitious materials or dissimilar metals.
- D. Adjust hinges for smooth operation.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sealants and joint backing.

1.02 REFERENCES

- A. ASTM C 834 - Standard Specification for Latex Sealants; 1995.
- B. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 1995.
- C. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 1991 (Reapproved 1995).
- D. ASTM D 1667 - Standard Specification for Flexible Cellular Materials--Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam); 1976 (Reapproved 1990).

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating sealant chemical characteristics.
- C. Samples: Submit two samples, 1/4 x 2 inch in size illustrating sealant colors for selection.

1.04 ENVIRONMENTAL REQUIREMENTS

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

1.05 COORDINATION

- A. Coordinate the work with all sections referencing this section.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Silicone Sealants:
 - 1. GE Silicones; Product Silglaze II.
 - 2. Substitutions: See Section 01600 - Product Requirements.
- B. Polyurethane Sealants:
 - 1. Bostik.
 - 2. ChemRex Inc. (Sonneborn).
 - 3. Pecora Corporation.
 - 4. Tremco, A BFGoodrich Specialty Chemicals Company.
 - 5. Substitutions: See Section 01600 - Product Requirements.
- C. Polysulfide Sealants:

1. ChemRex Inc. (Sonneborn).
2. Pecora Corporation.
3. Substitutions: See Section 01600 - Product Requirements.

D. Acrylic Emulsion Latex Sealants:

1. Bostik.
2. Pecora Corporation.
3. ChemRex Inc. (Sonneborn).
4. Tremco, A BFGoodrich Specialty Chemicals Company.
5. Substitutions: See Section 01600 - Product Requirements.

2.02 SEALANTS

- A. Type A - General Purpose Exterior Sealant: Polyurethane or Polysulfide; ASTM C 920, Grade NS, Class 25, Uses M, G, and A; single or multi- component.
1. Color: Standard colors matching finished surfaces.
 2. Applications: Use for:
 - a. Control, expansion, and soft joints in masonry.
 - b. Joints between concrete and other materials.
 - c. Joints between metal frames and other materials.
 - d. Other exterior joints for which no other sealant is indicated.
- B. Type E - Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.
1. Product: Chem-Calk Butyl Sealant manufactured by Bostik.
 2. Applications: Use for:
 - a. Concealed sealant bead in sheet metal work.
- C. Type F - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, single component, paintable.
1. Color: Standard colors matching finished surfaces.
 2. Applications: Use for:
 - a. Interior wall and ceiling control joints.
 - b. Joints between door and window frames and wall surfaces.
 - c. Other interior joints for which no other type of sealant is indicated.
- D. Type G - Bathtub/Tile Sealant: White silicone; ASTM C 920, Uses M and A; single component, mildew resistant.
1. Applications: Use for:
 - a. Joints between plumbing fixtures and floor and wall surfaces.
- E. Type I - Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C 920, Grade P, Class 25, Uses T, M and A; single component.
1. Approved by manufacturer for wide joints up to 1-1/2 inches.
 2. Color: Standard colors matching finished surfaces.
 3. Applications: Use for:
 - a. Perimeter expansion joints in floors.
- F. Type K - Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C 920, Class 25, Uses T, M and A; single or multi- component.
1. Color: Gray.
 2. Applications: Use for:
 - a. Joints in sidewalks, curbs and where paving abutts walls or other obstructions..
- G. Type S - Silicone Sealant: ASTM C 920, Grade NS, Class 25, Uses NT, A, G, M, O; single component, solvent curing, non-sagging, non-staining, fungus resistant, non-bleeding.

1. Color: Standard colors matching finished surfaces.
2. Product: Silglaze II manufactured by General Electric.
3. Applications: Use for:
 - a. Exposed applications in metal roofing system.

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.
- 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 which might 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 C 1193.
- 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 C 1193.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- D. Install bond breaker where joint backing is not used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave.

3.04 CLEANING

- A. Clean adjacent soiled surfaces.

3.05 PROTECTION OF FINISHED WORK

- A. Protect sealants until cured.

END OF SECTION

SECTION 08111
STANDARD STEEL DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-rated and fire-rated steel doors.
- B. Thermally insulated steel doors.
- C. Glass and glazing.

1.02 RELATED SECTIONS

- A. Section 08112 - Standard Steel Frames.
- B. Section 08710 - Door Hardware.
- C. Section 08800 - Glazing: Glass for doors.
- D. Section 09900 - Paints and Coatings: Field painting of doors.

1.03 REFERENCES

- A. ANSI/CABO A117.1 - American National Standard for Buildings and Facilities - Providing Accessible and Usable Buildings and Facilities; Council of American Building Officials; 1992.
- B. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 1996.
- C. ASTM C 236 - Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box; 1989 (Reapproved 1993).
- D. DHI A115 Series - Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; current edition (ANSI/DHI A115 Series).
- E. NFPA 80 - Standard for Fire Doors and Windows; National Fire Protection Association; 1995.
- F. SDI 100 - Recommended Specifications Standard Steel Doors and Frames; Steel Door Institute; 1991 (ANSI/SDI-100).

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door configurations, location of cut-outs for hardware reinforcement.
- C. Shop Drawings: Indicate door elevations, internal reinforcement, closure method, cut-outs for glazing, and finishes.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of SDI 100 and ANSI A117.1.
- B. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 REGULATORY REQUIREMENTS

- A. Fire Rated Door Construction: Conform to NFPA 252.
- B. Installed Door Assembly: Conform to NFPA 80 for fire rated class as indicated.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Protect doors with resilient packaging sealed with heat shrunk plastic.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.
- C. Break seal on site to permit ventilation.

PART 2 PRODUCTS

2.01 DOORS

- A. Exterior Doors (Thermally Isolated): SDI 100 Grade II, Model 2.
- B. Interior Doors (Non-rated): SDI 100 Grade II, Model 2.
- C. Interior Doors (Fire Rated and Heavy Duty): SDI 100 Grade III, Model 1.
- D. Interior Doors (Fire Rated): SDI 100 Grade I, Model 1.

2.02 DOOR CONSTRUCTION

- A. Face: Steel sheet in accordance with SDI 100.
 - 1. Provide ASTM A 653/A 653M sheet, G60/Z180 coating designation for exterior doors and wet area doors.
- B. End Closure: Channel, 0.047 inches thick, flush.
- C. Core: Manufacturer's standard.
- D. Core: Polystyrene foam for exterior doors.
- E. Thermal Insulated Doors: Total insulation R value of 12, measured in accordance with ASTM C 236.

2.03 ACCESSORIES

- A. Glass: In accordance with Section 08800.
- B. Removable Stops: Rolled steel, rectangular shape, mitered corners; prepared for countersink style screws.
- C. Primer: Zinc chromate type.

2.04 FABRICATION

- A. Hardware Preparation: In accordance with DHI A115 Series.
- B. Fabricate doors with hardware reinforcement welded in place.
- C. Attach fire rated label to each fire rated door unit.

2.05 FINISH

- A. Primer: Baked.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install doors in accordance with SDI 100.
- B. Coordinate installation of glass and glazing.
- C. Coordinate installation of doors with installation of frames specified in Section 08112 and hardware specified in Section 08710.

3.02 ADJUSTING

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

END OF SECTION

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SECTION 08112
STANDARD STEEL FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-rated and fire-rated steel frames.
- B. Thermally insulated steel frames.

1.02 RELATED SECTIONS

- A. Section 08111 - Standard Steel Doors.
- B. Section 08710 - Door Hardware: Hardware and weatherstripping.

1.03 REFERENCES

- A. ANSI/CABO A117.1 - American National Standard for Buildings and Facilities - Providing Accessible and Usable Buildings and Facilities; Council of American Building Officials; 1992.
- B. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 1996.
- C. DHI A115 Series - Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; current edition (ANSI/DHI 115 Series).
- D. NFPA 80 - Standard for Fire Doors and Windows; National Fire Protection Association; 1995.
- E. SDI 100 - Recommended Specifications Standard Steel Doors and Frames; Steel Door Institute; 1991 (ANSI/SDI-100).

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate frame configuration and finishes.
- C. Shop Drawings: Indicate frame elevations, reinforcement, anchor types and spacings, location of cut-outs for hardware, and finish.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of SDI 100 and ANSI A117.1.
- B. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.06 REGULATORY REQUIREMENTS

- A. Fire Rated Frame Construction: Conform to NFPA 252.

- B. Installed Frame Assembly: Conform to NFPA 80 for fire rated class same as fire door.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Accept frames on site in manufacturer's packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 FRAMES

- A. Exterior Frames:
 - 1. Grade II for Door Type 2, 0.058 inch thick material, base metal thickness.
 - 2. Provide ASTM A 653/A 653M sheet, G60/Z180 coating designation.
- B. Interior Frames:
 - 1. Grade II for Door Type 2 and for wood doors, 0.058 inch thick material, base metal thickness.
 - 2. Grade III for Door Type 1a, 0.070 inch thick material, base metal thickness.

2.02 ACCESSORIES

- A. Removable Stops: Rolled steel channel shape, butted corners; prepared for countersink style screws.
- B. Primer: Zinc chromate type.
- C. Silencers: Resilient rubber fitted into drilled hole.
- D. Weatherstripping: Specified in Section 08710.

2.03 FABRICATION

- A. Fabricate frames as welded unit.
- B. Hardware Preparation: In accordance with DHI A115 Series.
- C. Fabricate frames with hardware reinforcement plates welded in place. Provide mortar guard boxes.
- D. Prepare frames for silencers. Provide three single silencers for single doors and mullions of double doors on strike side. Provide two single silencers on frame head at double doors without mullions.
- E. Attach fire rated label to each fire rated door unit.

2.04 FINISH

- A. Primer: Baked.
- B. Coat inside of frame profile with bituminous coating to a thickness of 1/16 inch.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install frames in accordance with SDI 100.

- B. Coordinate installation of glass and glazing.
- C. Coordinate installation of frames with installation of hardware specified in Section 08710 and doors in Section 08111.
- D. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

3.02 ERECTION TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 inch measured with straight edges, crossed corner to corner.

END OF SECTION

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SECTION 08211
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flush wood doors; flush configuration; non-rated.

1.02 RELATED SECTIONS

- A. Section 08112 - Standard Steel Frames.
- B. Section 08710 - Door Hardware.
- C. Section 08800 - Glazing.

1.03 REFERENCES

- A. AWI P-200 - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute; 1997, Seventh Edition, Version 1.0.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cutouts for glazing.
- D. Samples: Submit two samples of door veneer, 12 x12 inch in size illustrating wood grain, stain color, and sheen.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with AWI P-200, Section 1300, Custom Grade.
- B. Finish doors in accordance with AWI P-200, Section 1500, grades identified in schedule.

1.06 DELIVERY, STORAGE, AND PROTECTION

- A. Package, deliver and store doors in accordance with AWI P-200, Section 1300.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 PROJECT CONDITIONS

- A. Coordinate the work with door opening construction, door frame and door hardware installation.

1.08 WARRANTY

- A. See Section 01780 - Closeout Submittals for additional warranty requirements.
- B. Provide warranty for the following term:
 - 1. Interior Doors: Life of installation.
- C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Veneer Doors:
 - 1. Eggers Industries.
 - 2. Southwood Door Company.
 - 3. Weyerhaeuser Architectural Doors.
 - 4. Substitutions: See Section 01600 - Product Requirements.

2.02 DOOR TYPES

- A. Flush Interior Doors: 1-3/4 inches thick; solid core construction; acoustic rated as indicated.

2.03 DOOR CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: AWI P-200, Section 1300, Type PC - Particleboard.

2.04 DOOR FACINGS

- A. Interior Doors - Veneer: Custom grade wood veneer, red oak species, plain sliced, with slip matched grain, for transparent finish.

2.05 ACCESSORIES

- A. Glazing Stops: Wood, of same species as door facing, mitered corners; prepared for countersink style screws.

2.06 FABRICATION

- A. Fabricate doors in accordance with AWI Quality Standards requirements.
- B. Fit door edge trim to edge of stiles after applying veneer facing.
- C. Bond edge banding to cores.
- D. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.
- E. Factory fit doors for frame opening dimensions identified on shop drawings.

- F. Provide edge clearances in accordance with AWI 1600.

2.07 FINISH

- A. Factory finish doors in accordance with AWI P-200, Section 1500 to the following finish designations:
 - 1. Transparent Finish: TR-4, transparent conversion varnish, Premium quality, semi-gloss sheen.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and AWI P-200 requirements.
- B. Trim door height by cutting bottom edges to a maximum of 3/4 inch (19 mm).
- C. Machine cut for hardware.
- D. Coordinate installation of doors with installation of frames specified in Section 08112 and hardware specified in Section 08710.
- E. Coordinate installation of glass and glazing.

3.02 INSTALLATION TOLERANCES

- A. Conform to AWI P-200, Section 1300 for maximum diagonal distortion.
- B. Maximum Vertical Distortion (Bow): 1/8 inch measured with straight edge or taut string, top to bottom, over an imaginary 36 x 84 inches surface area.
- C. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over an imaginary 36 x 84 inches surface area.

3.03 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION

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SECTION 08410

METAL-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass and glass infill panels.
- B. Aluminum doors and frames and door hardware.
- C. Perimeter sealant.

1.02 RELATED SECTIONS

- A. Section 07900 - Joint Sealers: Perimeter sealant and back-up materials.
- B. Section 08800 - Glazing.

1.03 REFERENCES

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 1997.
- B. AAMA 605.2 - Voluntary Specification for High Performance Organic Coatings on Architectural Aluminum Extrusions and Panels; American Architectural Manufacturers Association; 1992, Addendum 1995.
- C. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 1996.
- D. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 1996.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, 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. Warranty: Submit manufacturer warranty and ensure forms have been completed in Northern Kentucky Water Service District's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND PROTECTION

- 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 which bond to aluminum when exposed to sunlight or weather.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.07 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide 10 year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- C. 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. Kawneer.
- B. Other Acceptable Manufacturers:
 - 1. United States Aluminum Corp.
 - 2. Vistawall Architectural Products.
- C. Substitutions: See Section 01600 - Product Requirements.

2.02 COMPONENTS

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Unitized, shop assembly.
 - 2. Color: As selected from manufacturer's standards.
- B. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
 - 1. Framing members for interior applications need not be thermally broken.
 - 2. Glazing stops: Flush.
 - 3. Cross-Section: As indicated on drawings.
- C. Doors: Glazed aluminum.
 - 1. Thickness: 1-3/4 inches.
 - 2. Top Rail: 4 inches wide.
 - 3. Vertical Stiles: 4-1/2 inches wide.
 - 4. Bottom Rail: 8 inches wide.
 - 5. Glazing Stops: Square.
 - 6. Finish: Same as storefront.

2.03 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Fasteners: Stainless steel.

- C. Perimeter Sealant: Type as specified in Section 07900.
- D. Glass: As specified in Section 08800.
- E. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- F. Glazing Accessories: As specified in Section 08800.

2.04 FINISHES

- A. High Performance Organic Finish: AAMA 605.2; multiple coats, thermally cured fluoropolymer system; color as selected from manufacturer's standard colors.
- B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.05 HARDWARE

- A. Door Hardware: Storefront manufacturer's standard type to suit application.
 - 1. Finish on Hand-Contacted Items: Polished stainless steel.
 - 2. Include for each door weatherstripping, sill sweep strip, threshold, pivots, exit device, narrow stile handle latch, and closer.

2.06 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.
- H. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.
 - 1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that wall openings and adjoining air and vapor 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. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Set thresholds in bed of mastic and secure.
- J. Install hardware using templates provided.
- K. Install glass in accordance with Section 08800, using glazing method required to achieve performance criteria.
- L. Install perimeter sealant in accordance with Section 07900.

3.03 ADJUSTING

- A. Adjust operating hardware for smooth operation.

3.04 CLEANING AND PROTECTION

- 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. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Remove excess sealant by method acceptable to sealant manufacturer.
- D. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.
- E. Protect finished work from damage.

END OF SECTION

SECTION 08520
ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Extruded aluminum windows with fixed sash and operating sash.
- B. Site glazing.
- C. Operating hardware.
- D. Insect screens.

1.02 RELATED SECTIONS

- A. Section 07900 - Joint Sealers: Perimeter sealant and back-up materials.
- B. Section 08800 - Glazing.

1.03 REFERENCES

- A. AAMA 605.2 - Voluntary Specification for High Performance Organic Coatings on Architectural Aluminum Extrusions and Panels; American Architectural Manufacturers Association; 1992, Addendum 1995.
- B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 1997.
- C. ASTM A 123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 1989a.
- D. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 1996.
- E. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 1996.
- F. FS RR-W-365 - Wire Fabric (Insect Screening); Federal Specifications and Standards; 1980, Rev. A (Amended 1986).
- G. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).
- H. SSPC-Paint 25 - Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer; Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).

1.04 PERFORMANCE REQUIREMENTS

- A. Performance Requirements: As specified in PART 2, with the following additional requirements:

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions.
- C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations,, and installation requirements.
- D. Certificates: Certify that windows meet or exceed specified requirements.

1.06 DELIVERY, STORAGE, AND PROTECTION

- A. Comply with requirements of AAMA CW-10.
- B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

PART 2 PRODUCTS

2.01 WINDOWS

- A. Windows: Tubular aluminum sections, factory fabricated, factory finished, thermally broken, vision glass, related flashings, anchorage and attachment devices.
 - 1. Performance Requirements: AAMA/NWWDA 101/I.S.2 C30
- B. Fixed, Non-Operable Type:
 - 1. Construction: Thermally broken.
 - 2. Glazing: Double; clear; transparent.
 - 3. Exterior Finish: high performance organic coating.
 - 4. Interior Finish: high performance organic coating.
- C. Outswinging Casement Type:
 - 1. Construction: Thermally broken.
 - 2. Provide screens.
 - 3. Screens: Aluminum.
 - 4. Glazing: Double; clear; transparent.
 - 5. Exterior Finish: high performance organic coating.
 - 6. Interior Finish: high performance organic coating.

2.02 COMPONENTS

- A. Frames: 2 inch wide x 3 inch deep profile, of 1/8 inch thick section; thermally broken with interior portion of frame insulated from exterior portion; flush glass stops of snap-on type.
- B. Reinforced Mullion: 1-1/2 inch profile of extruded aluminum with integral reinforcement of shaped steel structural section.
- C. Insect Screen Frame: Rolled aluminum frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit.
- D. Insect Screens: FS RR-W-365, woven aluminum mesh; 14/18 mesh size.

- E. Operable Sash Weatherstripping: Wool pile; permanently resilient, profiled to achieve effective weather seal.
- F. Fasteners: Stainless steel.
- G. Glass and Glazing Materials: As specified in Section 08800.
- H. Sealant and Backing Materials: As specified in Section 07900.

2.03 MATERIALS

- A. Extruded Aluminum: ASTM B 221 (ASTM B 221M), 6063 alloy, T6 temper.
- B. Concealed Steel Items: Profiled to suit mullion sections; galvanized in accordance with ASTM A 123 to 2.0 oz/sq ft.

2.04 HARDWARE

- A. Sash lock: Lever handle with cam lock. Provide pole handle of 7 feet.
- B. Projecting Sash Arms: Cadmium plated steel, friction pivot joints with nylon bearings, removable pivot clips for cleaning.
- C. Pulls: Manufacturer's standard type.
- D. Limit Stops: Resilient rubber.

2.05 FABRICATION

- A. Fabricate components with smallest possible clearances and shim spacing around perimeter of assembly that will enable window installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- C. Arrange fasteners and attachments to ensure concealment from view.
- D. Prepare components with internal reinforcement for operating hardware.
- E. Provide steel internal reinforcement in mullions as required to meet loading requirements.
- F. Provide internal drainage of glazing spaces to exterior through weep holes.
- G. Assemble insect screen frames with mitered and reinforced corners. Secure wire mesh tautly in frame. Fit frame with four, spring loaded steel pin retainers.
- H. Double weatherstrip operable units.

2.06 FINISHES

- A. High Performance Organic Finish: AAMA 605.2; multiple coats, thermally cured fluoropolymer system; color as scheduled.
- B. Shop and Touch-Up Primer for Steel Components: SSPC-Paint 25, red iron oxide.
- C. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

3.02 INSTALLATION

- A. Install windows in accordance with manufacturer's instructions.
- B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- D. Install sill and sill end angles.
- E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- F. Coordinate attachment and seal of perimeter air barrier and vapor retarder materials.
- G. Install operating hardware not pre-installed by manufacturer.
- H. Install glass in accordance with requirements specified in Section 08800.
- I. Install perimeter sealant in accordance with requirements specified in Section 07900.

3.03 ERECTION TOLERANCES

- A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.04 ADJUSTING AND CLEANING

- A. Adjust hardware for smooth operation and secure weathertight closure.
- B. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.
- C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

END OF SECTION

SECTION 08710
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware for wood and hollow steel doors.
- B. Hardware for fire-rated doors.
- C. Lock cylinders for doors for which hardware is specified in other sections.
- D. Thresholds.
- E. Weatherstripping, seals and door gaskets.

1.02 RELATED SECTIONS

- A. Section 08111 - Standard Steel Doors.
- B. Section 08112 - Standard Steel Frames.
- C. Section 08211 - Flush Wood Doors.
- D. Section 08410 - Metal-Framed Storefronts: Hardware for same except cylinders; installation of cylinders.

1.03 ALLOWANCES

- A. See Section 01210 - Allowances, for allowances affecting this section.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate locations and mounting heights of each type of hardware, schedules, catalog cuts,.
 - 2. Submit manufacturer's parts lists and templates.
- C. Project Record Documents: Record actual locations of installed cylinders and their master key code.
- D. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- E. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Northern Kentucky Water Service District 's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with the following requirements:
 - 1. NFPA 101.
 - 2. NFPA 80.
 - 3. NFPA 252.

- B. **Manufacturer Qualifications:** Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- C. **Hardware Supplier Qualifications:** Company specializing in supplying commercial door hardware with 5 years of experience.

1.06 REGULATORY REQUIREMENTS

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

1.07 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.
- C. Coordinate Northern Kentucky Water Service District 's keying requirements during the course of the Work.

1.08 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year warranty for door closers.

1.09 MAINTENANCE PRODUCTS

- A. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 PRODUCTS

2.01 KEYING

- A. **Door Locks:** Grand master keyed.
 - 1. Include construction keying.
 - 2. Key to existing keying system.
- B. Supply keys in the following quantities:
 - 1. 3 master keys.
 - 2. 1 grand master keys.
 - 3. 1 construction keys.
 - 4. 3 change keys for each lock.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions.

- B. Use templates provided by hardware item manufacturer.
- C. Mounting heights for hardware from finished floor to center line of hardware item: As listed in Schedule, unless otherwise noted:
 - 1. For wood doors: Comply with DHI "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 2. Wood doors: See Section 08211.

3.03 ADJUSTING

- A. Adjust work under provisions of Section 01700.
- B. Adjust hardware for smooth operation.

3.04 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01700.
- B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

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SECTION 08800

GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glass.
- B. Glazing compounds and accessories.

1.02 RELATED SECTIONS

- A. Section 08111 - Standard Steel Doors: Glazed doors.
- B. Section 08211 - Flush Wood Doors: Glazed doors.
- C. Section 08410 - Metal-Framed Storefronts.
- D. Section 08520 - Aluminum Windows: Glazed windows.

1.03 REFERENCES

- A. ASTM C 864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 1993.
- B. ASTM C 1036 - Standard Specification for Flat Glass; 1991.
- C. ASTM E 773 - Standard Test Methods for Seal Durability of Sealed Insulating Glass Units; 1988 (Reapproved 1993).
- D. ASTM E 774 - Standard Specification for Sealed Insulating Glass Units; 1992.
- E. GANA (GM) - GANA Glazing Manual; Glass Association of North America; 1997.
- F. GANA (SM) - FGMA Sealant Manual; Glass Association of North America; 1990.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.

1.06 ENVIRONMENTAL REQUIREMENTS

- 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.

1.07 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide a ten (10) year warranty to include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

PART 2 PRODUCTS

2.01 FLAT GLASS MATERIALS

- A. Manufacturers:
 - 1. LOF, Libby-Owens-Ford Co..
 - 2. PPG Industries Inc., Glass Group.
 - 3. Other manufacturers which are equivalent in the judgement of the Architect.
- B. Clear Float Glass: Clear, annealed.
 - 1. Comply with ASTM C 1036, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select.
 - 2. 6 mm minimum thick.
- C. Clear Float Glass: Clear, fully tempered.
 - 1. Comply with ASTM C 1036, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select.
 - 2. 6 mm minimum thick.
- D. Low E Glass: Float type, heat strengthened, clear.
 - 1. Coating on inner surface.
 - 2. 6 mm minimum thick.
- E. Wired Glass: Clear.
 - 1. Diagonal mesh of woven stainless steel wire.
 - 2. 1/2 inch grid size.
 - 3. Polished both sides.
 - 4. 1/4 inch thick.

2.02 SEALED INSULATING GLASS MATERIALS

- A. Manufacturers:
 - 1. Guardian Industries, Falconer Glass Industries.
 - 2. Interpane Glass Co.
 - 3. Viracon, Apogee Enterprises, Inc.
 - 4. Substitutions: Refer to Section 01600 - Product Requirements.
- B. Insulated Glass Units: Double pane with glass to elastomer edge seal.
 - 1. Outer pane of low E glass, inner pane of clear float glass.
 - 2. Place low E coating on No.2 surface within the unit.
 - 3. Comply with ASTM E 774 and E 773.
 - 4. Purge interpane space with dry hermetic air.
 - 5. Total unit thickness of 1 inch.
- C. Edge Seal Construction: Aluminum, bent and soldered corners.

2.03 GLAZING COMPOUNDS

- A. Polysulfide Sealant: Two component; chemical curing, non-sagging type; cured Shore A hardness of 15 to 25; color as selected.

2.04 GLAZING ACCESSORIES

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C 864 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 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 sealant in accordance with manufacturer's instructions.

3.03 INSTALLATION - EXTERIOR WET METHOD (SEALANT AND SEALANT)

- A. Place setting blocks at 1/4 points and install glazing pane or unit.
- B. Install removable stops with glazing centered in space by inserting spacer shims both sides at 24 inch intervals, 1/4 inch below sight line.
- C. Fill gaps between glazing and stops with polysulfide type sealant to depth of bite on glazing, but not more than 3/8 inch below sight line to ensure full contact with glazing and continue the air and vapor seal.
- D. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.04 INSTALLATION - INTERIOR WET METHOD (COMPOUND AND COMPOUND)

- A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 24 inch centers, kept 1/4 inch below sight line.
- B. Locate and secure glazing pane using glazers' clips.

- C. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.05 CLEANING

- A. Remove glazing materials from finish surfaces.
- B. Remove labels after Work is complete.
- C. Clean glass and adjacent surfaces.

END OF SECTION

SECTION 09511

SUSPENDED ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.02 RELATED SECTIONS

- A. Section 07900 - Joint Sealers: Acoustical sealant.

1.03 REFERENCES

- A. ASTM C 635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 1995.
- B. ASTM C 636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels; 1996.
- C. ASTM E 580 - Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Moderate Seismic Restraint; 1996.
- D. ASTM E 1264 - Standard Classification for Acoustical Ceiling Products; 1996.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on suspension system components and acoustical units.
- C. Samples: Submit two samples 8 x 8 inch in size illustrating material and finish of acoustical units.
- D. Samples: Submit two samples each, 6 inches long, of suspension system main runner.

1.05 ENVIRONMENTAL REQUIREMENTS

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

1.06 PROJECT CONDITIONS

- 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. Install acoustical units after interior wet work is dry.

PART 2 PRODUCTS

2.01 ACOUSTICAL UNITS

- A. Manufacturers:
 - 1. Armstrong World Industries, Inc.
 - 2. Celotex Corp.
 - 3. USG Interiors, Inc.
 - 4. Substitutions: See Section 01600 - Product Requirements.

- B. Acoustical Units - General: ASTM E 1264, Class A.

- C. Acoustical Panels: ASTM E 1264 Type III, Painted mineral fiber, conforming to the following:
 - 1. Size: 24 x 48 inches.
 - 2. Thickness: 5/8 inches.
 - 3. Light Reflectance: 80 percent.
 - 4. NRC Range: 0.50 to 0.60.
 - 5. Edge: Reveal edge.
 - 6. Surface Color: White.
 - 7. Surface Pattern: Non-directional fissured.
 - 8. Product: Cortega Tegular #703 by Armstrong.
 - 9. Suspension System: Exposed grid Type 1.

2.02 SUSPENSION SYSTEM

- A. Suspension Systems - General: ASTM C 635; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.

- B. Exposed Steel Suspension System Type 1: Formed steel, commercial quality cold rolled, with painted finish; Heavy-duty.
 - 1. Profile: Tee; 15/16 inch wide face.
 - 2. Construction: Double web.
 - 3. Finish: White.
 - 4. Product: Prelude XL #7301 by Armstrong.

2.03 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

- B. Perimeter Moldings: Same material and finish as grid.
 - 1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

- C. Acoustical Sealant For Perimeter Moldings: Specified in Section 07900.

- D. 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. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- E. 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. Install in bed of acoustical sealant.
 - 2. Use longest practical lengths.
 - 3. 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. Fit border trim neatly against abutting surfaces.
- D. Install units after above-ceiling work is complete.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- F. Cutting Acoustical Units:
 - 1. Make field cut edges of same profile as factory edges.
 - 2. Double cut and field paint exposed reveal edges.
- G. Where round obstructions occur, provide preformed closures to match perimeter molding.
- H. Install hold-down clips on panels within 20 ft of an exterior door.

3.04 ERECTION 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.

END OF SECTION

SECTION 09650
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Resilient base.
- C. Resilient stair accessories.
- D. Installation accessories.

1.02 REFERENCES

- A. ASTM F 1066 - Standard Specification for Vinyl Composition Floor Tile; 1995.
- B. FS RR-T-650 - Treads, Metallic and Nonmetallic, Skid Resistant; Federal Specifications and Standards; Revision E, 1994.

PART 2 PRODUCTS

2.01 MATERIALS - TILE FLOORING

- A. Vinyl Composition Tile: ASTM F 1066:
 - 1. Size: 12 x 12 inch.
 - 2. Thickness: 0.125 inch.
 - 3. Pattern: Premium Patterns and Solid Colors. (VCT-1)
 - 4. Pattern: Marbleized. (VCT-2)

2.02 MATERIALS - STAIR COVERING

- A. Vinyl Stair Treads: FS RR-T-650, Composition B; full width and depth of stair tread in one piece; tapered thickness; nosing not less than 1-1/4 inch deep.
 - 1. Nominal Thickness: 0.1875 inch.
 - 2. Nosing Style: Square.
 - 3. Type: 1-smooth.
 - 4. Pattern: Squares.
 - 5. Color: Solid.
- B. Stair Nosings: 1-1/2 inch horizontal return, 1-1/8 inch vertical return, full width of stair tread in one piece:

2.03 MATERIALS - BASE

- A. Base: Rubber; top set covered:
 - 1. Height: 4 inch.
 - 2. Thickness: 0.125 inch thick.
 - 3. Finish: Satin.
 - 4. Length: Roll.
 - 5. Color: Color as selected from manufacturer's standards.

6. Accessories: Premolded external corners and end stops.

2.04 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.
- C. Moldings and Edge Strips: Metal.
- D. Filler for Coved Base: Plastic.
- E. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within tolerances specified in Section 03300 and are ready to receive resilient flooring.
- B. Verify that wall surfaces are smooth and flat within tolerances specified in Section 09260, are dust-free, and are ready to receive resilient base.
- C. Verify that concrete sub-floor surfaces are ready for resilient flooring installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- B. Prohibit traffic until filler is cured.
- C. Clean substrate.
- D. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - TILE FLOORING

- A. Install in accordance with manufacturer's instructions.
- B. Mix tile from container to ensure shade variations are consistent when tile is placed.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Set flooring in place, press with heavy roller to attain full adhesion.
- E. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.
- F. Where floor finishes 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. Secure metal strips after installation of flooring with stainless steel screws.
- H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- I. Install flooring in recessed floor access covers. Maintain floor pattern.

3.04 INSTALLATION - 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.

3.05 INSTALLATION - STAIR COVERINGS

- A. Install stair nosing and stair treads in one piece for full width and depth of tread.
- B. Adhere over entire surface. Fit accurately and securely.

3.06 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean, seal, and wax resilient flooring products in accordance with manufacturer's instructions and Owner's maintenance program.

3.07 PROTECTION OF FINISHED WORK

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

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SECTION 09680

CARPET

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet, direct-glued.
- B. Accessories.

1.02 ALLOWANCES

- A. See Section 01210 - Allowances, for cash allowances affecting this section.

1.03 REFERENCES

- A. ASTM D 2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 1996.
- B. CRI 104 - Standard for Installation of Commercial Textile Floorcovering Materials; Carpet and Rug Institute; 1994.
- C. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; National Fire Protection Association; 1995.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. 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 with minimum three years experience.*

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.
- B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.
- C. Ventilate installation area during installation and for 72 hours after installation.

1.07 EXTRA MATERIALS

- A. See Section 01600 - Product Requirements, for additional requirements.
- B. Provide 120 sq ft of carpeting of each type, color, and pattern specified.

PART 2 PRODUCTS

2.01 CARPET

- A. Carpet: Tufted, nylon, conforming to the following criteria:
 - 1. Critical Radiant Flux: Conform to NFPA 253, 0.22 watts/sq cm.
 - 2. Surface Flammability Ignition: Pass ASTM D 2859 (the "pill test").
 - 3. Roll Width: 12 ft.
 - 4. Max. Electrostatic Charge: 3 Kv. @ 20 percent R.H..
 - 5. Pile Weight: 28 oz/sq yd.

2.02 ACCESSORIES

- A. Sub-Floor Filler: Type recommended by carpet manufacturer.
- B. Moldings and Edge Strips: Embossed aluminum, black color.
- C. Adhesives: Compatible with materials being adhered.
- D. Seam Adhesive: Recommended by manufacturer.
- E. Contact Adhesive: Compatible with carpet material; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within tolerances specified in Section 03300 and are ready to receive carpet.
- B. Verify that concrete sub-floor surfaces are ready for carpet installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by carpet manufacturer and adhesive materials manufacturer.
- C. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.
- B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- C. Clean substrate.

3.03 INSTALLATION - GENERAL

- A. Install carpet and cushion in accordance with manufacturer's instructions and CRI 104.
- B. Verify carpet match before cutting to ensure minimal variation between dye lots.
- C. Lay out carpet and locate seams in accordance with shop drawings:
 - 1. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
 - 2. Do not locate seams perpendicular through door openings.

3. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
4. Locate change of color or pattern between rooms under door centerline.
5. Provide monolithic color, pattern, and texture match within any one area.

D. Install carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance.

3.04 DIRECT-GLUED CARPET

- A. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and unfrayed. Apply seam adhesive to cut edges of woven carpet immediately.
- B. Apply contact adhesive to floor uniformly at rate recommended by manufacturer. After sufficient open time, press carpet into adhesive.
- C. Apply seam adhesive to the base of the edge glued down. Lay adjoining piece with seam straight, not overlapped or peaked, and free of gaps.
- D. Roll with appropriate roller for complete contact of adhesive to carpet backing.
- E. Trim carpet neatly at walls and around interruptions.
- F. Complete installation of edge strips, concealing exposed edges. Bind cut edges where not concealed by edge strips.

3.05 CLEANING

- A. Remove excess adhesive from floor and wall surfaces without damage.
- B. Clean and vacuum carpet surfaces.

END OF SECTION

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SECTION 09900

PAINTS AND COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints and other coatings.
- C. See Schedule - Surfaces to be Finished, at end of Section.

1.02 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on all finishing products.
- C. Samples: Submit one paper chip samples, 3 x 3 inch in size illustrating range of colors available for each surface finishing product scheduled.

1.03 DELIVERY, STORAGE, AND PROTECTION

- 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.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- C. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
- D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers - Paints and Coatings:
 - 1. Porter.

2. Perry & Derrick.
3. Pratt & Lambert.
4. Sherwin Williams.

B. Substitutions: See Section 01600 - Product Requirements.

2.02 PAINTS AND COATINGS - GENERAL

- A. Paints and Coatings: Ready mixed, except field-catalyzed coatings. Prepare pigments:
1. To a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
 2. For good flow and brushing properties.
 3. Capable of drying or curing free of streaks or sags.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Paint ME-OP-3A - Ferrous Metals, Unprimed, Alkyd, 3 Coat:
1. One coat of alkyd primer.
 2. Gloss: Two coats of alkyd enamel.
- B. Paint ME-OP-2A - Ferrous Metals, Primed, Alkyd, 2 Coat:
1. Touch-up with zinc chromate primer.
 2. Gloss: Two coats of alkyd enamel.
- C. Paint MgE-OP-3A - Galvanized Metals, Alkyd, 3 Coat:
1. One coat galvanize primer.
 2. Gloss: Two coats of alkyd enamel.

2.04 PAINT SYSTEMS - INTERIOR

- A. Paint CI-OP-2L - Concrete/Masonry, Opaque, Latex, 2 Coat:
1. One coat of block filler.
 2. Semi-gloss: One coat of latex enamel.
- B. Paint MI-OP-3L - Ferrous Metals, Unprimed, Latex, 3 Coat:
1. One coat of latex primer.
 2. Gloss: Two coats of latex enamel.
- C. Paint MI-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat:
1. Touch-up with latex primer.
 2. Gloss: Two coats of latex enamel.
- D. Paint Mgl-OP-3A - Galvanized Metals, Alkyd, 3 Coat:
1. One coat galvanize primer.
 2. Gloss: Two coats of alkyd enamel.

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; 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.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.

3.02 PREPARATION

- A. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- B. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
- C. Marks: Seal with shellac those which may bleed through surface finishes.
- D. Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- E. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- F. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- G. 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.
- H. 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.
- I. Interior Wood Items to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.
- J. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.

- B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- 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. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- F. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

3.04 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Refer to Section 15075 and Section 16075 for schedule of color coding of equipment, duct work, piping, and conduit.
- B. Paint shop-primed equipment, where indicated.
- C. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- D. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.05 CLEANING

- A. Collect waste material which may 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 2, Paint Systems Articles.
- C. Mechanical and Electrical: Use paint systems defined for the substrates to be finished.
 - 1. Paint all insulated and exposed pipes occurring in finished areas to match background surfaces, unless otherwise indicated.
 - 2. Paint all equipment, including that which is factory-finished, exposed to weather or to view on the roof and outdoors.
 - 3. Paint shop-primed items occurring in finished areas.
 - 4. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
 - 5. Paint dampers exposed behind louvers, grilles, to match face panels.
- D. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

3.07 SCHEDULE - PAINT SYSTEMS

- A. Concrete, Concrete Block, Brick Masonry: Finish all surfaces exposed to view.
 - 1. Interior: CI-OP-2L, semi-gloss.

- B. Steel Doors and Frames: Finish all surfaces exposed to view; ME-OP-2A, gloss.

- C. Steel Fabrications: Finish all surfaces exposed to view.
 - 1. Exterior: ME-OP-3A, gloss; finish all surfaces, including concealed surfaces, before installation.
 - 2. Interior: MI-OP-3L, gloss.

- D. Galvanized Steel: Finish all surfaces exposed to view.
 - 1. Exterior: MgE-OP-3A - Gloss.
 - 2. Interior: Mgl-OP-3A - Gloss.

- E. Shop-Primed Metal Items: Finish all surfaces exposed to view.
 - 1. Finish the following items:
 - a. Exposed surfaces of lintels.
 - b. Exposed surfaces of steel stairs and railings.
 - 2. Exterior: ME-OP-2A - Gloss.
 - 3. Interior: MI-OP-2L - Gloss.

END OF SECTION

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SECTION 10523

FIRE EXTINGUISHERS & CABINETS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.02 REFERENCES

- A. NFPA 10 - Standard for Portable Fire Extinguishers; National Fire Protection Association; 1998.
- B. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.03 PERFORMANCE REQUIREMENTS

- A. Conform to NFPA 10.
- B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate cabinet physical dimensions.
- C. Product Data: Provide extinguisher operational features.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers, Cabinets and Accessories:
 - 1. Manufacturers: JL Industries is the Basis of Design and their model numbers are shown on the drawings. Equivalent products by other manufacturers are acceptable.
 - 2. Substitutions: See Section 01600 - Product Requirements.

2.02 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, 40 inches from finished floor to inside bottom of cabinet.
- C. Secure rigidly in place.
- D. Place extinguishers and accessories in cabinets.

END OF SECTION

SECTION 10800
TOILET ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Accessories for toilet rooms.
- B. Grab bars.

1.02 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

1.03 COORDINATION

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Products listed on drawings by model number are made by Bobrick.
- B. Products by other manufacturers which are judged equivalent by the architect are acceptable.
- C. Substitutions: Section 01600 - Product Requirements.
- D. All items of each type to be made by the same manufacturer.

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.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights and Locations: As required by accessibility regulations, as indicated on drawings, and as follows:

END OF SECTION

SECTION 11610
LABORATORY FUME HOODS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Bench-mounted fume hoods.

1.02 RELATED SECTIONS

- A. Section 12345 - Laboratory Casework.
- B. Division 15 - Mechanical Work.
- C. Division 16 - Electrical Work.

1.03 REFERENCES

- A. ASHRAE Std 110 - Method of Testing Performance of Laboratory Fume Hoods; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 1995.
- B. ASTM A 167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip; 1996.
- C. ASTM A 366/A 366M - Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality; 1996.
- D. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1997a.

1.04 DESIGN REQUIREMENTS

- A. Negative variations of face velocity shall not exceed 20% of the average face velocity.
- B. Average illumination of work area: Minimum 80 foot-candles.
- C. Fume hood shall be designed to minimize static pressure loss with adequate slot area and rectangular exhaust collar configuration. Maximum static pressure loss readings shall not exceed the following maximum with sash in full open position:
 - 1. Face Velocity Measured S.P.L. (w.g.)
 - 2. 100 F.P.M. . 30 inches
- D. Maximum variation in exhaust CFM, static pressure and average face velocity as a result of baffle adjustment shall not exceed 5% for any baffle position.
- E. Noise Criteria: Test data of octave band analysis verifying hood is capable of a 50 NC value when connected to a 50 NC HVAC source. Reading taken 3' in front of open sash at 100 fpm. face velocity.
- F. Bypass Type Fume Hoods: Bypass shall be sufficient in size to allow sash as it is closed to provide no more than four times increase in face velocity as measured when the sash was full open.

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's catalog data, specification sheets, and product manuals.
- C. Shop Drawings: Prepared specifically for this project; show dimensions and interface with other products.
- D. Test reports: Submit test reports on each size and type of hood verifying conformance to test performance specified.

1.06 QUALITY ASSURANCE

- A. Maintain testing facility at manufacturer's place of business for testing and evaluating laboratory fume hoods under both ideal and adverse conditions, in accordance with ASHRAE Std 110.
- B. Evaluation of manufacturer's standard product shall take place in manufacturer's own test facility, with testing personnel, samples, apparatus, instruments, and test materials supplied by the manufacturer at no cost to the Owner.
- C. Hood shall achieve a rating of 4.0 AM 0.1 PPM or better when subjected to ASHRAE/110-1995 test procedures.
- D. Single source responsibility: Fume hood casework, work surfaces, and other laboratory equipment and accessories shall be manufactured or furnished by a single laboratory furniture company.
 - 1. Five years or more experience in manufacture of laboratory fume hoods and equipment of type specified.
- E. Manufacturer Qualifications: Minimum 5 years of manufacturing fume hoods as a principal product.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver fume hoods, work surfaces, and accessories free of damage.
- B. Store and handle in a manner to prevent damage to fume hoods, work surfaces, accessories, or adjacent work.

1.08 WARRANTY

- A. Warrant against defects in materials and workmanship on fume hoods, work surfaces, and accessories; include labor and replacement parts (except lamps).
- B. Warranty Period: One year from date of installation or two years from date of purchase, whichever is sooner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Provide products made by Fisher Hamilton Inc., 1316 18th Street, Two Rivers, WI 54241.
- B. Substitutions: See Section 01600 - Product Requirements.

- C. Provide all laboratory fume hoods from a single manufacturer.

2.02 MANUFACTURED UNITS

- A. Bench-mounted fume hoods.
1. By-pass air flow design configuration.

2.03 MATERIALS

- A. Sheet Steel: High quality, cold rolled, mild steel meeting requirements of ASTM A 366; gauges U.S. Standard and galvanized..
- B. Stainless Steel: Type 304; gauges U.S. Standard.
- C. Ceiling enclosure panels: Minimum 18 gauge steel, upward directional louvers.
- D. Bypass grilles: Low resistant type, 18-gauge steel, upward directional louvers.
- E. Safety glass: 7/32" thick laminated safety glass
- F. Sash cables: Stainless Steel, uncoated, 1/8" diameter military spec. quality. (MIL-W-83420D-3)
- G. Sash guides: Corrosion resistant poly-vinyl chloride.
- H. Pulley assembly for sash cable: 2" diameter, zinc dichromate finish, ball bearing type, with cable retaining device. (Nylon tires not acceptable.)
- I. Sash Pull: Full width corrosion resistant plastic, stainless steel or steel with chemical resistant powder coating.
- J. Gaskets: 70 durometer PVC for interior access panels. Gasket interior access panels to eliminate air leakage and to retain liquids inside hood.
- K. Fasteners:
1. Interior fastening devices concealed. Exposed screws not acceptable.
2. Exterior panel member fastening devices to be corrosion resistant, non-metallic material. Exposed screws not acceptable.
- L. Work Surfaces for Bench-Mounted Fume Hoods: Black epoxy resin.

2.04 FINISHES

- A. Preparation: Spray clean metal with a heated cleaner/phosphate solution, pretreat with iron phosphate spray, water rinse, and neutral final seal.
- B. Application: Electrostatically apply urethane powder coat of selected color and bake in controlled high temperature oven.
1. Exterior and interior surfaces exposed to view: 1.5 mil., average and 1.2 mil., minimum coverage.
- C. Fume hood liner: Resisto-Roc panel coated with chemically resistant enamel finish, off-white in color. Finish shall be chemical fume and splash resistant. Allow prime coat to dry; sand and wipe prior to application of finish coat.

2.05 FUME HOOD CONSTRUCTION

- A. Superstructure: Rigid, self-supporting assembly of double wall construction, maximum 4-7/8" thick. Panels must be attached to a full frame construction, minimum 14 gauge galvanized members. Panels and brackets attached to eliminate screw heads and metallic bracketry from hood interior.
- B. Exhaust outlet: Rectangular with end radiused.
- C. Access opening perimeter: Air foil or streamlined shape with all right angle corners radiused or angled. Bottom foil shall provide access areas for electrical cords.
- D. Fume hood sash: Full view type with clear, unobstructed, side-to-side view of fume hood interior and service fixture connections.
 - 1. Counterbalance system: Single weight, pulley, cable, counter balance system. Maximum 7-lbs. pull required to raise or lower sash throughout its full length of travel. Life cycle test 100 lb., sash and weight to 100,000 cycles without sign of failure. Provide independent test data.
- E. Fume hood liner: Resisto-Roc panel coated with chemically resistant enamel finish, off-white in color. Finish shall be chemical fume and splash resistant. Allow prime coat to dry; sand and wipe prior to application of finish coat.
- F. Baffles: Provide exhaust slots full height on vertical sides of the baffle with upper and lower slots adjustable. Minimum depth of 19" for interior workspace is required at the extreme upper portion of the fume hood to provide maximum interior work area. All baffle supports/brackets to be non-metallic.
- G. Electrical Services: Three wire grounding type receptacles rated at 120 V.A.C. at 20 amperes.
- H. Work surfaces: 1-1/4" thick surface, dished a nominal 1/2" to contain spills.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify equipment rough-in before proceeding with work, including rough opening dimensions required for fume hood installation.
- B. Coordinate with other trades for proper installation of plumbing and electrical services.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions; comply with standards required by authorities having jurisdiction.
- B. Install equipment plumb, square, and straight, without distortion; securely anchor.
- C. Schedule installation to ensure that utility connections are achieved in an orderly and expeditious manner.
- D. Demonstrate fume hood operations and functions to Owner at completion of installation.

3.03 FIELD QUALITY CONTROL TESTING OF FUME HOODS

- A. Field testing requirements:
 - 1. Perform tests after installation is complete, the building ventilation system has been balanced, all connections have been made, and written verification has been submitted that the above conditions

have been met.

- B. Test procedure - SEFA 1-1992:

3.04 ADJUSTING AND CLEANING

- A. Adjust operating equipment, with the exception of air moving equipment, to provide efficient operation for intended use and as required by manufacturer.
1. Vertical-Rising Sashes: Operate smoothly without tilting when raised or lowered from either end; remain at rest in any open position.
- B. Clean equipment, casework, countertops, and other surfaces as recommended by manufacturer, rendering work in new and unused appearance.
- C. Clean adjacent construction and surfaces soiled in the course of installation of this work.
- D. Touch up minor damaged surfaces caused by installation. Replace damaged components as directed by Architect.

3.05 PROTECTION

- A. Provide protective measures to prevent equipment and surfaces from exposure to other construction activity.

END OF SECTION

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SECTION 12345

STEEL LABORATORY CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Steel casework.
- B. Work surfaces.
- C. Sinks and outlets.
- D. Service fittings.
- E. Accessory equipment.

1.02 RELATED SECTIONS

- A. Section 07900 - Joint Sealers.
- B. Section 11610 - Laboratory Fume Hoods
- C. Division 15 - Mechanical Work
- D. Division 16 - Electrical Work

1.03 DESIGN REQUIREMENTS

A. CASEWORK

1. Flush construction: Surfaces of doors, drawers and panel faces shall align with cabinet fronts without overlap of case ends, top or bottom rails. Horizontal and vertical case shell members (panels, top rails and bottoms) shall meet in the same plane without overlap, cracks or crevices.
2. Slimline styling: Front width of end panels 3/4" and front height of top and bottom members 1".
3. Self-supporting units: Completely welded shell assembly without applied panels at ends, backs or bottoms, so that cases can be used interchangeably or as a single, stand-alone unit.
4. Interior of case units: Easily cleanable, flush interior. Base cabinets, 30" and wider, with double swinging doors shall provide full access to complete interior without center vertical post.
5. Drawers: Sized on a modular basis for interchange to meet varying storage needs, and designed to be easily removable in field without the use of special tools.
6. Case openings: Rabbeted-like joints all four sides of case opening for hinged doors and two sides for sliding doors in order to provide dust resistant case.
7. Framed glazed doors: Identical in construction, hardware and installation to solid panel doors. Design frame glazed doors to be removable for glass replacement.

1.04 PERFORMANCE REQUIREMENTS

A. CASEWORK

1. Structural performance requirements: Casework components shall withstand the following minimum loads without damage to the component or to the casework operation:
2. Steel base unit load capacity: 500 lb. per lineal foot.
3. Suspended units: 300 lb.
4. Drawers in a cabinet: 150 lb.

5. Utility tables (4 legged): 300 lb.
6. Hanging wall cases: 300 lb.
7. Load capacity for shelves of base units, wall cases and tall cases: 100 lb.

B. Metal Finish

1. Abrasion resistance: Maximum weight loss of 5.5 mg. per 100 cycle when tested on a Taber Abrasion Tester #E40101 with 1000 gm wheel pressure and Calibrase #CS10 wheel.
2. Hardness: Surface hardness equivalent to 4H or 5H pencil.
3. Humidity resistance: Withstand 1000-hour exposure in saturated humidity at 100 degrees F.
4. Moisture resistance:
5. No visible effects to surface finish after boiling water trickled over test panel inclined at 45 degrees for five minutes.
6. No visible effects to surface finish following 100-hour continuous application of a water soaked cellulose sponge, maintained in a wet condition throughout the test period.
7. Adhesion: Score finish surface of test panel with razor blade into 100 squares, 1/16" x 1/16", cutting completely through the finish but with minimum penetration of the substrate, and brush away particles with soft brush. Minimum 95 squares shall maintain their finish.
8. Salt spray: Withstand minimum 200-hour salt spray test.

C. Chemical Resistance Finish

1. Test procedure: Apply 10 drops (approximately 0.5 cubic centimeters) of each reagent identified to the surface of the finished test panes laid flat and level on a horizontal surface. Ambient temperature: 68 - 72 F (20 - 22 C). After one hour flush away chemicals with cold water and wash surface with detergent and warm water at 150 F (65.5 C) and with alcohol to remove surface stains. Examine surface under 100 foot candles of illumination.
2. Evaluation ratings: Change in surface finish and function shall be described by the following ratings:
 - a. Excellent: No change to slight detectable change in color or gloss.
 - b. Good: Clearly discernible change in color or gloss. Finish remains intact and protective with no significant impairment to function or life.
 - c. Failure: Obvious and significant deterioration, visible blistering, bare spots, or roughness of surface.
3. Test results shall meet or exceed the following: (Concentration by weight)
 - a. REAGENT RATING
 - b. Acetic Acid, 98% Excellent
 - c. Formic Acid, 88% Good
 - d. Hydrochloric Acid, 37% Excellent
 - e. Nitric Acid, 25% Excellent
 - f. Nitric Acid, 60% Good
 - g. Phosphoric Acid, 75% Excellent
 - h. Sulfuric Acid, 25% Excellent
 - i. Sulfuric Acid, 85% Excellent
 - j. Ammonium Hydroxide, 58% Excellent
 - k. Sodium Hydroxide, 10% Excellent
 - l. Sodium Hydroxide, 25% Excellent
 - m. Acetone Excellent
 - n. Sodium Hypochlorite, 5.25% Excellent
 - o. Ethyl Acetate Excellent
 - p. Ethyl Alcohol Excellent
 - q. Ethyl Ether Excellent
 - r. Formaldehyde, 37% Excellent
 - s. Hydrogen Peroxide, 30% Excellent
 - t. Methylethyl Ketone Excellent
 - u. Phenol, 85% Good
 - v. Xylene Excellent

D. EPOXY RESIN WORK SURFACE

1. Test procedure: Apply five drops of each reagent to surface and cover with 25mm watch glass, convex side down; test volatiles using one ounce bottle stuffed with saturated cotton. After 24-hour exposure flush surface, clean, rinse and wipe dry.
2. Evaluation ratings: Change in surface finish and function shall be described by the following ratings:
 - a. No Effect: No detectable change in surface material.
 - b. Excellent: Slight detectable change in color or gloss, but no change to the function or life of the work surface material.
 - c. Good: Clearly discernible change in color or gloss, but no significant impairment of work surface function or life.
 - d. Failure: Pitting, cratering or erosion of work surface material; obvious and significant deterioration.
3. Test Results - Epoxy Resin Work Surface:
 - a. REAGENT RATING
 - b. Hydrochloric Acid 37% Excellent
 - c. Sulfuric Acid 33% No Effect
 - d. Sulfuric Acid 77% No Effect
 - e. Sulfuric Acid 96% Failure
 - f. Formic Acid 90% Excellent
 - g. Nitric Acid 20% Excellent
 - h. Nitric Acid 30% Excellent
 - i. Nitric Acid 70% Good
 - j. Hydrofluoric Acid 48% Fair
 - k. Phosphoric Acid 85% No Effect
 - l. Chromic Acid 60% Failure
 - m. Acetic Acid 98% Excellent
 - n. 3 & 8 Equal Parts Excellent
 - o. Ammonium Hydroxide 28% No Effect
 - p. Sodium Hydroxide 10% No Effect
 - q. Sodium Hydroxide 20% No Effect
 - r. Sodium Hydroxide 40% No Effect
 - s. Sodium Hydroxide Flake No Effect
 - t. Sodium Sulfide Excellent
 - u. Zinc Chloride No Effect
 - v. Tincture of Iodine Excellent
 - w. Silver Nitrate No Effect
 - x. Methyl Alcohol No Effect
 - y. Ethyl Alcohol No Effect
 - z. Butyl Alcohol No Effect
 - aa. Benzene Excellent
 - ab. Xylene No Effect
 - ac. Toluene Excellent
 - ad. Gasoline No Effect
 - ae. Dichlor Acetic Acid Good
 - af. Di Methyl Formamide Excellent
 - ag. Ethyl Acetate No Effect
 - ah. Amyl Acetate Excellent
 - ai. Acetone Excellent
 - aj. Chloroform Excellent
 - ak. Carbon Tetrachloride No Effect
 - al. Phenol Excellent
 - am. Cresol Excellent
 - an. Formaldehyde No Effect
 - ao. Trichlorethylene Excellent
 - ap. Ethyl Ether Excellent
 - aq. Furfural Good

- ar. Methylene Chloride Excellent
- as. Mono Chlor Benzene Good
- at. Dioxane Excellent
- au. Methyl Ethyl Ketone Excellent
- av. Acid Dichromate Fair
- aw. Hydrogen Peroxide No Effect
- ax. Naphthalene Excellent

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Provide 3/4" = 1'-0" scale elevations of individual and battery of casework units, cross sections, rough-in and anchor placements, tolerances and clearances. Indicate relation of units to surrounding walls, windows, doors and other building components. Provide 1/4" = 1'-0" rough-in plan drawings for coordination with trades. Rough in shall show free area.
- C. Finish Samples: Submit 3 x 5 inch samples of each color of finish for casework, work surfaces and for other prefinished equipment and accessories for selection by [Architect].
- D. Test Reports: When requested by Architect, submit independent laboratory certified test reports verifying conformance to test performance specified.
- E. Product Data: Provide component dimensions, configurations, construction details, joint details, and attachments, utility and service requirements and locations, and _____.

1.06 QUALITY ASSURANCE

- A. Single source responsibility: Casework, work surfaces, laboratory fume hood and equipment and accessories shall be manufactured or furnished by a single laboratory furniture company.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Accept casework on site. Inspect on arrival for damage.
- B. Schedule delivery of casework and equipment so that spaces are sufficiently complete that material can be installed immediately following delivery.
 - 1. Protect finished surfaces from soiling or damage during handling and installation. Keep covered with polyethylene film or other protective coating.
- C. Protect all work surfaces throughout construction period with 1/4" corrugated cardboard completely covering the top and securely taped to edges. Mark cardboard in large lettering "No Standing".

1.08 PROJECT CONDITIONS

- A. Coordinate casework installation with size, location and installation of service utilities.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- C. Do not deliver or install equipment until the following conditions have been met:
 - 1. Windows and doors are installed and the building is secure and weathertight.
 - 2. Ceiling, overhead ductwork and lighting are installed.
 - 3. All painting is completed and floor tile is installed.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Design, materials, construction and finish of casework specified is the minimum acceptable standard of quality for flush front steel laboratory casework. The basis of this specification is Fisher Hamilton Inc., 1316 - 18th Street, Two Rivers, WI 54241 product.
- B. Substitutions: See Section 01600 - Product Requirements.

2.02 MATERIALS

- A. Sheet steel: Mild, cold rolled and leveled unfinished steel.
- B. Minimum gauges:
 - 1. 20 gauge: Solid door interior panels, drawer fronts, scribing strips, filler panels, enclosures, drawer bodies, shelves, security panels and sloping tops.
 - 2. 18 gauge: Case tops, ends, bottoms, bases, backs, vertical posts, uprights, glazed door members, door exterior panels and access panels.
 - 3. 16 gauge: Top front rails, top rear gussets, intermediate horizontal rails, table legs and frames, leg rails and stretchers.
 - 4. 14 gauge: Drawer suspensions, door and case hinge reinforcements and front corner reinforcements.
 - 5. 11 gauge: Table leg corner brackets and gussets for leveling screws.
- C. Glass for glazed swinging and sliding doors: 1/8" (3mm) framed doors, 7/32" (6mm) unframed doors thick, clear float glass.

2.03 CASEWORK FABRICATION

- A. Base Units and Cases:
 - 1. Base units and 25", 31" and 37" high wall cases: End panels and back reinforced with internal reinforcing front and rear posts.
 - 2. 49" and 84" high cases: Formed end panels with front and rear reinforcing post channels; back shall be formed steel panel, recessed 3/4" for mounting purposes.
- B. Posts: Front post fully closed with full height reinforcing upright. Shelf adjustment holes in front and rear posts shall be perfectly aligned for level setting, adjustable to 1/2" o/c.
- C. Secure intersection of case members with spot and arc welds. Provide gusset reinforcement at front corners.
- D. Base unit backs: Provide drawer units without backs and cupboard units with removable backs for access to services behind units.
- E. Bottoms: Base units and 25", 31", 37" and 49" high wall cases shall have one piece bottom with front edge formed into front rail, rabbeted as required for swinging doors and drawers and flush design for sliding doors.
- F. Top rail for base units: Interlock with end panels, flush with front of unit.
- G. Horizontal intermediate rails: Recessed behind doors and drawer fronts.
- H. Base for base units: 4" high x 3" deep with formed steel base and 11 ga. die formed steel gussets at corners. Provide 3/8" diameter leveling screw with integral bottom flange of minimum 0.56 sq. in. area at each corner, accessible through openings in toe space.

- I. Tops of wall cases: One piece, with front edge formed into front rail.
- J. Drawers:
 1. Drawer fronts: 3/4" thick, double wall construction, prepainted prior to assembly and sound deadened.
 2. Drawer bodies: Bottom and sides formed into one-piece center section with bottom and sides coved and formed top edges. Front and back panels spot-welded to center section.
 3. Drawer suspension: Heavy duty coved raceways for both case and drawer with nylon tired, ball bearing rollers; self-centering and self-closing when open to within 3" of the closed position.
 4. Provide drawer with rubber bumpers. Friction centering devices are not acceptable.
 5. Provide security panels for drawers with keyed different locks.
 6. File drawers: Provide with 150# full extension slides for full access and operation.
- K. Doors:
 1. Solid panel doors: 3/4" thick, double wall, telescoping box steel construction with interior prepainted and sound deadened, top corners welded and ground smooth. Reinforce interior of front panel with welded steel hat channels. Hinges with screws to internal 14 gauge reinforcing in case and door. Hinges shall be removable; welding of hinges not acceptable. Doors shall close against rubber bumpers.
 2. Frame glazed doors: Outer head to be one piece construction. Inner head to consist of top, bottom and side framing members which are removable for installation or replacement of glass. Provide continuous vinyl glazing retainer to receive glass. In all other respects, framed glazed door construction and quality shall match solid panel doors.
 3. Sliding doors - solid or framed glazed: Design for tilt-out removal after removal of bottom guide. Doors shall be hung with nylon tired sleeve bearing rollers in formed steel top hung track and shall close against rubber bumpers.
 4. Unframed sliding glass doors: Glass with edges ground set in extruded aluminum shoe with integral pulls, wheel assemblies and top and bottom extruded aluminum track. Provide rubber bumpers at fully opened and closed door position.
- L. Shelves:
 1. Form front and back edges down and back 3/4". Form ends down 3/4".
 2. Reinforce shelves over 36" long with welded hat channel reinforcement the full width of shelf.
 3. Pull out shelves: Same suspension as specified for drawers.
- M. Base molding: 4" high, to be furnished and installed by flooring contractor.
- N. Hardware:
 1. Drawer and hinged door pulls: Clear anodized extruded aluminum, screw attached on 4" centers. [Architect specify optional pulls].
 2. Sliding door pulls: Recessed stainless steel, styled and sized to harmonize with drawer pulls.
 3. Hinges: Institutional type, five knuckle projecting barrel hinges, minimum 2-1/2" long, type 302 or 304 stainless steel. Provide two hinges for doors up to 36" high; three hinges for doors over 36" high. Drill each leaf for three screw attachment to door and frame.
 4. Door catches: Adjustable type, spring actuated nylon roller catches.
 5. Elbow catches: Spring type of cadmium plated steel, with strike of suitable design.
 6. Locks: National Lock Remove-A-Core 5- pin tumbler, heavy-duty cylinder type. Exposed lock noses shall be dull nickel (satin) plated and stamped with identifying numbers.
 7. Keying: Locks [location shown on drawings] shall have capacity for 225 primary key changes. Master key one level with the potential of 40 different, non-interchangeable master key groups.
 8. Keys: Stamped brass available from manufacturer or local locksmith, and supplied in the following quantities unless otherwise specified:
 - a. 2 - for each keyed different lock.
 - b. 3 - for each group keyed alike locks.
 - c. 2 - for master keys for each system.
 9. Label holders: [Locations shown on drawings] Formed steel with satin chrome finish, 1" x 1-1/2", screw

installed.

10. Shelf clips: Die formed steel, zinc plated, designed to engage in shelf adjustment holes.

O. TABLE FRAMES

1. Table frames: 4-1/2" high "C" channel front and back aprons, end rails and cross rails.
2. Table drawers: Provide front and back rails; drawer unit, hardware and suspension same as specified for base unit drawers.
3. Legs: 2" x 2" steel tube legs with welded leg bracket. Attach legs with two bolts to front and back aprons and weld to end rails. Each leg shall have a recessed leveling screw and a black, coved vinyl or rubber leg shoe, 2" in height.
4. Knee space frame: 2" high apron where no drawers required.

P. METAL FINISH

1. Preparation: Spray clean metal with a heated cleaner/phosphate solution, pretreat with iron phosphate spray, water rinse, and neutral final seal. Immediately dry in heated ovens, gradually cooled, prior to application of finish.
2. Application: Electrostatically apply powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high-grade laboratory furniture quality finish of the following thickness:
3. Exterior and interior exposed surfaces: 1.5 mil average and 1.2 mil min.
4. Backs of cabinets and other surfaces not exposed to view: 1.0 mil average.

Q. Chemical Resistance

1. Test procedure: Apply 10 drops (approximately 0.5 cc) of each reagent identified to the surface of the finished test panels laid flat and level on a horizontal surface. Ambient temperature: 68-72 deg F. (20-22 deg C.). After one hour flush away chemicals with cold water and wash surface with detergent and warm water at 150 deg F. (65.5 deg C.) and with alcohol to remove surface stains. Examine surface under 100 foot candles of illumination.
2. Evaluation ratings: Change in surface finish and function shall be described by the following ratings:
 - a. Excellent: Indicates excellent to superior integrity of finish film. Includes no effect of slight change in gloss and slight discoloration.
 - b. Good: Allows change of gloss or discoloration or slight swelling while retaining integrity of finish film.
 - c. Failure: Obvious and significant deterioration, including blistering, pitting, cratering, erosion and/or loss of finish material.
3. Test results (concentration by weight) Modular Steel Casework:
4. CHEMICAL RATING
5. Acetic Acid, 93% Excellent
6. Formic Acid, 33% Good
7. Hydrochloric Acid, 37% Excellent
8. Nitric Acid, 25% Excellent
9. Nitric Acid, 60% Good
10. Phosphoric Acid, 75% Excellent
11. Sulfuric Acid, 28% Excellent
12. Sulfuric Acid, 85% Excellent
13. Ammonium Hydroxide, 10% Excellent
14. Sodium Hydroxide, 10% Excellent
15. Sodium Hydroxide, 25% Excellent
16. Acetone Excellent
17. Carbon Tetrachloride Excellent
18. Ethyl Acetate Excellent
19. Ethyl Alcohol Excellent
20. Ethyl Ether Excellent
21. Formaldehyde, 37% Excellent
22. Hydrogen Peroxide, 5% Excellent

23. Methyleneethyl Ketone Excellent
24. Phenol, 85% Good
25. Xylene Excellent

R. EPOXY RESIN WORK SURFACE

1. Material: Chemical and abrasion resistant, durable top of one inch thick cast material of epoxy resins and inert products, cast flat, with a uniform low-sheen black surface.
 - a. Where indicated on plans provide work surfaces with: 1-1/4" thick surface, dished a nominal 1/2" to contain spills.
2. Backsplash curb: Same material as top, 4" high, butt jointed and cemented to top. Provide where tops abut wall surfaces and at reagent ledges. Include end curb where top abuts end wall or adjacent top of different level.
3. Reagent ledges: Same material as top. Provide 6" high x 7-1/2" wide single faced units and 6" high x 9" wide double faced units [as shown on drawings] [as required]. Ledge face shall permit installation of service fixtures and top shall be removable for access to service utilities

S. SINKS, DRAINS AND TRAPS

1. Epoxy resin sinks: Integrally molded from modified thermosetting black epoxy resin, specially compounded and oven cured. Cove inside corners and pitch bottom to threaded drain outlet.
 - a. Size as noted on drawings.
 - b. Drain location as noted on drawings.
 - c. Hamilton Model No. as noted on drawings.

T. Sink supports:

1. Cabinet sinks: Support sinks on 11 gauge, adjustable, 1" x 2" x 1" channel with reagent resistant finish. Provide two channels across width of cabinet, attached to 3/8" diameter threaded hanger rods.
2. Table sinks: Support sinks on 2" wide, U-shaped steel straps screwed to cross rails. Straps shall be 1/4" thick; 1/2" thick for sinks over 250-sq. in. in area. Straps shall have baked enamel finish.
3. Caulk joint between top and sink with non-hardening mastic.
4. Epoxy resin cupsinks: Integrally molded from modified thermosetting black epoxy resin, specially compounded and oven cured. Cove inside corners and pitch bottom to threaded drain outlet.
 - a. Size as noted on drawings.
 - b. Hamilton Model No. as noted on drawings.

U. Traps: 1-1/2" size, type S in thermoplastic polyethylene.

V. LABORATORY FITTINGS

1. Water Service Fittings:
 - a. Water service faucets and valves shall have renewable unit containing all working parts subject to wear, including replaceable stainless steel seat. Unit shall have serrations for position locking into valve body.
 - b. Gooseneck vacuum breakers: Brass forgings integral with gooseneck, with renewable seat and special design valve member for fine flow control.
 - c. Goosenecks shall have separate 3/8" IPS coupling securely brazed to gooseneck to provide full thread for attachment of anti-splash outlet fittings, serrated tips and filter pumps.
 - d. Air, Gas and Vacuum Systems Fittings:
 - e. Needle valves: Small pattern needle valve, straightway type with stainless steel replaceable floating cone and brass seat (non-renewable). Ten serrated end is integral with valve body.
 - f. Ground key cocks: Straightway ground key cocks, individually ground and lapped and tested at 100 psi. air under water. Cocks shall have single arm long easy grip handle with screw-on type index. Ten serrated end is integral with valve body.
 - g. Distilled Water Faucet and Valves: Polyvinyl chloride (PVC) with rigid gooseneck and removable ten serrated hose end, arranged for manual operation.
 - h. Steam Fittings: Bonnet assembly similar to needle valve fixture. Provide valve stem with flat teflon valve disc and renewable, stainless steel valve seat.

- i. Turrets for gas, air, vacuum, steam or water fixtures: "Round" type design, provided with brass shanks, locknuts and washers.
 - j. Handles for service cocks, faucets and remote controls: Four-arm type except ground key cocks. Provide removable screw-on type colored plastic discs with letter stamped on disc in contrasting color as scheduled below:
 - 1) Service Disc/Letter Colors Letters
 - 2) Gas Blue/White Gas
 - 3) Vacuum Yellow/Black Vac.
 - 4) Compressed Air Orange/White C-Air
 - 5) Cold Water Green/White C.W.
 - 6) Hot Water Red/White H.W.
 - 7) Steam Black/White Strm.
 - 8) Chilled Water Brown/White CH.
 - 9) Distilled Water White/Black D.W.
- W. Fixture finish: Chrome finish developed by the following sequence of platings over properly prepared brass castings or forgings:
- 1. Plating Minimum Plating Thickness
 - 2. Copper (Initial) 0.000050 IN.
 - 3. Nickel 0.000350 IN.
 - 4. Chromium (Final) 0.000015 IN.
- X. Electrical fixtures and fittings: Flush, pedestal or line type, provided in strict accordance with the current edition of the National Electric Code of the National Fire Protection Association, and with requirements of all local regulatory authorities.
- 1. Pedestal and line type housings: Heavy "lustrebrite" corrosion resistant aluminum alloy polished to a chrome like color.
 - 2. Pedestals: Provide with integral bases; low design for use on either single or double faces.
 - 3. Line type housings: Similar in design to pedestals; designed to be self-supporting when installed with rigid conduit.
 - 4. Receptacles: Rated 120 volts AC at 20 amps., three wire grounding type with "Automatic Ground" feature. Provide single or duplex receptacles as required, with ivory or black colored molded thermo-set bodies.
 - 5. Switches: Single pole, toggle type.
 - a. Flush boxes: Galvanized steel.
 - b. Flush plates: Chrome plated or nylon plastic.
 - 6. Conduit: Rigid type, of size to accommodate easy pulling of wire. Boxes, component parts and fittings shall be the screw type. Provide enamel finish on exposed conduit and ferrous fittings.
 - 7. Pedestal and line type housings, flush boxes, receptacles and flush plates must be grounded.

PART 3 EXECUTION

3.01 INSTALLATION

3.02 CASEWORK INSTALLATION:

- A. Set casework components plumb, square, and straight with no distortion and securely anchored to building structure. Shim as required using concealed shims.
- B. Bolt continuous cabinets together with joints flush, tight and uniform, and with alignment of adjacent units within 1/16" tolerance.
- C. Secure wall cabinets to solid supporting material, not to plaster, lath or gypsum board.

- D. Abut top edge surfaces in one true plane. Provide flush joints not to exceed 1/8" between top units.

3.03 WORK SURFACE INSTALLATION:

- A. Where required due to field conditions, scribe to abutting surfaces.
- B. Only factory prepared field joints, located per approved shop drawings, shall be permitted. Secure joints in field, where practicable, in the same manner as in factory, with dowels, splines, adhesive or fasteners recommended by manufacturer.
- C. Secure work surfaces to casework and equipment components with material and procedures recommended by the manufacturer.
- D. Sink installation: Sinks which were not factory installed shall be set in chemical resistant sealing compound and secured and supported per manufacturer's recommendations.
- E. Accessory installation: Install accessories and fittings in accordance with manufacturer's recommendations. Turn screws to seat flat; do not drive.

3.04 ADJUSTING

- A. Repair or remove and replace defective work, as directed by [Architect] [Owner] upon completion of installation.
- B. Adjust doors, drawers, hardware, fixtures, and other moving or operating parts to function smoothly.

3.05 CLEANING

- A. Clean shop finished casework, touch up as required.
- B. Clean countertops with diluted dishwashing liquid and water leaving tops free of all grease and streaks. Use no wax or oils.

3.06 PROTECTION OF FINISHED WORK

- A. Do not permit finished casework to be exposed to continued construction activity.
- B. Advise contractor of procedures and precautions for protection of material, installed laboratory casework and fixtures from damage by work of other trades.

END OF SECTION

SECTION 15020

GENERAL MECHANICAL REQUIREMENTS

RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of all Division-15 sections.

SCOPE

The base bid shall include furnishing all materials, labor, tools, equipment and installation of all work required to install complete mechanical systems as outlined in Division-15.

Submittal of a bid indicates that the contractor has examined the drawings, specifications, and visited the site and has included all required allowances.

Contractor: shall be designated as the sub-contractor for that section of work unless specifically stated otherwise.

ALLOWANCES

In addition to all work shown on the drawings, the HVAC contractor shall include a \$2000. cost allowance and the Plumbing contractor shall include a \$1000. cost allowance in the base bid for miscellaneous moves, adds and/or changes to the mechanical systems which may occur. This allowance or portions of this allowance shall not be used unless written permission is first obtained in the form of a change order from the Architect or Engineer. Any and all unused portions of this allowance shall be refunded by the respective contractor at the close of the contract.

MATERIALS AND EQUIPMENT

Materials installed shall be new, full weight, of the best quality. All similar materials shall be of the same type and manufacturer.

Contractor is responsible for the safety and good condition of the materials and equipment installed until final acceptance by the Owner. Materials shall be stored to prevent damage or weathering prior to installation.

When several materials, products or items of equipment are specified by name for one use, the contractor may select any one of those specified and shall include with his bid an Equipment List listing the equipment selected.

Bidders may bid on other materials, products or equipment. Other products, material, article, device, fixture or form of construction not mentioned as approved equal must be approved by the Engineer. Request for approval must be made in writing and approved by the Architect ten (10) days prior to bid opening date, and issued by addendum.

The responsibility for costs incurred from deviation from the base equipment shall be the equipment supplier and this contractor. Use of any equipment will be considered as a statement that clearances and arrangements have been checked and found satisfactory.

GENERAL STANDARDS

The installation of all work shall conform to the applicable State and Local codes and statutes.

The applicable provisions of the following standards shall govern:

Kentucky Building Code
American Society for Test Materials (ASTM);
National Fire Protection Association (NFPA);
Underwriters Laboratories (UL);
American Gas Association (AGA);
National Sanitation Foundation (NSF).
Sheet Metal & Air Conditioning Contractors National Association (SMACNA).
American National Standards Institute (ANSI)

RECORD DOCUMENTS

Record Drawings: Provide two sets of As-Built Drawings on mylar reproducibles to the Owner at the date of final acceptance.

Prepare record documents in accordance with the requirements in Division 1.

In addition to the requirements specified in Division 1, indicate the following installed conditions:

Ductwork mains and branches, size and location, locations of dampers and other control devices; filters, boxes, and terminal units.

Mains and branches of piping systems, with valves and control devices located and numbered, concealed unions, traps, strainers, expansion compensators, tanks, etc. located). Indicate actual inverts and horizontal locations of underground piping.

Equipment locations (exposed and concealed), dimensioned from prominent building lines.

PLANS

Plans are diagrammatic indicating required size, points of termination of ducts and pipes and suggested routes. However, it is not intended that drawings indicate all necessary offsets. It shall be the work of the contractor to install piping and ductwork in such manner as to conform to the structure, avoid obstructions and preserve headroom.

Coordination Drawings: The contractor shall provide a 1/4" scale double line set of coordination drawings to the Engineer prior to installation of the systems. The top elevation of all disciplines shall be clearly marked throughout the drawings so that no interferences occur. Drawings shall depict actual clearances of installed equipment, penetration locations and service clearances. Indicate scheduling, sequencing, movement and positioning of large equipment during construction. Indicate where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the work. Conflicts in equipment and materials shall be corrected prior to installation. Contractor shall provide a reproducible mylar showing all disciplines and three blue line drawings of the HVAC discipline only.

Exact location of electric outlets, heating equipment, piping, lighting fixtures, ducts, etc., shall be coordinated so there will be no interferences at installation between the various trades. It is the work of the contractor to prepare complete coordination drawings indicating exact location of all items.

All ducts and piping shall be run as straight as possible and symmetrical with architectural items.

Piping and ducts shall be concealed in pipe shafts. Pipe spaces and furring wherever possible.

Piping and ductwork fabricated before coordination with the other trades will be done at the contractor's risk.

SUBMITTALS

Refer to Division 1 Requirements for further details.

Clearly state equipment markings (i.e. ACU-1), capacities, voltages and model numbers on all submittals. This information shall be clearly stated on the cover sheet in tabular form.

Product Data: Submit manufacturer's specifications for equipment showing dimensions, weights, capacities, ratings, performance with operating points clearly indicated, motor electrical characteristics, gages and finishes of materials, and installation instructions.

Shop Drawings: Submit assembly-type shop drawings showing unit dimensions, construction details, and field connection details in accordance with general conditions and supplementary general conditions.

Maintenance Data: Submit maintenance instructions, including all factory published maintenance information and include this information in maintenance manuals.

PRODUCT DELIVERY, STORAGE AND HANDLING

Deliver equipment and materials according to factory shipping requirements. Pack components in factory-fabricated protective containers. Units shall be delivered in sections of such size as will pass through available openings.

44Store equipment and materials in clean dry place and protect from weather and construction traffic. When stored inside, do not exceed structural capacity of the floor.

Handling and rigging of equipment and products shall be as recommended by the manufacturer. Components and equipment damaged during shipment or handling shall not be installed. Replace and return damaged components to the manufacturer.

SUPERVISION AND WORKMANSHIP

Workmanship throughout shall conform to the standards of best practice and all labor employed must be competent to do all the work required.

Contractor shall furnish the services of an experienced superintendent to be in constant charge of the work at all times.

Quality Assurances: Contractor if requested shall demonstrate his ability to perform all work to be included under the contract. Assurance if requested, shall be in the form of a list of past projects of similar size and complexity and a list of six (6) references pertaining to those projects. Failure to demonstrate these quality assurances shall be taken as a statement of the contractors inability to perform.

Contractor shall have a minimum five (5) years experience in the installation of HVAC systems similar to the systems specified.

Welders shall show proof satisfactory to the Engineer that they have passed qualifications prescribed by are certified by the National Certified Pipe Welding Bureau or by other reputable and recognized agency, acceptable to the Engineer, using welding procedures set forth in the ASME Boiler Construction Code, Section IX, Welding Qualifications. No welder shall be employed who does not meet the above requirements.

PIPING

Pipe shall be cleaned and ends properly reamed. Until final connections are made, piping shall be capped or plugged. All piping shall bear the ASTM label and be U.S. made pipe. Foreign pipe shall be allowed only with the written approval of the engineer.

Valves and specialties shall be placed for easy operation and access. Valves shall be installed in a horizontal or vertical position.

Provide numbered brass tags not less than 1-1/2" diameter on all shutoff valves and furnish the Owner with typewritten sheets in duplicate showing the number of valves, where the valve is located, and what it controls. Typewritten sheets shall be furnished framed under glass.

All fixtures, specialties and items of equipment shall be flanged or union connected and shall have stop valves for isolation.

Locate and install piping so that 1/2" minimum clearance is maintained after insulation is applied. Install piping free of sags and bends and installed perpendicular or parallel to the building structure.

Piping over electrical equipment is prohibited unless approved by the engineer and the piping is panned and piped to a floor drain.

Provide dielectric insulation at points where copper or brass piping comes in contact with ferrous piping, reinforcing steel or other dissimilar metal in structure. Provide dielectric unions or couplings where dissimilar metals are in contact.

Gas Piping: The contractor or sub-contractor responsible for the installation of each gas fired piece of equipment, shall provide the final gas connections within 20 feet of the units, including drops through roof with patching, gas valve, union, drip leg and manifolds as required for multiple installation.

All welding shall conform to the applicable requirements of the American Standard Code for Pressure piping. See Supervision and Workmanship.

SPECIFICATIONS

Specifications shall be interpreted in connection with the drawings hereinbefore described, and if anything is shown on drawings and not mentioned in the specifications, or vice versa, it is to be included in the work the same as though clearly set forth by both.

Furthermore, all materials or labor previously required to fully complete the work shall be included in the contractor's work even though each item necessarily involved be not specifically mentioned or shown. Such work and/or materials shall be of the same grade or quality as the parts actually specified and shown. Should there be a conflict between the plans and specifications, the greater quantity or better quality shall be furnished.

PERMITS, FEES, INSPECTION, LAWS AND REGULATIONS

Permits and fees of every nature required in connection with this work shall be obtained and paid for by this contractor who shall also pay for all the installation fees and similar charges. Laws and regulations which bear upon or affect the various branches of this work shall be complied with by this contractor, and are hereby made a part of this contract. All work which such laws require to be inspected shall be submitted to the proper public officials for inspections and certificates of final approval must be furnished to the Owner before final acceptance will be given by the Engineer.

ELECTRICAL REQUIREMENTS AND MOTORS

Electrical wiring shall be provided under Division 16 unless specifically called for in another section of the specifications.

An enclosed safety type, NEMA Type HD motor disconnect switch shall be furnished and installed under the Electrical Division for each motor installation unless specifically mentioned as furnished under another section/of these specifications.

The motor control apparatus shall be furnished complete as a part of the motor and apparatus which it operates when called for in certain instances in the Mechanical Division. Motor control apparatus except as above shall be complete, factory wired and tested, ready for connections to be made under Division 16.

All motors shall be in accordance with the latest standards of NFPA 70, "National Electrical Code".

Refer to Schedule of Equipment for voltages and phase.

All mechanical equipment shall be U. L. listed for use with "HACR" circuit breakers.

Service Factors indicated for motors are minimum values and apply at frequency and utilization voltage at which motor is connected. Provide motors which will not operate in the service factor range when supply voltage is within 10 percent of motor voltage rating.

Temperature Rise: Based on 40 deg. C ambient except as otherwise indicated.

Enclosure: Open drip-proof.

Wherever in these specifications, a motor voltage is listed, the motor shall be wound for the listed voltage and none other will be accepted.

The Electrical Section of the specifications and drawings shall be consulted for the exact voltage.

Polyphase Motors

Squirrel cage induction type

NEMA design letter Designation "B"

Internal thermal overload protection

Bearings: double shielded, prelubricated, regreasable

Energy Efficient Motors: equal or greater than NEMA MG-1

1.25 Service factor

Multi Speed Motors: separate windings for each speed

Single-Phase Motors

Internal Thermal overload protection

Sealed, prelubricated bearings

TEMPORARY SERVICE: Refer to Section 01500

TESTING AND BALANCING

Air Systems

The contractor shall procure the services of an independent Air Balance and Testing Agency, approved by the engineer, and a member of AABC or NEBB, which specializes in the balancing and testing of heating ventilating and air conditioning systems, to balance, adjust and test air moving equipment and air distribution or exhaust systems as herein specified. All work by this agency shall be done under direct supervision of a qualified Heating and Ventilating Engineer employed by this agency. All instruments used by this agency shall be accurately calibrated and maintained in good working order.

Air balance and testing shall not begin until the system has been completed and is in full working order. The Contractor shall put all heating, ventilating and air conditioning systems and equipment into full operation and shall continue the operation of same during each working day of testing and balancing. The contractor shall submit within 30 days after receipt of contract, 8 copies of submittal data for the testing and balancing of the air conditioning, heating, and ventilating systems. The Air Balance and Testing Agency shall provide proof of having successfully completed at least five projects of similar size and scope.

OPERATING AND MAINTENANCE MANUALS

The scope of such operating and maintenance manuals shall include the following:

- Description of mechanical equipment and systems.
- Operating instructions.
- Routine maintenance schedules and procedures.

Organization - A manual of such purpose shall be arranged in two parts, with Part I dealing with information pertaining to systems and Part II covering information pertaining to equipment. These may be bound in as many volumes as may be required for convenience of use and reference.

HANGERS AND SUPPORTS AND FOUNDATION

Support all piping, ductwork and equipment by hangers or brackets. Furnish structural steel members, (prime painted with zinc chromate) where required to support piping and equipment. No portion of piping or valves shall be supported by equipment. Double nut all threaded rods.

Pipe hangers to be ITT Grinnel (Clevis Hanger) Fig. 260, Elcen or approved equal. Rod sizes to conform to the following: 3/8" rods for 3/4"-2" pipe; 1/2" rods for 2-1/2"-3" pipe; 5/8" for 4"-5" and 3/4" for 6". All piping within 100 feet of pumps or vibrating equipment to be supported on vibration isolators. Hangers shall be sized to allow insulation to pass through unobstructed, provide saddle support for insulation at all hanger. Note: 1/4" rods are not acceptable.

Riser clamps to be ITT Grinnel Fig. 261 or equal.

Ductwork - Support by means of hangers as follows:

Duct Width	Hanger Size and Type	Max. Spacing
60 or less	1"x.109" (#12 gage)	8
61 to 90	3/8" dia. rod	8
Over 90	3/8" dia. rod	4

A pair of hangers shall be located at every transverse joint and elsewhere according to the table. Where ductwork is hung via rods, rods shall be double nutted.

Suspend hangers from joist or I beam by means of C clamps with lock nut and retaining clip. ITT Grinnel Fig. 86. Suspend hanger rods from structural concrete slab by means of universal insert.

Brace piping by structural steel members securely attached to building construction.

Anchor pipes by means of structural steel members securely attached to building construction.

Where piping is close to floor, support on adjustable pipe support.

Hanger spacing for piping unless otherwise noted is to be as follows: 1-1/4" or smaller to be 8' O.C.; 1-1/2"-2" to be 10' O.C.; 2-1/2" and larger to be 12' O.C. and at each change of direction. Hanger spacing for copper pipe to be as follows: 1" or smaller 6' O.C.; 1-1/4" or larger 8' O.C. Hanger spacing for cast iron soil pipe - 5' O.C. and at each hub. Piping shall be also supported at each change in direction at valves and equipment.

Piping connections to all equipment with moving parts shall be isolated with braided copper or stainless steel flexible links, which shall be selected to absorb the deflection on the isolating members.

All mechanical equipment shall have concrete bases and/or structural steel supports and shall be furnished and installed by sub-contractor. Minimum base height equals 4".

Concrete bases shall extend at least 4" beyond the bed or frame of the supported machine. Bases shall have straight and finished sides and a 1"-45 degree chamfer at the top. Reinforcing steel bars shall be placed in both directions of the base.

The use of pumps or other equipment as piping supports shall be prohibited. All such connectors and their supports shall be independently supported from the building structure and inspected and approved by the Engineer before bolting.

Provide flexible connectors where pipes or ducts cross building expansion joints equal to Flexonics.

PHOTOELECTRIC SMOKE DETECTORS:

Fire Alarm Related Work For Mechanical Systems

The following applies whether or not shown on drawings. Prior to submitting a bid, each contractor shall review documents of all other branches which may have an impact on such work.

It shall be the responsibility of the contractor who installs the alarm panel and/or wiring to provide all necessary working drawings and submittals (wiring diagrams, zone schedule, plan view layouts, routing, wiring, device & panel submittals, etc.). These submittals shall be approved by the state fire marshall's office (or a similar agency as locally required) prior to submittal to engineer. All components shall be UL listed and NFPA approved for their specific application. Where control panels are required, provide remote annunciator (at location as directed in field) and provide full battery back-up as required by NFPA.

All smoke detectors shall be specifically UL listed for use with the existing or new building fire alarm panel(s) and shall be provided with all required power supply/alarm wiring, sampling tubes, test station, auxiliary contacts, etc.

All work shall be in strict compliance with all applicable sections of the latest edition of NFPA. Each air handling unit, sprinkler flow switch and/or sprinkler tamper switch shall be separately zoned. All fire alarm system wiring shall be supervised and installed in conduit (3/4" minimum).

Unless local prevailing codes require otherwise, fire alarm related work for mechanical systems shall be provided as follows.

Buildings with Sprinkler System and/or with Fire Protective Signaling System and/or with Automatic Fire Detection System:

For air handling units and air systems with capacity of 2000 cfm or above, HVAC contractor shall furnish, install & wire a UL listed photoelectric smoke detector (with all required sampling tubes, test stations, auxiliary contacts, etc.) in the main supply duct, consult with local authorities in jurisdiction for exact location. Electrical contractor will install smoke detector and make alarm system connections. Temperature contractor shall make shut down control wiring connections thru auxiliary NC contacts in detector sub base. Consult local authorities in jurisdiction for exact location.

If a sprinkler system exists in the building, the sprinkler contractor shall furnish and install all required flow and tamper switches. The electrical contractor shall furnish, install and wire all required fire alarm system wiring as well as all required additional components within the fire alarm system control and annunciator panels to allow for the additional zoning.

Electrical contractor shall coordinate with mechanical contractors and shall install the detectors in easily accessible locations. Electrical contractor shall provide all necessary fire alarm system wiring (in conduit) and supplementary work, components, equipment, etc. as required to interface the sprinkler and/or smoke detector work with the building fire alarm system(s).

HVAC contractor shall make wiring connection from the auxiliary contacts of the detectors into fan control circuits to stop fans in event of presence of smoke.

ARCHITECTURAL COORDINATION ITEMS

Cut and drill all openings in walls and floors required for the installation. Secure approval of Engineer before cutting and drilling. Neatly patch all openings cut.

Cutting and patching to be held to a minimum by arranging with other contractors for all sleeves and openings before construction is started.

Patching through fire rated walls and enclosures shall not diminish the rating of that wall or enclosure. Patch shall be equal to rockwool, firestop, caulk or approved "rated" patch.

Provide products equivalent to the following:

For Floor Openings:	Instant Firestop; 305-SL
For Wall Openings:	Instant Firestop; 344-GG
Mineral Felt:	Instant Firestop; Type MW
For Insulated Pipes:	Instant Firestop; Type PI
For Fill Areas:	Instant Firestop; C-1000

Furnish all access panels required for proper servicing of equipment. Provide access panels for all concealed valves, vents, controls and cleanout doors. Provide frame as required for finish. Furnish panels to General Contractor. Exact locations to be determined by the Engineer. Minimum size to be 12" x 12", units to be 16 gauge steel, locking device shall be screw driver cam locks.

Install standard Schedule 40 black steel pipe sleeves two sizes larger than pipes passing through floors, walls or masonry construction.

Sleeves through walls to be cut flush with both faces.

Sleeves through floor to extend one inch above floor top elevation.

Pipes penetrating roof shall use a pipe curb assembly equal to Pate Co.

Caulk between sleeves and pipes with rockwool and caulk around sleeves with sealing compound. Material must meet all applicable fire ratings required.

Crane Company, B&C or approved equal chromium plates to be used wherever uninsulated exposed pipes pass through walls or ceilings.

Furnish and set all forms required in masonry walls or foundation to accommodate pipes.

EXCAVATING AND BACKFILLING

Comply with all codes in jurisdiction. Provide slope sides, shore and brace as required for stability. Refer to Division 2, "Earthwork" for further requirements.

The contractor shall perform all excavation and backfilling required for his work and shall consult with utilities prior to beginning excavation.

Remove materials of every nature and description encountered in obtaining indicated lines and grades as shown on drawings. No extras will be allowed due to variations of proportion and the variation of materials.

All piping shall be laid on a bed of sand, 6" deep, well tamped into place and properly graded to permit the pipe to have an even bearing throughout its entire length.

Excess excavated earth materials shall be removed from the site.

All backfilling of excavation under concrete slabs, concrete drives and walks or blacktop surfaces shall be bankrun gravel. All excavations shall be compacted to prevent settling.

Roadways, walks and slabs	100%
Yard areas	95%

Compaction shall be performed in 12" lifts and spread evenly.

The contractor shall pay for all expenses for the proper restoration of all streets, sidewalks, concrete and blacktop surfaces broken for installing piping.

CLEANING EQUIPMENT AND PREMISES

Clean all parts of the apparatus and equipment. Exposed parts which are to be painted shall be cleaned of cement, plaster and other materials and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all corners and cracks scraped out.

Exposed metal work shall be brushed down with steel brushes to remove rust and other spots and left smooth and clean. Remove trapped elements during cleaning and flushing period, after which they shall be replaced and adjusted.

During the progress of the work, the contractor shall clean up after his men and leave the premises and all portions of the building in which he is working in a clean and safe condition.

PAINTING, MARKING AND NAMEPLATE DATA

Nameplate: For each piece of power operated mechanical equipment provide a permanent operational data nameplate indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

All exposed piping, ductwork and equipment shall be identified by stenciling as follows (or as listed in the identification section) by this contractor.

Provide directional arrows at least 4" long spaced at least every 50 feet.

Contents of piping and ductwork shall be labeled: Example - Air Conditioning Supply - A.C. Sup.; Air Conditioning Return - A. C. Ret.; Toilet Exhaust Air - Toilet Exh.

Equipment shall be labeled with unit numbers same shown on drawings or indicated in specifications.

Letters shall be 1" tall for piping and 4" tall for ductwork and equipment. The air conditioning system numbers and zone numbers shall be added after each designation of the air conditioning supply ductwork.

GUARANTEE

The contractor shall provide a guarantee in written form stating that all work under this section shall be free of defective work, materials, or parts for a period of one year from the date of substantial completion and shall repair, revise or replace at no cost to the owner any such defects occurring within the guarantee period. Contractor shall also state in written form that any items or occurrences arising during the guarantee period will be attended to in a timely manner and will in no case exceed four (4) working days from date of notification by owner.

END OF SECTION

SECTION 15100

VALVES

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

Types of valves specified in this section include the following:

Gate Valves
Ball Valves
Globe Valves
Check Valves

PART 2 - PRODUCTS

Manufacturer: Subject to compliance with requirements, provide valves of one of the following:

Milwaukee
Crane
Hammond
Stockham
Lunkenheimer:
Powell:
Keystone:
Watts:

VALVE FEATURES:

Bronze Valves shall be listed for domestic use.

Valve Design: Valves shall have rising stem, or rising outside screw and yoke stems; except, non-rising stem valves may be used where headroom prevents full extension of rising stems.

Pressure and Temperature Ratings: as required to suit system pressures and temperatures.

Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe size.

Operators: Provide the following special operator features:

Handwheels, fastened to valve stem, for valves other than quarter turn.

Lever Handle on quarter-turn valves 6 inch and smaller, except for plug valves. Provide one wrench for every 10 plug valves.

Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.

End Connections:

Flanged:

Threaded:

GATE VALVES:

Gate Valves - 2 Inch and Smaller: Class 125, body and bonnet of cast bronze, threaded or solder ends, solid disc, copper-silicon alloy stem, brass packing gland, "Teflon" impregnated packing, and malleable iron handwheel. Class 150 valves meeting the above shall be used where pressure requires.

Gate Valves - 2-1/2 Inch and Larger: Class 125 iron body, bronze mounted, with body and bonnet conforming to ASTM A 126 Class B, flanged ends, and "Teflon" impregnated packing and two-piece backing gland assembly.

BALL VALVES:

Ball Valves - 1 Inch and Smaller: 2-piece Ball Valves 2" and smaller, 600 WOG, 150 SWP, Cast Bronze body, Teflon seats, conventional port, blow-out roof stem, adjustable packing gland, chrome plated bronze ball, screwed ends. Provide solder ends for domestic hot and cold water service; threaded ends for heating hot water condenser water, chilled water and low pressure steam. Provide extended valve stems for valves used on insulated lines.

Ball Valves - 1-1/4 Inch to 2 Inch: rated for 150 psi saturated steam pressure, 600 psi WOG pressure; 3-piece construction, bronze body, conventional port, chrome-plated brass ball, "blowout proof stem, and vinyl-covered steel handle. Provide solder ends for domestic hot and cold water service; threaded ends for heating hot water, condenser water, chilled water and low pressure steam. Provide extended valve stems for valves used on insulated lines.

GLOBE VALVES:

Globe Valves - 2 Inch and Smaller: Class 125, body and screwed bonnet of cast bronze, threaded or solder ends, brass or replaceable composition disc, copper-silicon alloy stem, brass packing gland, and malleable iron handwheel. Class 150 valves meeting the above shall be used where pressure requires.

Globe Valves - 2-1/2 Inch and Larger: Class 125 iron body and bolted bonnet, Class B; outside screw and yoke, bronze mounted, flanged ends, and two-piece backing gland assembly.

CHECK VALVES:

Swing Check Valves - 2 Inch and Smaller: Class 125, cast bronze body and cap, horizontal swing, Y-pattern, with a bronze disc, and having threaded or solder ends. Valve shall be capable of being reground while the valve remains in the line. Class 150 valves meeting the above specifications may be used where pressure requires or Class 125 are not available. Provide solder ends for domestic hot and cold water service; threaded ends for heating hot water, condenser water, chilled water and low pressure steam.

Swing Check Valves - 2-1/2 Inch and Larger: Class 125 (Class 175 FM approved for fire protection piping systems), cast iron body and bolted cap, Class B; horizontal swing, with a bronze disc or cast iron disc with

bronze disc ring, and flanged ends. Valve shall be capable of being refitted while the valve remains in the line. Class 150 valves meeting the above specifications may be used where pressure requires or Class 125 are not available.

PART 3 - EXECUTION

EXAMINATION:

Examine valve interior through the end ports, for cleanliness, freedom from foreign matter and corrosion. Remove special packing materials, such as blocks used which prevents disc movement during shipping and handling.

Actuate valve through an open-close and close-open cycle. Examine functionally significant features, such as guides and seats made accessible by such actuation. Following examination, return the valve closure member to the position in which it was shipped.

Examine threads on both the valve and the mating pipe for form (out-of-round or local indentation) and cleanliness.

Replace defective valves with new valves.

Examine mating flange faces for conditions which might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size and material, and for freedom from defects and damage.

VALVE SELECTION:

Copper Tube Size 2 Inch and Smaller: Solder ends, except in heating, chilled, condenser water and low pressure steam service which shall have threaded ends.

Steel Pipe Sizes 2 Inch and Smaller: threaded.

Steel Pipe Sizes 2-1/2 Inch and Larger: flanged.

VALVE INSTALLATIONS:

General Application: Use gate, ball, and butterfly valves for shut-off duty. Use ballcentric and butterfly for throttling duty.

Control Valves shall be globe type modulating valves.

Locate valves for easy access and provide separate support where necessary.

Install valves and unions for each fixture and item of equipment in a manner to allow equipment removal without system shut-down. Unions are not required on flanged devices. Isolation valves shall be installed on branch lines serving two or more pieces of equipment and every 100 feet.

Install valves in horizontal piping with stem at or above the center of the pipe.

Install 3-valve bypass around each pressure reducing valve using throttling type valves.

Install balancing valve in the bypass of 3-way valves.

Installation of Check Valves: Install for proper direction of flow as follows:

Swing Check Valves: horizontal position with hinge pin level.

SOLDER CONNECTIONS:

Cut tube square and to exact lengths.

Clean end of tube to depth of valve socket, using steel wool, sand cloth, or a steel wire brush to a bright finish. Clean valve socket in same manner.

Apply proper soldering flux in an even coat to inside of valve socket and outside of tube.

Open gate and globe valves to fully open position.

Remove the cap and disc holder of swing check valves with composition discs.

Insert tube into valve socket making sure the end rests against the shoulder inside valve. Rotate tube or valve slightly to insure even distribution of the flux.

Apply heat evenly to outside of valve around joint until solder will melt upon contact. Feed solder until it completely fills the joint around tube. Avoid hot spots or overheating the valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.

THREADED CONNECTIONS:

Note the internal length of threads in valve ends, and proximity of valve internal seat or wall, to determine how far pipe should be threaded into valve.

Align threads at point of assembly.

Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified).

Assemble joint wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

FLANGED CONNECTIONS:

Align flanges surfaces parallel.

Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using a torque wrench.

For dead end service, butterfly valves require flanges both upstream and downstream for proper shutoff and retention.

FIELD QUALITY CONTROL:

Testing: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks; replace valve if leak persists.

ADJUSTING AND CLEANING:

Cleaning: Clean mill scale, grease, and protective coatings from exterior of valves and prepare to receive finish painting or insulation.

END OF SECTION

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SECTION 15120
PIPING SPECIALTIES

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

Types of piping specialties specified in this section include the following:

- Pipe Escutcheons.
- Pipeline Strainers.
- Vandal-Proof Vent Caps.
- Dielectric Unions.
- Mechanical Sleeve Seals.
- Fire Barrier Penetration Seals.
- Pipe Sleeves.
- Sleeve Seals.

PART 2 - PRODUCTS

PIPING SPECIALTIES:

PIPE ESCUTCHEONS:

General: Provide pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.

Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.

Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.

Manufacturer: Subject to compliance with requirements, provide pipe escutcheons of one of the following:

- Chicago Specialty Mfg. Co.
- Producers Specialty & Mfg. Corp.
- Sanitary-Dash Mfg. Co.

LOW PRESSURE Y-TYPE PIPELINE STRAINERS:

General: Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 125 psi working pressure, with Type 304 stainless steel screens, with 3/64" perforations @ 233 per sq. in.

Threaded Ends, 2" and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.

Flanged Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.

Butt Welded Ends, 2-1/2" and Larger: Schedule 40 cast carbon steel body, bolted screen retainer with off-center blowdown fitted with pipe plug.

Manufacturer: Subject to compliance with requirements, provide low pressure Y-type strainers of one of the following:

Armstrong Machine Works.
Hoffman Specialty ITT; Fluid Handling Div.
Metraflex Co.
Spirax Sarco.
Trane Co.
Victaulic Co. of America.
Watts Regulator Co.

VANDAL-PROOF VENT CAPS:

General: Provide cast-iron vandal-proof vent caps, full size of vent pipe, caulked base connection for cast-iron pipes, threaded base for steel pipes.

Manufacturer: Subject to compliance with requirements, provide vandal-proof vent caps of one of the following:

Josam Mfg. Co.
Smith (Jay R.) Mfg. Co.
Tyler Pipe; Sub. of Tyler Corp.
Zurn Industries, Inc.; Hydromechanics Div.

DIELECTRIC UNIONS:

General: Provide standard products recommended by manufacturer for use in service indicated, which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action, and stop corrosion.

Manufacturer: Subject to compliance with requirements, provide dielectric unions of one of the following:

B & K Industries, Inc.
Capital Mfg. Co.; Div. of Harsco Corp.
Eclipse, Inc.
Epcos Sales, Inc.
Perfection Corp.
Rockford-Eclipse Div.

MECHANICAL SLEEVE SEALS:

General: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

Manufacturer: Subject to compliance with requirements, provide mechanical sleeve seals of one of the following:

Thunderline Corp.

FIRE BARRIER PENETRATION SEALS:

Provide seals for any opening through fire-rated walls, floors, or ceilings used as passage for mechanical components such as piping or ductwork.

Cracks, Voids, or Holes Up to 4" Diameter: Use putty or calking, one-piece intumescent elastomer, non-corrosive to metal, compatible with synthetic cable jackets, and capable of expanding 10 times when exposed to flame or heat, UL-listed.

Openings 4" or Greater: Use sealing system capable of passing 3-hour fire test, consisting of wall wrap or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250 to 350 deg. F (121 to 177 deg. C), UL-listed.

Manufacturer: Subject to compliance with requirements, provide fire barrier penetration seals of one of the following:

Electro Products Div./3M.
Nelson; Unit of General Signal.

FABRICATED PIPING SPECIALTIES:

Pipe Sleeves: Provide pipe sleeves of one of the following:

Sheet-Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gages: 3" and smaller, 20 gage; 4" to 6" 16 gage; over 6", 14 gage.

Steel-Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.

Plastic-Pipe: Fabricate from Schedule 80 PVC plastic pipe; remove burrs.

Sleeve Seals: Provide sleeve seals for sleeves located in foundation walls below grade, or in exterior walls, of one of the following:

Mechanical Sleeve Seals: Installed between sleeve and pipe.

PART 3 - EXECUTION

INSTALLATION OF PIPING SPECIALTIES:

Pipe Escutcheons: Install pipe escutcheons on each pipe penetration thru floors, walls, partitions, and ceilings where penetration is exposed to view; and on exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and is flush with adjoining surface.

Y-Type Strainers: Install Y-type strainers full size of pipeline, in accordance with manufacturer's installation instructions. Install pipe nipple and shutoff valve in strainer blow down connection, full size of connection, except for strainers 2" and smaller installed ahead of control valves feeding individual terminals. Where indicated, provide drain line from shutoff valve to plumbing drain, full size of blow down connection.

Locate Y-type strainers in supply line ahead of the following equipment, and elsewhere as indicated, if integral strainer is not included in equipment:

Pressure reducing valves.

Vandal-Proof Vent Caps: Install vandal-proof vent caps on each vent pipe passing through roof, and elsewhere as indicated. Locate base of vent cap 6" above roof surface, or higher where require by Code.

Dielectric Unions: Install at each piping joint between ferrous and non-ferrous piping. Comply with manufacturer's installation instructions.

Mechanical Sleeve Seals: Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal.

Provide at all locations where piping exits building below grade.

Fire Barrier Penetration Seals: Fill entire opening with sealing compound. Adhere to manufacturer's installation instructions.

Provide at all fire wall separations where piping or ducts penetrate the wall.

INSTALLATION OF FABRICATED PIPING SPECIALTIES:

Pipe Sleeves: Install pipe sleeves of types indicated where piping passes through walls, floors, ceilings, and roofs. Do not install sleeves through structural members of work, except as detailed on drawings, or as reviewed by Architect/Engineer. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than 2 pipe sizes larger than piping run. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves. Extend floor sleeves 1/4" above level floor finish, and 3/4" above floor finish sloped to drain. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves.

END OF SECTION

SECTION 15250
MECHANICAL INSULATION

PART 1 - GENERAL

DESCRIPTION OF WORK:

Extent of mechanical insulation required by this section is indicated on drawings, and by requirements of this section.

Types of mechanical insulation specified in this section include the following:

Piping System Insulation:

Domestic Water Piping Systems.
Chilled Water Piping System.
Refrigerant Piping Systems.

Ductwork System Insulation:

Cold Ductwork.

Manufacturer: Subject to compliance with requirements, provide products of one of the following:

Armstrong World Industries, Inc.
Owens-Corning Fiberglass Corp.
Keene Corp.
CertainTeed.
Johns Manville.
Pittsburg Corning Corp.

Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread rating of 25 or less, and smoke-developed rating of 50 or less, as tested by ANSI/ASTM and NFPA 255.

PART 2 - PRODUCTS

PIPING INSULATION MATERIAL:

Fiberglass piping insulation: ASTM C 547, Class 1

Flexible Unicellular Piping Insulation: ASTM C 534, Type I

Encase pipe fittings insulation with one-piece premolded PVC fitting covers.

Vapor Barrier Material: Paper-backed aluminum foil, except as otherwise indicated, strength and permeability rating equivalent to adjoining pipe insulation jacketing.

Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for applications indicated.

Adhesives, Sealers, and Protective Finishes: As recommended by insulation manufacturer for applications indicated.

DUCTWORK INSULATION MATERIALS:

Rigid Fiberglass Ductwork Insulation:

Flexible Fiberglass Ductwork Insulation:

Vapor Barrier Material for Ductwork: Paper-backed aluminum-foil, except as otherwise indicated; strength and permeability rating equivalent to factory-applied vapor barriers on adjoining ductwork insulation, where available; with following additional construction characteristics:

High Puncture Resistance: Low vapor transmission (for ducts in exposed areas).

Moderate Puncture Resistance: Medium vapor transmission (for ducts in concealed areas).

Ductwork Insulation Accessories: Provide staples, bands, wires, tape, anchors, corner angles and similar accessories as recommended by insulation manufacturer for applications indicated.

Ductwork Insulation Compounds: Provide cements, adhesives, coatings, sealers, protective finishes and similar compounds as recommended by insulation manufacturer for applications indicated.

PART 3 - EXECUTION

PLUMBING PIPING SYSTEM INSULATION:

Insulation Omitted: Omit insulation on exposed plumbing fixture runouts from faces of wall or floor to fixture; on unions, flanges, strainers, flexible connections, and expansion joints.

Cold Piping:

Application Requirements: Insulate the following cold plumbing piping systems:

Domestic cold water piping.

Horizontal Roof Leaders and underside of roof drain sumps in the interior of building.

Insulate each piping system specified above with one of the following types and thicknesses of insulation:

Insulation: Flexible unicellular 1/2" thickness.

Hot Piping:

Application Requirements: Insulate the following hot plumbing piping systems:

Domestic hot water piping.

Domestic hot water recirculating piping.

Insulate each piping system specified above with one of the following types and thicknesses of insulation:

Insulation: Flexible unicellular 3/4" thick.

HVAC PIPING SYSTEM INSULATION:

Insulation Omitted: Omit insulation on hot piping within radiation enclosures or unit cabinets; on cold piping within unit cabinets provided piping is located over drain pan; and on unions, flanges, strainers, flexible connections, and expansion joints.

Cold Piping (40 Deg F (4.4 Deg C) to ambient):

Application Requirements: Insulate the following cold HVAC piping systems:

Air conditioner condensate drain piping.

Insulate each piping system specified above with one of the following types and thicknesses of insulation:

Fiberglass: 1" thick for pipe sizes up to and including 4", 1-1/2" thick for pipe sizes over 4".

Sub-Freezing Piping (0 to 39 Deg F (-18 to 4 Deg C)):

Application Requirements: Insulate the following sub-freezing HVAC piping systems:

Refrigerant suction lines between evaporators and compressors.

Insulate each piping system specified above with one of the following types and thicknesses of insulation:

Insulation: Armaflex, 1/2" thick for pipe sizes up to and including 1", 1" thick Armaflex for pipe sizes over 1".

DUCTWORK SYSTEM INSULATION:

Cold Ductwork (below ambient temperature):

Application Requirements: Insulate the following cold ductwork:

Outdoor air intake ductwork between air entrance and fan inlet or HVAC unit inlet.
HVAC supply ductwork between fan discharge, or HVAC unit discharge, and room terminal outlet.
HVAC Ductwork three feet downstream of roof penetrations.
HVAC Louvers, Plenums and Ductwork three feet downstream of wall penetrations.

Insulate each ductwork system specified above with one of the following types and thicknesses of insulation:

Insulation: Externally wrapped rigid fiberglass; 1-1/2" thick.

Insulation: Externally wrapped flexible fiberglass; 1-1/2" thick, application limited to concealed locations.

Insulation: Internal fiberglass insulation; 1" thick only where specifically noted on drawings.

INSTALLATION OF PIPING INSULATION:

Install insulation on pipe systems subsequent to testing and acceptance of tests.

Repair or replace damaged existing insulation as indicated or required.

Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other.

Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.

Maintain integrity of vapor-barrier jackets on pipe insulation, and protect to prevent puncture or other damage.

Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated.

Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.

Install protective metal shields and insulated inserts wherever needed to prevent compression of insulation.

INSTALLATION OF DUCTWORK INSULATION:

Install insulation materials with smooth and even surfaces.

Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.

Maintain integrity of vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage.

Extend ductwork insulation without interruption through walls, floors and similar ductwork penetrations, except where otherwise indicated.

Lined Ductwork: Except as otherwise indicated, omit insulation on ductwork where internal insulation or sound absorbing linings have been installed. Duct lining to be 3-lb density, 1" thick unless otherwise noted. Size of ductwork shown on the drawings is free net area, outside dimension of ducts will need to be increased if lined duct is used.

Ductwork Exposed to Weather: Protect outdoor insulation from weather by installing outdoor protective finish or jacketing as recommended by manufacturer.

Corner Angles: Install corner angles on external corners of insulation on ductwork in exposed finished spaces before covering with jacketing.

PROTECTION AND REPLACEMENT:

Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

Protection: Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION

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SECTION 15350
NATURAL GAS PIPING SYSTEMS

PART 1 - GENERAL:

RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to this Section.

Division 15 Basic Materials and Methods sections apply to work of this section - 15020, 15100, 15120.

DESCRIPTION OF WORK:

Extent of natural gas piping system work, is indicated on drawings and schedules, and by requirements of this section.

Applications for natural gas piping systems include the following:

- Gas service from street main to building meter outside of building.
- Gas main to building from gas meter.
- Building distribution system from gas mains to gas-fired equipment connections.
- Gas meter only will be provided by the utility company to the site, ready for installation.

Trenching and backfill required in conjunction with gas service piping is specified in applicable Division 15 Basic Materials and Method sections, and is included as work of this section.

QUALITY ASSURANCE:

Manufacturers: Firms regularly engaged in manufacturer of natural gas piping products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than five years.

Installer: A firm with at least three years of successful installation experience on projects with natural gas piping system work similar to that required for project.

ANSI Code Compliance: Comply with applicable provisions of ANSI 31.2 "Fuel Gas Piping."

National Fuel Gas Code Compliance: Comply with applicable provisions of NFPA 54 (ANSI Z223.1) "National Fuel Gas Code," and ANSI Z223.1a "Supplement to National Fuel Gas Code."

Local Utility Compliance: Comply with requirements of local gas utility company. Refer to CG&E specification at end of this section for exterior plastic gas service requirements.

SUBMITTALS:

Product Data: Submit manufacturer's data for fuel gas piping systems materials and products.

PART 2 - PRODUCTS

NATURAL GAS PIPING MATERIALS AND PRODUCTS:

General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with ANSI B31.2 where applicable, base pressure rating on natural gas piping system maximum design pressures. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials use in natural gas piping systems. Where more than one type of material or product is indicated, selection is Installer's option.

BASIC IDENTIFICATION:

General: Provide identification complying with Division 15 Basic Materials and Methods sections in accordance with the following listing:

- Building Distribution Piping: Plastic pipe markers
- Gas Service: Underground-type plastic line markers
- Gas Valves: Plastic valve tags

BASIC PIPE, TUBE, AND FITTINGS:

General: Provide pipe, tube, and fittings in accordance with the following listing:

Gas Service Piping:

All Pipe Sizes: Black steel pipe.

Pipe Weight: Schedule 40.
Fittings: Wrought-steel buttwelding.

Wrapping: Machine wrap pipe using 50% overlap wrap, with polyvinyl chloride tape. Land wrap fittings using 100% overlap wrap extending 6" beyond fitting onto wrapped pipe. Comply with tape manufacturer's installation instructions.

Coated Pipe may be used as approved by local utility company. Anode bags shall be provided on outside metallic mains per utility company recommendations.

Building Distribution Piping:

Pipe Size 2" and Smaller: Black steel pipe

Pipe Weight: Schedule 40
Fittings: Malleable iron threaded

Pipe Size 2-1/2" and Larger: Black steel pipe

Pipe Weight: Schedule 40

Fittings: Wrought-steel buttwelding

BASIC PIPING SPECIALTIES:

General: Provide piping specialties complying with Division 15 Basic Materials and Methods sections in accordance with the following listing:

Pipe escutcheons
Pipe sleeves
Sleeve seals

BASIC SUPPORTS, ANCHORS, AND SEALS:

General: Provide supports, anchors, and seals in accordance with the following listing:

Adjustable swivel pipe rings for horizontal-piping hangers and supports.

Two-bolt riser clamps for vertical piping supports.

Concrete inserts, C-clamps, and steel brackets for building attachments.

Fire barrier penetration seals.

SPECIAL VALVES:

General: Special valves required for natural gas piping systems include the following types:

Gas Cocks:

Gas Cocks 2" and Smaller: 150 psi non-shock WOG, bronze straightway cock, flat or square head, threaded ends.

Gas Cocks 2-1/2" and Larger: 125 psi non-shock WOG, iron body bronze mounted, straightway cock, square head, flanged ends.

Lab gas cocks shall be provided by casework contractor.

Available Manufacturers: Subject to compliance with requirements, manufacturers offering gas cocks which may be incorporated in the work include, but are not limited to, the following:

DeZurik; Unit of General Signal
Homestead Industries, Inc.; Valve Division
Jenkins Brothers
Lunkenheimer Co., Division of Conval Corporation
NIBCO, Inc.
Powell Company

Rockwell Manufacturing co.
Walworth Company

GAS METER:

General: Gas meter will be furnished by utility company. Coordinate with utility company for installation requirements.

PART 3 - EXECUTION

INSTALLATION OF BASIC IDENTIFICATION:

General: Install natural gas distribution piping with Mechanical Identification.

INSTALLATION OF NATURAL GAS PIPING:

General: Install mechanical identification in accordance with applicable codes and local Utility Company requirements.

Use sealants on metal gas piping threads which are chemically resistant to natural gas. Use sealants sparingly, and apply to only male threads of metal joints.

Remove cutting and threading burrs before assembling piping.

Do not install defective piping or fittings. Do not use pipe with threads which are chipped, stripped or damaged.

Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping, or equipment connections are completed.

Ground gas piping electrically and continuously within project, and bond tightly to grounding connection if required by utility company requirements.

Install drip-legs in gas piping where indicated, and where required by code or regulation.

Install "tee" fitting with bottom outlet plugged or capped, at bottom of pipe risers.

Use dielectric unions where dissimilar metals are joined together.

Install piping with 1" drop in 60' pipe run (0.14%) in direction of flow.

Install piping parallel to other piping, but maintain minimum of 12" clearance between gas piping and steam or hot water piping above 200 degrees F (93 degrees C).

For piping buried in building substrate, or below floor slabs, install in welded conduit, ventilated to outdoors on both ends, and tested to same requirements as gas piping.

GAS SERVICE:

General: Arrange with Utility Company to provide gas service to indicated locations with shutoff at terminus. Consult with Utility as to extent of its work, costs, fees and permits involved. Pay such costs and fees; obtain permits.

Contact Cinergy Corp., 7200 Industrial Road, Florence, KY 41042.

Gas main will be provided from street main to a point 2 feet to the east side of Alexandria Pike by utility company. Plumbing Subcontractor shall extend from this point to gas meter location at building.

Extend service pipes from gas meter to inside building wall, under Utility's direction.

Provide shutoff outside building where indicated, in adjustable gas service valve box, with cover set flush to finished grade.

INSTALLATION OF PIPING SPECIALTIES:

Install piping specialties in accordance with Division 15 Basic Materials and Methods sections.

INSTALLATION OF SUPPORTS, ANCHORS, AND SEALS:

Install supports, anchors, and seals in accordance with Division 15 Basic Materials and Methods section.

INSTALLATION OF VALVES:

Gas Cocks: Provide at connection to gas train for each gas-fire equipment item, and on risers and branches where indicated.

Locate gas cocks where easily accessible, and where they will be protected from possible injury.

Pressure Regulating Valves: Install as indicated; comply with Utility requirements. Pipe atmospheric vent to outdoors, full size of outlet. Install gas shutoff valve upstream of each pressure regulating valve.

INSTALLATION OF GAS METER:

Install gas meter in accordance with local Utility Company's installation instructions, and comply with requirements.

Set Meter on concrete pad as indicated.

EQUIPMENT CONNECTIONS:

General: Connect gas piping to each plumbing equipment gas-fired equipment item, with drip leg and shutoff gas cock. Comply with equipment manufacturer's instruction. Plumbing Subcontractor shall make final connections to plumbing equipment. HVAC Subcontractor shall make final connections to HVAC equipment.

PIPING TESTS:

Test natural gas piping in accordance with ANSI B31.2, and local utility requirements.

SPARE PARTS:

Furnish to Owner, with receipt, two valve wrenches for each type of valve installed, requiring same.

EXTERIOR GAS MAIN:

The following exterior gas main installation requirements were taken from CG&E Gas Installers Manual:

All gas service piping shall conform to CG&E Company's specifications. Choice of materials will be subject to CG&E approval. Refer to Gas Installers Manual furnished by CG&E Company.

Plumbing Subcontractor shall be responsible for any local or state permits required to install the gas service pipe and shall be responsible for any damage to utilities that are caused by their activities.

Street gas main must be located before trenching is started. To have gas piping located, along with other underground utility facilities that may be buried in the vicinity of where you plan to dig, you must call the Utilities Protection Service at least two (2) working days in advance. In Kentucky call 1-800-762-6007.

Polyethylene plastic pipe that meets the requirements of ASTM Specification D 2513 shall be used. Polyethylene plastic pipe material designated by the Plastic Pipe Institute (PPI) as PE 2406 shall be used.

The service riser shall be of steel pipe (ASTM A53, API 5L, or equal) and shall be fabricated in accordance with CG&E Company drawings. Schedule 40 wall thickness shall be used. Wall thickness must be at least 0.188 inches for three through eight inch steel pipe. Buried steel piping must be protected against corrosion by coating and the use of Magnesium anodes in accordance with CG&E Company requirements.

Each end of the gas service piping must be temporarily and securely capped to keep dirt and water out.

Plastic piping must be located outside and below ground.

The meter set assembly shall not be placed under any operable window or air duct, within 10 feet of any adjacent air duct, or within 10 feet of any source of ignition. Electrical equipment within 3 feet of the meter set must be suitable for Class 1, Division 1, Group D locations. Electrical equipment between 3 and 10 feet must be suitable for Class 1, Division 2, Group D locations.

Service piping must be installed in a trench that is separate from other utilities, drains, etc. The trench bottom shall be continuous, relatively smooth, and free of rock. The width of the trench shall be sufficient to provide for adequate room for visual inspection and for compacting side fills.

The trench shall be of sufficient depth to provide 3' minimum cover at the street and 2'-6" minimum cover at the service riser. The remainder of the service route shall have 2'-6" nominal cover. Service piping installed in sod areas shall have at least 2'-0" cover.

The service piping must not be installed closer than three feet to septic systems, drains, conduits, other utility ducts, lines or pipes. If the service piping must cross over, under or near one of the above, a twelve inch minimum separation must be maintained. Exception: Gas service piping in joint service trench must not be closer than six inches to shared trench utilities.

Service piping may be installed in a joint service trench with electric service cable in conduit, telephone cable, and television cable. The pipe must not be closer than six inches from these cables. If the gas piping must cross any of these cables, the six inch minimum separation must be maintained.

Only electric, telephone, and cable television utilities are permitted in the same trench with gas piping. There are no exceptions. When other facilities parallel gas piping, three feet of separation between trenches must be maintained. If the gas piping must cross a facility other than shared trench occupants, a twelve inch minimum separation must be maintained.

All occupants in the trench with gas service piping must enter the building above ground level.

The requirements are for gas piping and electric service cable only. Contact your cable television company and your telephone company for their requirements.

Plastic to plastic joints shall be accomplished by butt fusion. Only individuals qualified by CG&E are permitted to make fusion joints on plastic pipe. CG&E inspector to record names and social security numbers of individuals making fusion joints. Only Phillips Dricopipe 6500, PE 2406, medium density, polyethylene is approved when fusion is required.

Plastic pipe to steel pipe transition shall be accomplished using a transition fitting or coupling with stiffener. Coupling with stiffener to be tightened by CG&E at time of visual inspection.

A #12 AWG or heavier (smaller AWG number), solid, insulated (RHW, THW, or polyethylene insulation is recommended), copper wire shall be taped to pipe at 15 to 20 foot intervals. Do not wrap wire around pipe. The wire must be one continuous, unbroken length. Coil tracer wire at meter location and street end with enough wire to extend a minimum of two feet above grade.

Plastic gas services longer than 1000 feet in length from curb valve to meter riser must have tracer wire boxes installed and maintained at customer's expense in accordance with CG&E standards. Contact CG&E representative for tracer wire box installation requirements.

Pipe found to be buckled, fractured, kinked, cut gouged beyond 10 percent wall thickness, or contaminated by exhaust, oil, or dirt cannot be used.

Changes in direction will be made with fusion elbows where minimum bending radius of plastic pipe must be exceeded. The minimum bending radius for each service is as follows:

<u>Service Size</u>	<u>With Fusion Joints</u>	<u>No Fusion Joints</u>
3"	25'	5'
4"	30'	7'
6"	45'	10'
8"	60'	15'

Mitered joints, and cut or altered plastic fittings are prohibited.

Transition fittings and couplings are not permitted within 10 feet of a bend.

CG&E construction drawing will specify steel riser and concrete meter pad dimensions for this particular application.

Protection of underground metallic piping against corrosion shall be accomplished by coatings, designed specifically for use on underground pipe, and cathodic protections, by the use of magnesium anodes.

Steel service pipe designed for underground use having an acceptable coating applied at a coating mill is available and is preferred. Acceptable mill applied coatings include reinforced coal tar enamel, extruded polyethylene, and fusion bonded epoxy.

Bare steel pipe, fittings, and welds located below ground must be field coated with an acceptable coating system designed for underground use.

Paint type coatings are not acceptable. Field applied coatings must be installed in accordance with the manufacturer's instructions. In general, these materials should be spiral wrapped and overlapped 1/2 inch minimum.

Acceptable field applied coatings include coal tar/synthetic resin tape with plastic backing, coal tar/synthetic resin tape with glass reinforcement, pressure sensitive polyethylene or polyvinyl chloride tape, or wax impregnated tape.

Surfaces to be coated must be dry, and free of loose rust, scale, and foreign material prior to coating application.

Anodes used for protection of short sections (less than 30 feet) of buried steel gas piping such as service risers for plastic gas services shall consist of 3 pounds of magnesium with connecting wire attached, centered in a bag containing low-resistance backfill material. Larger sizes are available and may be used.

Anodes shall be buried a minimum distance of two feet from the pipe and at or below the pipe depth and backfilled with soil. The connecting wire shall be attached to the steel pipe using a thermite weld or brazed connection. The point of attachment to the service must be cleaned to a bright metal to insure a durable, low resistance connection. After the connection is made, exposed steel shall be coated with acceptable coating material.

The service trench shall not be backfilled until the pipe has been visually inspected and approved by a CG&E representative. If the electric service lateral also occupies a joint service trench, it must be inspected by the appropriate electrical code inspection authority before the trench can be backfilled. After you have completed the installation, and before you backfill, call either (513) 651-0444 or (800) 634-4300 for visual inspection.

Except where tunneling is necessary, the gas service pipe must be completely visible and exposed from end to end. All fusion joints must be visible. If the service piping is being installed using trenchless technology, the actual pipe installation must be inspected by CG&E personnel.

The service shall be continuously supported beneath its entire length by clean, firm backfill material (no rocks). Intermittent blocking shall not be used to support plastic pipe. The first layer of fill must be free of rocks, stones, cinders, slag, concrete blocks, pieces of wood, or other materials that may cause damage to the pipe or pipe coating. If native rock free soil is not available, the first layer of fill material around and 6" over the pipe shall be sand. Pea gravel backfill is not permitted. Trench must be backfilled 48 hours after visual inspection.

The pressure test and tie-in are done after the service line has passed the visual inspection and has been backfilled. Delays can occur on the test and tie-in if the service line has not been backfilled. Obtaining permits to excavate from various communities can also cause delays. An inspection fee is charged for the service piping pressure test. There is no charge for the gas meter installation or service tie-in.

END OF SECTION

SECTION 15401

DOMESTIC WATER PIPING SYSTEMS

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to this Section.

Division 15 Basic Materials and Methods sections 15020, 15100, 15120, 15250 apply to work of this section.

DESCRIPTION OF WORK:

Extent of domestic water piping systems work, is indicated on drawings and schedules, and by requirements of this section.

Applications for domestic water piping systems include the following:

- Domestic cold-water piping
- Domestic hot-water piping
- Domestic recirculating water piping
- Exterior water piping
- Exterior meter pit
- Interior backflow preventers
- Trap primers for floor drains

Insulation for domestic water piping is specified in applicable Division-15 section 15250 and is included as work of this section.

Trenching and backfill required in conjunction with exterior water piping is specified in applicable Division-15 sections, and is included as work of this section.

Trenching and backfill required in conjunction with domestic water piping inside of building foundations is specified in applicable Division-15 sections, and is included as work of this section.

QUALITY ASSURANCE:

Manufacturers: Firms regularly engaged in manufacture of domestic water piping systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

Installer: A firm with at least 3 years of successful installation experience on projects with domestic water piping systems work similar to that required for project.

Plumbing Code Compliance: Comply with applicable portions of Kentucky Plumbing Code pertaining to plumbing materials construction and installation of products.

ANSI Compliance: Comply with applicable American National Standards pertaining to products and installation of domestic water piping systems.

SUBMITTALS:

Product Data: Submit manufacturer's data for domestic water piping systems, materials and products.

PART 2 - PRODUCTS

DOMESTIC WATER PIPING MATERIALS AND PRODUCTS:

General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in domestic water piping systems. Where more than 1 type of materials or products are indicated, selection is Installer's option.

BASIC IDENTIFICATION:

General: Provide identification complying with Division 15 Basic Materials and Methods sections in accordance with the following listing:

Domestic Water Piping: Plastic pipe markers

Water Service: Underground-type plastic line markers

Domestic Water Valves: Plastic valve tags

BASIC PIPE, TUBE, AND FITTINGS:

General: Provide pipe, tube, and fittings complying with Division-15 Basic Materials and Methods sections in accordance with the following listing:

Tube Size 2" and Smaller: Copper tube.

Wall Thickness: Type L, hard-drawn temper.

Fittings: Wrought-copper, solder-joints.

Tube Size 2-1/2" and Larger: Copper tube.

Wall Thickness: Type L, hard-drawn temper.

Fittings: Wrought-copper, solder-joints.

Exterior Water Piping:

Tube Size 3/4" and Smaller: Copper tube.

Wall Thickness: Type K, soft-annealed temper.

Fittings: Cast-copper, flared tube.

Tube Size 1" through 2": Copper tube.

Wall Thickness: Type K, soft-annealed temper.

Fittings: Wrought-copper, solder-joints.

Pipe Size 3" and Over: Ductile-iron pipe, with cement-mortar lining.

Pipe Weight: Class per waterworks requirements.

Fittings: Ductile-iron, with rubber-gasket joints.

BASIC PIPING SPECIALTIES:

General: Provide piping specialties complying with Division-15 accordance with the following listing:

- Pipe escutcheons.
- Dielectric unions.
- Drip pans.
- Pipe sleeves.
- Sleeve seals.

SPECIAL PIPING SPECIALTIES:

Water Hammer Arresters: Provide bellows type water hammer arresters, stainless steel casing and bellows, pressure rated for 250 psi, tested and certified in accordance with PDI Standard WH-1.

Available Manufacturers: Subject to compliance with requirements, manufacturers offering water hammer arresters which may be incorporated in the work include, but are not limited to, the following:

Manufacturer: Subject to compliance with requirements, provide water hammer arresters of one of the following:

- Amtrol, Inc.
- Smith, (Jay R.) Manufacturing Co.
- Wade Division, Tyler Pipe
- Zurn Industries, Inc., Hydromechanics Division

BASIC SUPPORTS, ANCHORS, AND SEALS:

General: Provide supports, anchors, and seals complying with Division-15 Basic Materials and Methods sections in accordance with the following listing:

- Adjustable steel clevises, adjustable roller hangers, and adjustable pipe roll stands for horizontal piping hangers and supports.

Two-bolt riser clamps for vertical piping supports.

Concrete inserts, C-clamps, and steel brackets for building attachments.

Protection shields for insulated piping support in hangers.

Copper flashings for piping penetrations.

Fire barrier penetration seals.

BASIC VALVES:

General: All bronze valves shall be used for inside domestic water. Provide valves complying with Division-15 Basic Materials and Methods sections in accordance with the following listing:

Valves in copper tubing

Gate Valves - 125# Screw Bonnet, Rising Stem, Solid Wedge

Milwaukee #148/#F-2885
Crane #1334
Lunkenheimer #2132
Powell #1821 or approved equal

Globe Valves - 150# Union Bonnet, Composition or Buna Disc

Milwaukee #590T/#F-2981M
Lunkenheimer #126
Powell #1823 or approved equal

Angle Valves - 150# Angle/Bronze with Teflon Disc, Union Bonnet, Gland Packed, Threaded End.

Milwaukee #595T
Hammond #1B454
Powell #151 or approved equal

Ball Valves - (See "Valve" Section)

Check Valves - 125 Y Pattern, Composition Brass or Buna N Disc

Crane #17075
Hammond #18912
Lunkenheimer #2145
Powell #1825 or approved equal

Water Main - Kennedy Fig. 571X, Mueller A2380, Darling #55 or approved equal.

Hose Bibbs

1/2" - Chicago Faucet Co., No. 293, Crane or American
Standard or approved equal with vacuum breaker; 3/4" Chicago

Faucet No. 387, Crane or American Standard or approved equal with vacuum breaker.

Hydrants - Wall, 3/4" Zurn Z-1310 with vacuum breaker. Woodford, Wade, Josam, or Smith.

BASIC PUMPS:

General: Provide in-line pumps for hot water recirculating.

BASIC EXPANSION COMPENSATION:

General: Provide expansion compensation products complying with Division 15 Basic Materials and Methods section in accordance with the following listing:

Expansion compensators for hot water and hot water recirculating piping.

Pipe alignment guides.

BASIC METERS AND GAGES:

General: Provide meters and gages complying with Division 15 Basic Materials and Methods section in accordance with the following listing:

Pressure Gages, Glas Thermometers

PART 3 - EXECUTION

INSTALLATION OF BASIC IDENTIFICATION:

General: Install mechanical identification in accordance with Division 15 Basic Materials and Methods sections.

INSTALLATION OF DOMESTIC WATER DISTRIBUTION PIPING:

General: Install water distribution piping in accordance with Division 15 Basic Materials and Methods sections.

INSTALLATION OF EXTERIOR WATER PIPING:

General: Install new exterior water service piping from meter in pit in compliance with local governing regulations.

Copper Tube: Install in accordance with recommended procedures of the Copper Development Association.

Ductile-Iron Pipe: Install in accordance with ANSI/AWWA C-60.

Sterilization: At completion of water service line installation, flush and sterilize in conformance with AWWA C-601, to satisfaction of local authorities having jurisdiction.

INSTALLATION OF PIPING SPECIALTIES:

Install piping specialties in accordance with Division 15 Basic Materials and Methods sections.

Water Hammer Arresters: Install in upright position, in locations and of sizes in accordance with PDI Standard WH-201, and elsewhere as indicated.

INSTALLATION OF SUPPORTS, ANCHORS, AND SEALS:

Install supports, anchors, and seals in accordance with Division 15 Basic Materials and Methods sections.

INSTALLATION OF VALVES:

Install valves in accordance with Division 15 Basic Materials and Methods sections.

Sectional Valves: Install on each branch and riser, close to main, where branch or riser serves 2 or more plumbing fixtures or equipment connections, and elsewhere as indicated.

Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.

Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere where indicated or required to completely drain domestic water piping system.

Check Valves: Install on discharge side of each pump, and elsewhere as indicated.

Balance Cocks: Install in each hot water recirculating loop, and elsewhere as indicated.

Hose Bibbs: Install on exposed piping where indicated, with vacuum breaker.

Sill Faucets: Install on concealed piping where indicated with vacuum breaker.

Hydrants: Installed where indicated, in accordance with manufacturer's installation instructions.

INSTALLATION OF PUMPS:

Install pumps on domestic hot water return.

INSTALLATION OF EXPANSION COMPENSATION PRODUCTS:

Install expansion compensation products as noted.

EQUIPMENT CONNECTIONS:

Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated, but in no case smaller than required by Kentucky Plumbing Code.

Mechanical Equipment Connections: Connect hot and cold water piping system to mechanical equipment as indicated, and comply with equipment manufacturer's installation instructions. Provide shutoff valve and union for each connection, provide drain valve on drain connection.

SPARE PARTS:

Furnish to Owner, with receipt, one valve key for each key operated hydrant, bibb, or faucet installed.

END OF SECTION

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SECTION 15405

SOIL AND WASTE PIPING SYSTEMS

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to this Section.

Division 15 Basic Materials and Methods sections 15020, 15100 apply to work of this section.

DESCRIPTION OF WORK:

Extent of soil and waste piping system work, is indicated on drawings and schedules, and by requirements of this section.

Applications for soil and waste piping systems include the following:

Above ground soil, waste and vent piping within buildings including soil stacks, vent stacks, horizontal branches, traps, and connections to fixtures and drains.

Underground building drain piping including mains, branches, traps, connections to fixtures and drains, and connections to stacks, terminating at connection to sanitary sewer manhole outside building.

Acid waste and vent piping for all lab sinks and emergency shower drains.

Trenching and backfilling required in conjunction with underground building drain piping is specified in applicable Division 15 sections, and is included as work of this section.

Note any special backfill requirements. Refer to soil engineer's report.

QUALITY ASSURANCE:

Manufacturers: Firms regularly engaged in manufacturer of piping products of types, materials and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

Installer: A firm with at least three years of successful installation experience on projects with soil and waste piping systems work similar to that required for project.

Plumbing Code Compliance: Comply with applicable portions of local Plumbing Code pertaining to plumbing materials, construction and installation of products.

ANSI Compliance: Comply with applicable American National Standards pertaining to products and installation of soil and waste piping systems.

PDI Compliance: Comply with applicable Plumbing and Drainage Institute Standards pertaining to products and installation of soil and waste piping systems.

SUBMITTALS:

Product Data: Submit manufacturer's data for soil and waste piping systems materials and products.

PART 2 - PRODUCTS

SOIL AND WASTE PIPING MATERIALS AND PRODUCTS:

General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in soil and waste piping systems. Unless otherwise noted, where more than one type of material or product is indicated, selection is Installer's option. All underground soil and waste piping to be cast iron.

BASIC IDENTIFICATION:

General: Provide identification in accordance with the following listing:

Above Ground Soil, Waste, and Vent Piping: Plastic pipe markers.

BASIC PIPE, TUBE, AND FITTINGS:

General: Provide pipe, tube, and fittings in accordance with the following listing:

Cast iron soil piping and fittings service weight ASTM A-74 with ASTM C-564 gasketed joints.

Waste and vent piping 2-1/2" and under - Type "M" copper ASTM B88.62.

Soil, waste and vent piping 3" and over in size and all underground cast iron soil piping and fittings, ASTM A-74, service weight.

No-hub cast iron pipe and fittings may be used above floor for soil, waste and vent.

Schedule 40 PVC may be used for above and below floor piping as allowed by building code. Integrity of building fire ratings must be maintained.

SDR35 PVC pipe and fittings may be used outside building.

Acid waste and vent piping shall be schedule 40 polypropylene pipe and fittings as allowed by building code. Integrity of building fire ratings must be maintained. Provide polypropylene trap for all acid waste lab sinks and floor drains. Use fusion weld joints below floor and mechanical joints above floor slab.

BASIC PIPING SPECIALTIES:

General: Provide piping specialties complying with Division 15 Basic Materials and Methods sections in accordance with the following listing:

Pipe Escutcheons.

Sleeve Seals.

Vandal-Proof Vent Caps.
Fire Barrier Penetration Seals.

Pipe Sleeves.

BASIC SUPPORTS, ANCHORS, AND SEALS:

General: Provide supports, anchors, and seals in accordance with the following listing:

Adjustable steel clevises, steel pipe clamps, and pipe saddle supports for horizontal piping hangers and supports.

Two-bolt riser clamps for vertical piping supports.

Concrete inserts, C-clamps, and steel brackets for building attachments.

Copper flashings for piping penetrations.

DRAINAGE PIPING PRODUCTS:

General: Provide factory-fabricated drainage piping products of size and type indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and governing regulations.

Cleanout Plugs: Cast-bronze or brass, threads complying with ANSI B2.1, countersunk head.

Floor Cleanouts: Cast-iron body and frame; cleanout plug; adjustable round top as follows:

Provide cleanouts where shown and at bends and angles. Extend to make flush installation with floor, wall or finish grade.

Grade: Heavy Duty clean out in concrete pad at grade.

Floors: Zurn Z-1420-2, Josam, Wade, Smith or approved equal, nickel bronze scoriated top

Walls: Zurn Z-1460-9, Josam, Smith or approved equal, nickel bronze with Z-1460 hex head plug

Provide square cleanout tops where tile floors occur.

FLOOR DRAINS

General: Provide floor drains of size as indicated on drawings, and type, including features, as specified herein.

Drains to be Zurn, Wade, Josam, Smith or approved equal.

Floor Drain #1: Zurn Z-508 with 9" heavy duty strainer.

Floor Drain #2: Polypropylene floor drain.

Provide trap primer for all floor drains in Mechanical Rooms.

PART 3 - EXECUTION

INSTALLATION OF BASIC IDENTIFICATION:

General: Install Soil, waste, and vent piping systems with Mechanical Identification.

INSTALLATION OF SOIL AND WASTE ABOVE GROUND PIPING:

General: Install soil and waste piping in accordance with local Plumbing Code.

INSTALLATION OF BUILDING DRAIN PIPING:

General: Install underground building drains as indicated and in accordance with local Plumbing Code. Lay underground building drains beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Clean interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

Install soil and vent piping pitched to drain at minimum slope of 1/4" per foot (2%) for piping 3" and smaller, and 1/8" per foot (1%) for piping 4" and larger.

INSTALLATION OF PIPING SPECIALTIES:

Install piping specialties in accordance with Division 15 Basic Materials and Methods section "Piping Specialties."

Frost-Proof Vent Caps: Install frost-proof vent caps on each vent pipe passing through roof, and elsewhere where indicated. Maintain 1" clearance between vent pipe and roof substrate.

INSTALLATION OF SUPPORTS, ANCHORS, AND SEALS:

Install supports, anchors, and seals in accordance with Division 15 "General Mechanical Requirements" and "Piping Specialties."

INSTALLATION OF DRAINAGE PIPING PRODUCTS:

Cleanouts: Install in sanitary above ground piping and sanitary building drain piping as indicated, as required by National Standard Plumbing Code; and at each change in direction of piping greater than 45 degrees; at minimum intervals of 50' for piping 4" and smaller and 100' for larger piping; and at base of each vertical soil or waste stack. Install floor and wall cleanout covers for concealed piping, select type to match adjacent building finish.

Flashing Flanges: Install flashing flange and clamping device with each stack and cleanout passing through waterproof membranes.

Vent Flashing Sleeves: Install on stacks passing through roof, secure over stack flashing in accordance with manufacturer's instructions.

INSTALLATION OF FLOOR DRAINS:

General: Install floor drains in accordance with manufacturer's written instructions and in locations indicated.

Coordinate with soil and waste piping as necessary to interface floor drains with drainage piping systems.

Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.

Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.

Position drains so that they are accessible and easy to maintain.

EQUIPMENT CONNECTIONS:

Piping Runouts to Fixtures: Provide soil and waste piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated; but in no case smaller than required by Kentucky Plumbing Code.

Locate piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.

PIPING TESTS:

Test soil and waste piping system in accordance with requirements of Kentucky Plumbing Code.

END OF SECTION

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SECTION 15407

STORM WATER PIPING SYSTEMS

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to this Section.

Division-15 Basic Materials and Methods sections 15020, 15120, 15250 apply to work of this section.

DESCRIPTION OF WORK:

Extent of storm water piping work, is indicated on drawings and schedules, and by requirements of this section.

Applications for storm water piping include the following:

Conductor piping from roof drains to storm building drain.

Footing foundation drains and drains under gym floor.

Storm building drain piping from conductor piping and drains to storm sewer connections outside building.

At downspout locations provide cast iron hub 12" above grade and make connections to downspout.

Insulation for storm water piping is specified in applicable Division-15 sections, and is included as work of this section.

Trenching and backfill required in conjunction with storm building drain piping is specified in applicable Division-15 sections, and is included as work of this section. Note special backfill requirements.

QUALITY ASSURANCE:

Manufacturers: Firms regularly engaged in manufacturer of piping products of types, materials and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

Installer: A firm with at least three (3) years of successful installation experience on projects with storm water piping systems work similar to that required for project.

Plumbing Code Compliance: Comply with applicable portions of local plumbing code pertaining to plumbing materials, construction and installation of products.

ANSI Compliance: Comply with applicable American National Standards pertaining to products and installation of storm water piping systems.

PART 2 - PRODUCTS

STORM WATER PIPING MATERIALS AND PRODUCTS:

General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fitting of materials which match pipe materials used in storm water piping systems. Where more than one type of materials or products are indicated, selection is Installer's option.

BASIC PIPE, TUBE AND FITTINGS:

General: Provide pipe, tube and fittings complying with Division-15 Basic Materials and Methods sections in accordance with the following listing.

Above Ground Piping Within Buildings:

Pipe Size 10" and Smaller: Hubless cast-iron soil pipe.

Pipe Class: Service Weight

Fittings: Hubless cast-iron soil pipe fittings, hubless joints.

Underground Building Drain Piping:

Pipe Size 10" and Smaller: Cast-iron hub-and-spigot soil pipe.

Pipe Class: Service Weight

Fittings: Cast-iron hub-and-spigot soil pipe fittings, compression gasket joints.

Pipe Size 12" and Larger: Reinforced concrete pipe, ASTM-C76, Class 4, with compression gasket joints complying with ASTM C443.

Note: Schedule 40 PVC may be used above and below floor as allowed by building code. Integrity of fire rated connections must be maintained.

For footing drains and underdrains use Schedule 40 PVC perforated pipe.

BASIC PIPING SPECIALTIES:

General: Provide piping specialties complying with Division-15 Basic Materials and Methods sections in accordance with the following listing:

Pipe Escutcheons
Drip Pans
Pipe Sleeves
Sleeve Seals
Fire Barrier Penetration Seals.

BASIC SUPPORTS, ANCHORS AND SEALS:

General: Provide supports, anchors and seals complying with Division-15 Basic Materials and Methods sections in accordance with the following listing.

Adjustable steel clevises, steel pipe clamps, and pipe saddle supports for horizontal piping hangers and supports.

Two-bolt riser clamps for vertical piping supports.

Concrete inserts, C-clamps, and steel brackets for building attachments.

Copper flashings for piping penetrations.

DRAINAGE PIPING PRODUCTS:

General: Provide factory-fabricated drainage piping products of size and type indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and governing regulation.

Cleanout Plugs: Cast-bronze or brass, threads complying with ANSI B2.1, countersunk head.

Floor Cleanouts: Cast-iron body and frame; cleanout plug; adjustable round top flush with finish floor.

Wall Cleanouts: Cast-iron body adaptable to pipe with cast bronze or brass cleanout plug; stainless steel cover including screws.

Flashing Flanges: Cast-iron watertight stack or wall sleeve with membrane flashing ring. Provide underdeck clamp and sleeve length as required.

Available Manufacturer: Subject to compliance with requirements, manufacturers offering drainage piping products which may be incorporated in the work include, but are not limited to, the following:

Manufacturer: Subject to compliance with requirements, provide drainage piping products of one of the following:

Josam Manufacturing Company
Smith (Jay R.) Company
Wade Division, Tyler Pipe
Zurn Industries, Hydromechanics Division

ROOF DRAINS:

General: Provide roof drains of size as indicated on drawings; and type, including features, as specified herein:

Zurn ZC-100ERC-VP (Secured Top)

Roof Drain Type: Cast-iron body and combined flashing collar and gravel stop, cast-iron vandal proof secured top dome, with following features:

Underdeck clamp
Extension as required
Sump receiver
Bottom outlet, inside caulk or threaded as required
Insulate underside of roof drain sump

Available Manufacturers: Subject to compliance with requirements, manufacturers offering roof drains which may be incorporated in the work include, but are not limited to, the following:

Manufacturer: Subject to compliance with requirements, provide roof drains of one of the following:

Josam Manufacturing Company
Smith (Jay R.) Manufacturing Company
Wade Division, Tyler Pipe
Zurn Industries Inc., Hydromechanics Division

PART 3 - EXECUTION

INSTALLATION OF BASIC IDENTIFICATION:

General: Install mechanical identification in accordance with Division-15 Basic Materials and Methods sections.

INSTALLATION OF STORM WATER PIPING ABOVE GROUND:

General: Install storm water piping in accordance with Division-15 Basic Materials and Methods sections and with local plumbing code.

INSTALLATION OF BUILDING DRAIN PIPING:

General: Install storm building drains as indicated and in accordance with local plumbing code. Lay storm building drains beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements and other special installation requirements. Clear interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

Install storm water piping pitched to drain at minimum slope of 1/4" per foot (2%) for piping 3" and smaller, and 1/8" per foot (1%) for piping 4" and larger.

INSTALLATION OF PIPING SPECIALTIES:

Install piping specialties in accordance with requirements of Division-15 Basic Materials and Methods sections.

INSTALLATION OF SUPPORTS, ANCHORS AND SEALS:

Install supports, anchors and seals in accordance with Division-15 Basic Materials and Methods sections.

INSTALLATION OF DRAINAGE PIPING PRODUCTS:

Cleanouts: Install in conductor piping and storm building drain piping as indicated, as required by National Standard Plumbing Code; at each change in direction of piping greater than 45 degrees; at minimum intervals of 50' for piping 4" and smaller and 100' for larger piping; and at base of each conductor. Install floor and wall cleanout covers for concealed piping, select type to match adjacent building finish.

Flashing Flanges: Install flashing flange and clamping device with each cleanout passing through waterproof membrane.

INSTALLATION OF DRAINS:

General: Install drains in accordance with manufacturer's written instructions and in locations indicated.

Coordinate metal flashing work with work of roofing, waterproofing and adjoining substrate work.

Coordinate with roofing as necessary to interface roof drains with roofing work.

Coordinate with storm water piping as necessary to interface drains with drainage piping system.

Install drains at low points of surface areas to be drained, or as indicated.

Install drain flashing collar or flange so that no leakage occurs between drain and adjoining roofing. Maintain integrity of waterproof membranes, where penetrated.

Position drains so that they are accessible and easy to maintain.

PIPING TESTS:

Test storm water piping system in accordance with requirements of local plumbing code.

END OF SECTION

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SECTION 15410
LAB GAS PIPING SYSTEMS

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

Division-15 Basic Materials and Methods Sections 15020, 15100, 15120 and 15250 apply to work of this section.

DESCRIPTION OF WORK:

Extent of lab gas piping systems work is indicated on drawings and schedules and by requirements of this section.

Applications for lab gas piping systems include the following:

- Oxygen piping
- Vacuum piping
- Air piping
- Lab gas nitrous oxide piping
- Lab gas helium piping
- Lab gas argon piping
- Lab gas acetylene piping
- Future lab gas piping

QUALITY ASSURANCE

Manufacturers: Firms regularly engaged in manufacture of lab gas piping systems products, of types, materials and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

Installer: A firm with at least 3 years of successful installation experience on projects with lab gas piping systems work similar to that required for project.

Plumbing Code Compliance: Comply with applicable portions of local Plumbing Code pertaining to plumbing materials construction and installation of products.

ANSI Compliance: Comply with applicable American National Standards pertaining to products and installation of lab gas piping systems.

Comply with applicable NFPA standards.

SUBMITTALS:

Product Data: Submit manufacturer's data for lab gas piping systems, materials and products.

PART 2 - PRODUCTS

LAB GAS PIPING MATERIALS AND PRODUCTS:

General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in lab gas piping systems. Where more than one type of materials or products are indicated, selection is Installer's option.

BASIC IDENTIFICATION:

General: Provide identification complying with Division-15 Basic Materials and Methods section "General Mechanical Requirements" in accordance with the following listing:

Lab Gas Piping: Plastic pipe markers
Lab Gas Valves: Plastic valve tags

BASIC PIPE, TUBE AND FITTINGS:

General: Provide pipe, tube and fittings complying with Division-15 Basic Materials and Methods section "Pipe, Tube and Fittings" and per NFPA standards.

BASIC PIPING SPECIALTIES:

General: Provide piping specialties complying with Division-15 in accordance with the following listing:

Pipe escutcheons
Dielectric unions
Drip pans
Pipe sleeves
Sleeve seals

BASIC SUPPORTS, ANCHORS AND SEALS:

General: Provide supports, anchors and seals complying with Division-15 Basic Materials and Methods section "Supports, Anchors and Seals" and per NFPA standards.

BASIC VALVES:

General: Provide valves complying with Division-15 Basic Materials and Methods section "Valves" and NFPA standards.

LAB GAS PIPING:

Piping: Type "L" copper and fittings per NFPA requirements, specifically prepared for lab gas piping.

PART 3 - EXECUTION

INSTALLATION OF BASIC IDENTIFICATION:

General: Install mechanical identification in accordance with Division-15 Basic Materials and Methods section and per NFPA standards.

INSTALLATION OF LAB GAS DISTRIBUTION PIPING:

General: Install lab gas distribution piping in accordance with Division-15 Basic Materials and Methods section and per NFPA standards.

INSTALLATION OF PIPING SPECIALTIES:

Install piping specialties in accordance with Division-15 Basic Materials and Methods section "Piping Specialties" and per NFPA standards.

INSTALLATION OF SUPPORTS, ANCHORS AND SEALS:

Install supports, anchors and seals in accordance with Division-15 Basic Materials and Methods section "Supports, Anchors and Seals" and per NFPA standards.

INSTALLATION OF VALVES:

Install valves in accordance with Division-15 Basic Materials and Methods section "Valves" and per NFPA standards.

After installation, a pipeline system check to certify there are no cross connections shall be performed by an Ohmeda representative in accordance with NFPA requirements.

After installation, a pipeline system check to certify there are no cross connections shall be performed by the lab gas equipment representative in accordance with NFPA requirements and paid for by this contractor.

END OF SECTION

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SECTION 15420
PLUMBING EQUIPMENT

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to this Section.

DESCRIPTION OF WORK:

Extent of plumbing equipment work is indicated on drawings and provisions of this section, including schedules and equipment lists associated with either drawings or this section.

Types of plumbing equipment required for project include the following:

Commercial Gas-Fired Water Heaters
Acid Dilution Sump - Refer to plans.

QUALITY ASSURANCE:

Manufacturers: Firms regularly engaged in manufacture of plumbing equipment of type and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

UL and NEMA Compliance: Provide electric motors and electrical components required as part of plumbing equipment, which have been listed and labeled by Underwriters Laboratories and comply with NEMA standards.

NEC Compliance: Comply with National Electrical Code (ANSI/NFPA 70) as applicable to installation and electrical connections of ancillary electrical components of plumbing equipment.

ANSI Compliance: Comply with ANSI Z223.1 (NFPA 54) "National Fuel Gas Code" as applicable to installation of gas-fired water heaters.

AGA and NSF Labels: Provide water heaters which have been listed and labeled by American Gas Association and National Sanitation Foundation.

ASME Relief Valve Stamps: Provide water heaters with safety relief valves bearing ASME valve markings.

AWWA Compliance: Comply with applicable American Water Works Association standards pertaining to steel water tanks.

PDI Compliance: Comply with applicable Plumbing and Drainage Institute standards pertaining to grease interceptors.

SUBMITTALS:

Product Data: Submit manufacturer's plumbing equipment specifications, installation and start-up instructions, and capacity and ratings, with selection points clearly indicated.

Shop Drawings: Submit assembly type shop drawings indicating dimensions, weights, required clearances, and methods of assembly of all components.

Wiring Diagrams: Submit ladder-type wiring diagrams for all components, clearly indicating all required field electrical connections.

Maintenance Data: Submit maintenance data and parts lists for each item of plumbing equipment. Include "trouble-shooting" maintenance guides. Include this data in maintenance manual.

PART 2 - PRODUCTS

DOMESTIC WATER HEATER:

Commercial Gas-Fired Water Heater:

General: Provide commercial gas-fired water heaters and tanks of size, capacity as follows (refer to plans for piping diagram):

Furnish and install a factory-packaged water heater, model number BTH-199 as manufactured by A.O. Smith. The heater will be UL listed.

Recovery: The water heater shall have a gas input of 199,000 BTU/H and a recovery of 283 gallons per hour from 40°F to 120°F. The water heater will have an efficiency of 94%. The complete water heating system will comply with all current ASHRAE 90.1 requirements for thermal efficiency and standby heat losses.

Warranty: The heater shall have a one-year, cost-free service policy covering all parts and labor, or have additional coverage under a long-life service policy. The tank will have 5-year warranty against leakage or producing rusty water. The tank and heating surfaces will have a 3-year, non-prorated warranty against failure due to scale buildup. See complete policies and warranties for details.

The heater will fit properly in the space provided and installation will conform to all local, state, and national codes. Factory-authorized startup will be provided.

Available Manufacturers: Subject to compliance with requirements, manufacturers offering gas fired water heaters which may be incorporated in the work include, but are not limited to, the following:

A.O. Smith, Consumer Products Div.
Rheem Water Heater Div., City Investing Co.
Rudd Water Heater Div., City Investing Co.
State Industries
Lochinvar or PVI

PART 3 - EXECUTION

INSTALLATION OF DOMESTIC WATER HEATERS:

Gas-Fired Water Heater:

General: Install gas-fired water heater as indicated, in accordance with manufacturer's installation instructions, and in compliance with applicable codes.

Support: Set unit on concrete pad; orient so controls and devices needing service and maintenance have adequate access. Level and plumb unit.

Gas Supply: Connect to gas line with drip leg, tee, gas cock, and union; full size of unit inlet connection. Locate piping so as not to interfere with service of unit.

Piping: Connect hot and cold water piping to unit with shutoff valves and unions. Connect recirculating water line to unit with shutoff valve, check valve, and union.

Flue and Combustion Air: Provide and install for high efficiency water heaters.

Start-up: Start-up, test and adjust gas-fired water heater in accordance with manufacturer's start-up instructions, and Utility Company's requirements. Check and calibrate controls, adjust burner for maximum efficiency.

Testing: Upon completion of installation, pressure test water tanks hydrostatically to assure structural integrity and freedom from leaks in accordance with applicable sections of ASME Boiler and Pressure Vessel Code.

Flushing: Flush water tanks upon completion of installation in accordance with manufacturer's instructions, and comply with applicable health codes.

END OF SECTION

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SECTION 15450
PLUMBING FIXTURES AND TRIM

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to this Section.

Section 15020 General Mechanical Requirements apply to work of this section.

DESCRIPTION OF WORK:

Extent of plumbing fixtures and trim work is indicated by drawings and schedules, and by requirements of this section.

Types of plumbing fixtures required for the project include the following:

- Lavatories.
- Service sinks.
- Water closets.
- Water coolers.
- Countertop sinks.
- Lab equipment connections
- Emergency showers

Refer to Division-16 sections for electrical connections to water cooler and other plumbing fixtures; not work of this section.

QUALITY ASSURANCE:

Manufacturers: Firms regularly engaged in manufacture of plumbing fixtures of the type, style and configuration required, whose products have been in satisfactory use in similar service for not less than 3 years.

Plumbing Fixture Standards: Comply with applicable portions of Kentucky Plumbing Code pertaining to materials and installation of plumbing fixtures.

ANSI Standards: Comply with applicable ANSI standards pertaining to plumbing fixtures and systems.

ANSI Standards: Comply with ANSI A171.1 standard and Kentucky Building Code pertaining to plumbing fixtures for handicapped.

PDI Compliance: Comply with standards established by Plumbing and Drainage Institute pertaining to plumbing fixture supports.

Federal Standards: Comply with applicable FS WW-P-541/-Series sections pertaining to plumbing fixtures and ADA requirements.

UL Labels: Provide water coolers which have been listed and labeled by Underwriters Laboratories.

SUBMITTALS:

Product Data: Submit manufacturer's specifications for plumbing fixtures and trim, including catalog cut of each fixture type and trim item furnished, roughing-in dimensioned drawings, templates for cutting substrates, fixture carriers, and installation instructions.

Maintenance Data: Submit maintenance data and parts lists for each fixture type and trim item, including instructions for care of finishes. Include this data in maintenance manual.

PRODUCT DELIVERY, STORAGE AND HANDLING:

Deliver plumbing fixtures individually wrapped in factory-fabricated containers.

Handle plumbing fixtures carefully to prevent breakage, chipping and scoring the fixture finish. Do not install damaged plumbing fixtures; replace and return damaged units to equipment manufacturer.

PART 2 - PRODUCTS

PLUMBING FIXTURES:

General: Provide factory-fabricated fixtures of type, style and material indicated. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by the manufacturer, and as required for a complete installation. Where more than one type is indicated, selection is Installer's option; but, all fixtures of same type must be furnished by single manufacturer. Where type is not otherwise indicated, provide fixtures complying with governing regulations.

MATERIALS:

General: Unless otherwise specified, comply with applicable Federal Specification WW-P-541/-Series sections pertaining to plumbing fixtures, fittings, trim, metals and finishes. Comply with requirements of WW-P-541/-specification relative to quality of ware, glazing, enamel, composition and finish of metals, air gaps, and vacuum breakers, even though some plumbing fixtures specified in this section are not described in WW-P-541.

Provide materials which have been selected for their surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, foundry sand holes, stains, discoloration, or other surface imperfections on finished units are not acceptable.

Where fittings, trim and accessories are exposed or semi-exposed, provide bright chrome-plated or polished stainless steel units. Provide copper or brass where not exposed.

PLUMBING FITTINGS, TRIM AND ACCESSORIES:

Water Outlets: At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves, or dispensing devices, of type and size indicated, and as required to operate as indicated. Include manual shutoff valves and connecting stem pipes to permit outlet servicing without shut-down of water supply piping systems.

Vacuum Breakers: Provide with flush valves where required by governing regulations, including locations where water outlets are equipped for hose attachment.

P-Traps: Include removable P-traps where drains are indicated for direct connection to drainage system.

Carriers: Provide cast-iron supports for fixtures of either graphitic gray iron, ductile iron, or malleable iron as indicated.

Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.

Escutcheons: Where fixture supplies and drains penetrate walls in exposed locations, provide chrome plated cast-brass escutcheons with set screw.

Aerators: Provide aerators of types approved by Health Departments having jurisdiction.

Comply with additional fixture requirements contained in fixture schedule attached to this section.

MANUFACTURERS:

Available manufacturers: Subject to compliance with requirements, manufacturers offering plumbing fixtures and trim which may be incorporated in the work include, but are not limited to, the following:

Plumbing Fixtures:

- American Standard, U.S. Plumbing Products.
- Crane Co.
- Eljer Plumbingware Div., Wallace-Murray Corp.
- Kohler Co.
- Acorn Engineering Co.
- Bradley Corp.

Plumbing Trim:

- American Standard, U.S. Plumbing Products.
- Chicago Faucet Co.
- Eljer Plumbingware Div., Wallace-Murray Corp.
- Kohler Co.
- Speakman Co.
- T & S Brass and Bronze Works, Inc.
- McGuire.

Fixture Seats:

Bemis Mfg. Co.
Beneke Corp., Div. of Beatrice Foods.
Olsonite Corp., Olsonite Seats.

Water Coolers:

Ebco Mfg. Co.
Elkay Mfg. CO.
Halsey Taylor Div., King-Seeley Thermos Co.
Haws Drinking Faucet Co.
Western Drinking Fountains, Div. of Sunroc Corp.

Countertop Sinks:

American Standard, U.S. Plumbing Products.
Elkay Manufacturing Company
Just Manufacturing Company
Moen, Division of Stanadyne/Western
Bradley Corporation
Acorn Engineering Company

Service Sinks:

American Standard, U.S. Plumbing Products.
Crane Co.
Eljer Plumbingware Div., Wallace-Murray Corp.
Fiat Products, Unit of Mark Control Corp.
Kohler Co.
Stern-Williams Co., Inc.

Emergency Showers:

Acorn
Bradley
Speakman

FIXTURE SCHEDULE

P1 - Water Closet: Floor mounted, tank type, Kohler "Highline" K-3427 with K-4650 open front white seat with cover and K-7637 angle supply with stop.

P2 - Lavatory: Wall hung, 20" X 18" vitreous china, Kohler "Greenwich" K-2032 with K-15597 single lever faucet with 0.5 gpm spray and open grid strainer, K-7606 angle supplies with stops and K-9000 1-1/4" P-trap. Provide Zurn concealed arm carrier.

P3 - Countertop Sink: One-compartment, 20 gauge, stainless steel, self-rimming, Elkay PSR-2219, three hole, with LK-4100 single lever faucet, LK-99 crumb cup strainer and 1-1/2" drain. Provide 17 gauge, 1-1/2" chrome P-trap and 1/2" hot and cold water chrome stops.

P4 - Emergency Shower - Eyewash: Bradley S19-310 with S19-330 privacy curtain and mounting. All P4 fixtures shall be fed from Leonard TM-800 mixing valve. Provide 3"F.D.#2 in floor.

P5, P6, P7, P10: Lab sinks to be furnished with casework including faucets and trim. Plumber shall mount and install same. Provide polypropylene trap and stops at each location.

P8 - Service Receptor: 24" X 24" molded stone floor sink, Fiat Model MSB-2424 with Speakman #SC-5811-RCP faucet with stops, vacuum breaker and 3" drain. Provide P-trap.

P9 - Water Cooler: Wall hung Elkay EBFS-8. Provide 17 gauge P-trap and stop. Mount at handicap height.

PART 3 - EXECUTION

INSPECTION AND PREPARATION:

Examine roughing-in work of domestic water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Also examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until unsatisfactory conditions have been corrected.

Install plumbing fixtures of types indicated where shown and at indicated heights; in accordance with fixture manufacturer's written instructions, roughing-in drawings, and with recognized industry practices. Ensure that plumbing fixtures comply with requirements and serve intended purposes. Comply with applicable requirements of the National Standard Plumbing Code pertaining to installation of plumbing fixtures.

Fasten plumbing fixtures securely to indicated supports or building structure; and ensure that fixtures are level and plumb. Secure plumbing supplies behind or within wall construction so as to be rigid, and not subject to pull or push movement.

CLEAN AND PROTECT:

Clean plumbing fixtures of dirt and debris upon completion of installation.

Protect installed fixtures from damage during the remainder of the construction period.

FIELD QUALITY CONTROL:

Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

Inspect each installed unit for damage to finish. If feasible, restore and match finish to original at site; otherwise, remove fixture and replace with new unit. Feasibility and match to be judged by Architect/Engineer. Remove cracked or dented units and replace with new units.

EXTRA STOCK:

General: Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner with receipt. Furnish 1 device for every 10 units.

END OF SECTION

SECTION 15500
FIRE PROTECTION SYSTEM

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to this Section.

Requirements of Sections 15020, 15100, 15120 govern work specified in this section where applicable.

DESCRIPTION OF WORK:

Extent of fire protection systems work is indicated on drawings and schedules, and by requirements of this section.

Applications of fire protection systems include the following:

Fire protection service piping including exterior main, fire hydrant, and valves to building entrances. Leave 2" tap in 6" main for Plumbing contractor.

All exterior water main work shall be installed per water district requirements and NFPA 24.

Fire protection riser piping from building entrances to distribution systems.

Fire protection distribution piping from risers to sprinkler heads. Building shall be 100% sprinklered.

Trenching and backfill required in conjunction with exterior fire protection piping is specified is applicable Division-15 sections, and is included as work of this section.

QUALITY ASSURANCE:

Manufacturers: Firms regularly engaged in manufacture of fire protection piping systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

Installer: Firm with at least 3 years of successful installation experience on projects with fire protection piping systems work similar to that required for project.

NFPA Code: Comply with ANSI/NFPA 13, "Installation of Sprinkler Systems".

UL Labels: Provide fire sprinkler piping products which have been approved and labeled by Underwriters Laboratories.

Local Fire Department/Marshall Regulations: Comply with governing regulations pertaining to fire protection piping.

State Building Code: Comply with governing regulations pertaining to Fire Protection Systems.

SUBMITTALS:

Product Data: Submit manufacturer's data for fire protection systems, materials and product.

Shop Drawings: Submit scaled layout drawings for fire protection pipe and fittings including, but not necessarily limited to, pipe and tube sizes, locations, elevations and slopes of horizontal runs, wall and floor penetrations, and connections. Show interface and spatial relationship between piping and proximate equipment.

Submit Shop Drawings to appropriate authority for review and approval prior to submission to Engineer's office and prior to installation of any portion of both underground and overhead systems.

Approval Drawings: Prepare approval drawings of fire protection systems indicating pipe sizes, pipe locations, fittings, shutoffs, equipment, etc. Submit to Agency having jurisdiction for approval. Submit one approved copy, bearing stamp and/or signature of Agency having jurisdiction, before proceeding with installation.

Approval Calculation: Prepare hydraulic calculations of fire protection systems. Submit to Agency having jurisdiction for approval. Submit one approved copy, bearing stamp and/or signature of Agency having jurisdiction, before proceeding with installation.

Certificate of Installation: Submit certificate upon completion of fire protection piping work which indicates that work has been tested in accordance with ANSI/NFPA 13, and also that system is operational, complete and has no defects.

PART 2 - PRODUCTS

FIRE PROTECTION PIPING MATERIALS AND PRODUCTS:

General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in fire protection piping systems. Where more than one type of materials or products are indicated, selection is Installer's option.

BASIC IDENTIFICATION:

General: Provide identification in accordance with the following listing:

Fire Protection Piping: Plastic pipe markers.

Fire Protection Service: Underground-type plastic line markers.

Fire Protection Valves: Plastic valve tags.

BASIC PIPE, TUBE AND FITTINGS:

General: Provide pipe, tube and fittings in accordance with the following listing:

Interior Piping:

Black Steel Pipe:

Pipe Weight: Schedule 40 up to 8"; Schedule 30 for 8" and larger.

Fittings: Class 125, cast-iron threaded.

Fittings: Mechanical grooved pipe couplings and fittings; cut groove type.

Black Steel Pipe:

Pipe Weight: Schedule 10 for 5" and smaller; 0.134" wall thickness for 6"; and 0.188" wall thickness for 8" and 10".

Fittings: Wrought-steel buttwelding.

Fittings: Mechanical grooved pipe couplings and fittings; roll-groove or mechanical locking type.

Exterior Piping:

Ductile-Iron Pipe:

Lining: Cement-mortar lining for pipe and fittings.

Wall Thickness: Class as approved by waterworks.

Fittings: Ductile iron with rubber-gasket push-on joints.

BASIC PIPING SPECIALTIES:

General: Provide piping specialties complying with Division-15 Basic Materials and Methods section "Piping Specialties", in accordance with the following listing:

Pipe escutcheons
Dielectric unions
Drip pans
Sleeves
Sleeve seals
Fire Barrier Penetration Seals.

BASIC SUPPORTS, ANCHORS AND SEALS:

General: Provide supports, anchors and seals in accordance with the following listing:

Adjustable steel clevises, adjustable steel band hangers, adjustable band hangers, for horizontal piping hangers and supports.

Two-bolt riser clamps for vertical piping supports.

Steel turnbuckles and malleable iron sockets for hanger-rod attachments.

Concrete inserts, top-beam C-clamps, side beam or channel clamps and center beam clamps for building attachments.

Copper flashings for piping penetrations.

BASIC VALVES:

General: Provide valves complying with Division-15 Basic Materials and Methods section "Valves", in accordance with the following listing:

Interior Valves:

Sectional: Gate valves.

Check: Swing check valves.

Double Detector check valve assembly inside building per water district requirements.

Exterior Valves:

Underground: Gate valves with vertical indicator post.

SPECIAL VALVES:

General: Provide valves, UL listed, in accordance with the following listing. Provide sizes and types which mate and match piping and equipment connections.

Alarm Check Valves: Provide cast-iron water flow alarm check valves, 175 psi working pressure.

Fire Department Connection Valve: Provide at building to match local fire department thread. Verify with local fire department as to the type of connection required.

BASIC METERS AND GAGES:

General: Provide meters and gages in accordance with the following listing:

Pressure gages, 0-250 psi range.

FIRE PROTECTION SPECIALTIES:

General: Provide fire protection specialties, UL listed, in accordance with the following listing. Provide sizes and types which material match piping and equipment connections.

Water Flow Indicators: Provide vane type water flow detectors.

Water-Motor Gongs: Provide 10" weatherproof, red enameled finish, water-motor gongs or electric bells as required.

Supervisory Switches: Provide products recommended by manufacturer for use in service indicated.

Automatic Sprinklers: Provide automatic sprinklers of type indicated on Drawings, and in accordance with the following listing. Provide fusible links for 165 deg. F (74 deg. C) unless otherwise indicated.

Upright
Pendent
Alcove

Finish: Concealed white plate for occupied areas with ceilings, cast brass for unoccupied areas.

Sprinkler Cabinet and Wrench: Furnish steel, baked red enameled, sprinkler box with capacity to store 10 sprinklers and wrench sized to sprinklers.

Available Manufacturers: Subject to compliance with requirements, manufacturers offering fire protection specialties which may be incorporated in the work include, but are not limited to, the following:

Manufacturer: Subject to compliance with requirements, provide fire protection specialties of one of the following:

Allen (W.D.) Mfg. Div., J.W. Moon, Inc.
Automatic Sprinkler Corp. of America
Chemetron Corp.
Elkhart Brass Mfg. Co.
Grinnell Fire Protection Systems Co., Inc.
Viking Corp.
Western Fire Equipment Co.
Potter Roemer

PART 3 - EXECUTION

INSTALLATION OF BASIC IDENTIFICATION:

General: Install mechanical identification in accordance with Division-15 Basic Materials and Methods section "General Mechanical Requirements".

Install fire protection signs on piping in accordance with ANSI/NFPA 13 requirements.

INSTALLATION OF PIPE, TUBE AND FITTINGS:

General: Install pipe, tube and fittings in accordance with Division-15 Basic Materials and Methods sections "General Mechanical Requirements" and "Piping Specialties".

Fire Sprinkler Piping Systems:

General: Comply with requirements of ANSI/NFPA 13 for installation of fire sprinkler piping materials. Install fire sprinkler piping products where indicated, in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that fire sprinkler piping complies with requirements and serves intended purposes.

Coordinate with other work, including plumbing piping, as necessary to interface components of sprinkler piping properly with other work.

Install drain piping at low points of piping systems.

Install hose outlet valves in piping where hose outlets are indicated.

Install sectional valves in inlet piping, at bottom of each riser, and in loops as indicated.

Install fire department connection valves in piping where fire department connections are indicated.

Install water flow indicators where indicated.

Mount supervisory flow indicators where indicated.

Install manual shutoff at each audible alarm station.

Install valved hose connections of sizes indicated, or 3/4" size if not otherwise indicated on sprinkler at ends of branch lines and cross mains at locations where indicated.

Install Inspector's test connection where indicated, or at most remote point of riser. Do not locate in finished room areas.

INSTALLATION OF PIPING SPECIALTIES:

Install piping specialties in accordance with Division-15 Basic Materials and Methods section "Piping Specialties".

INSTALLATION OF SUPPORTS, ANCHORS AND SEALS:

Install supports, anchors and seals in accordance with Division 15 Basic Materials and Methods sections "General Mechanical Requirements" and "Piping Specialties".

INSTALLATION OF VALVES:

Install valves in accordance with Division-15 Basic Materials and Methods section "Valves".

INSTALLATION OF METERS AND GAGES:

Install meters and gages in accordance with NFPA Requirements.

INSTALLATION OF FIRE PROTECTION SPECIALTIES:

General: Install fire protection specialties as indicated, and in accordance with ANSI/NFPA 13.

ADJUST AND CLEAN:

Sprinkler Piping Flushing: Prior to connecting sprinkler risers for flushing, flush water feed mains, lead-in connections and control portions of sprinkler piping. After fire sprinkler piping installation has been completed and before piping is placed in service, flush entire sprinkler system, as required to remove foreign substances, under pressure as specified in ANSI/NFPA 13. Continue flushing until water is clear, and check to ensure that debris has not clogged sprinklers.

FIELD QUALITY CONTROL:

Hydrostatic Testing: After flushing system, test fire sprinkler piping hydrostatically, for period of 2 hours, at not less than 200 psi or at 50 psi in excess of maximum static pressure when maximum static pressure is in excess of 150 psi. Check system for leakage of joints. Measure hydrostatic pressure at low point of each system or zone being tested.

Repair or replace piping system as required to eliminate leakage in accordance with ANSI/NFPA standards for "little or no leakage", and retest as specified to demonstrate compliance.

EXTRA STOCK:

General: For each style and temperature range required, furnish additional sprinkler heads, amounting to one (1) unit for every one hundred (100) installed units, but not less than five (5) units of each.

END OF SECTION

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SECTION 15530
REFRIGERANT PIPING

PART 1 - GENERAL

Codes and Standards:

ANSI Compliance:

ASHRAE Compliance:

PART 2 - PRODUCTS

MATERIALS AND PRODUCTS:

Tube Size 3/4" and Smaller: Copper tube; Type ACR, soft annealed temper fittings; cast copper-alloy fittings for flared copper tubes; flared joints.

Tube Size 7/8" through 4-1/8": Copper tube, Type ACR, soft annealed temper; wrought-copper, solder-joint fittings; soldered joints.

Soldered Joints: Solder joints using (silfos) solder.

SPECIAL REFRIGERANT VALVES:

General: Special valves required for refrigerant piping include the following types:

Globe and Check Valves:

Globe Shutoff Valves: Forged brass, packed, back seating, winged seal cap, 300 deg. F (149 deg. C) temperature rating, 500 psi working pressure.

Check Valves: Forged brass, accessible internal parts, soft synthetic seat, fully guided brass piston and stainless steel spring, 250 deg. F (121 deg. C) temperature rating, 500 psi working pressure.

Manufacturer: Subject to compliance with requirements, provide globe and check valves of one of the following:

Henry Valve Co.
Parker Hannifin Corp.; Refrigeration & Air-Cond. Div.
Sporlan Valve Co.

Solenoid Valves:

2-Way Solenoid Valves: Forged brass, designed to conform to ARI 760, normally closed, Teflon valve seat, NEMA 1 solenoid enclosure, 24 volt, 60 Hz., UL-listed, 1/2" conduit adapter, 250 deg. F (121 deg. C) temperature rating, 400 psi working pressure.

Manual Operator: Provide manual operator to open valve.

Manufacturer: Subject to compliance with requirements, provide solenoid valves of one of the following:

Alco Controls Div.; Emerson Electric Co.
Automatic Switch Co.
Sporlan Valve Co.

REFRIGERANT SPECIALTIES:

Refrigerant Strainers: Brass shell and end connections, brazed joints, monel screen, 100 mesh, UL-listed, 350 psi working pressure.

Moisture-Liquid Indicators: Forged brass, single port, removable cap, polished optical glass, solder connections, UL-listed, 200 deg. F (93 deg. C) temperature rating, 500 psi working pressure.

Refrigerant Filter-Driers: Steel shell, ceramic fired desiccant core, solder connections, UL-listed, 500 psi working pressure.

Refrigerant Filter-Driers: Corrosion-resistant steel shell, steel flange ring and spring, wrought copper fittings, ductile iron cover plate with steel cap screws, replaceable filter-drier core, 500 psi working pressure.

Evaporator Pressure Regulators: Provide corrosion-resistant, spring loaded, stainless steel springs, pressure operated, evaporator pressure regulator, in size and working pressure indicated, with copper connections.

Refrigerant Discharge Line Mufflers: Provide discharge line mufflers as recommended by equipment manufacturer for use in service indicated, UL-listed.

Manufacturer: Subject to compliance with requirements, provide refrigeration accessories of one of the following:

Alco Controls Div.; Emerson Electric Co.
Henry Valve Co.
Parker-Hannifin Corp.; Refrigeration & Air-Conditioning Div.
Sporlan Valve Co.

PART 3 - EXECUTION

INSPECTION:

General: Examine areas and conditions under which refrigerant piping systems materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

INSTALLATION OF REFRIGERANT PIPING:

Install refrigerant piping with 1/4" per foot (1%) downward slope in direction of oil return to compressor. Provide oil traps and double risers required to provide oil return.

Clean refrigerant piping by swabbing with dry lintless (linen) cloth, followed by refrigerant oil soaked swab. Remove excess oil by swabbing with cloth soaked in high flash point petroleum solvent, squeezed dry.

Provide bushings between copper piping and pipe supports to eliminate dissimilar metal condition.

Bleed dry nitrogen through refrigerant piping during brazing operations.

INSTALLATION OF SPECIAL REFRIGERANT VALVES:

Solenoid Valves: Install in refrigerant piping as indicated with stem pointing upwards.

Wiring of solenoid valves is specified in applicable Division-16 sections, and is included as work of this section.

INSTALLATION OF REFRIGERANT ACCESSORIES:

Refrigerant Strainers: Install in refrigerant lines as indicated, and in accessible location for service.

Moisture-Liquid Indicators: Install as indicated on refrigerant liquid lines, in accessible location.

Refrigerant Filter-Dryers: Install in refrigerant lines as indicated, and in accessible location for service.

Evaporator Pressure Regulators: Install in refrigerant suction lines or evaporator outlets as indicated. Adjust, if required, for proper evaporator pressure.

Refrigerant Discharge Line Mufflers: Install as indicated, in horizontal or downflow portion of hot-gas lines, immediately after leaving compressor; not in riser.

FIELD QUALITY CONTROL:

Refrigerant Piping Leak Test: Prior to initial operation, clean and test refrigerant piping in accordance with ANSI B31.5, "Refrigeration Piping". Perform initial test with dry nitrogen, using soap solution to test all joints. Perform final test with 27" vacuum, and then 200 psi using halide torch. System must be entirely leak-free.

Repair or replace refrigerant piping as required to eliminate leaks, and retest as specified to demonstrate compliance.

DEHYDRATION AND CHARGING SYSTEM:

Install core in filter dryer after leak test but before evacuation.

Evacuate refrigerant system with vacuum pump; until temperature of 35 deg. F (2 deg. C) is indicated on vacuum dehydration indicator.

During evacuation, apply heat to pockets, elbows, and low spots in piping.

Maintain vacuum on system for minimum of 5 hours after closing valve between vacuum pump and system.

Break vacuum with refrigerant gas, allow pressure to build up to 2 psi.

Complete charging of system, using new filter dryer core in charging line. Provide full operating charge.

ADJUSTING AND CLEANING:

Cleaning and Inspecting: Clean and inspect refrigerant piping systems.

END OF SECTION

SECTION 15670
CONDENSING UNITS

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

SUMMARY:

Section includes:

Air-cooled condensing units.

SPECIAL PROJECT WARRANTY:

Warranty on Motor/Compressor: Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, motors/compressors with inadequate or defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only, and does not include labor for removal and reinstallation.

Warranty Period: 5 years from date of owner acceptance.

PART 2 - PRODUCTS

AIR-COOLED CONDENSING UNITS:

Manufacturers: Subject to compliance with requirements, provide air-cooled condensing units of one of the following:

BDP Co; Div Carrier Corp.
Carrier Air Conditioning; Div of Carrier Corp.
McQuay Air Conditioning Group; McQuay Inc.
Trane (The) Co; Div American Standard Inc.

General: factory-assembled and tested air-cooled condensing units, consisting of casing, compressors, condensers, coils, condenser fans and motors, and unit controls. Capacities and electrical characteristics are scheduled.

Unit Casings: designed for outdoor installation and complete with weather protection for components and controls, and complete with removable panels for required access to compressors, controls, condenser fans, motors, and drives. Additional features include:

steel, galvanized or zinc-coated, for exposed casing surfaces, treated and finished with manufacturer's standard paint coating;

lifting lugs to facilitate rigging of units;

factory-installed metal grilles, for protection of condenser coil during shipping, installation, and operation;

hinged and gasketed control panel door.

Compressor: reciprocating hermetic-type compressor, 1,750 RPM, designed for air-cooled condensing, complete with crankcase sight glass, crankcase heater, and backseating service access valves on suction and discharge ports. Capacity shall be controlled through cylinder unloading. Additional features include:

Crankcase heater in well within crankcase;

Capacity steps as scheduled, or greater number;

Compressor of same manufacturer as condensing unit.

Controls: Operating and safety controls shall include high and low pressure cutouts, oil pressure cutout, compressor winding thermostat cutout, 3-leg compressor overload protection, and condenser fan motors with thermal and overload cutouts. Control transformer if required shall be 115-volts. Provide magnetic contactors for compressor and condenser fan motors. Additional features include:

Reset relay circuit for manual resetting of cutouts from remote thermostat location;

Automatic nonrecycling pumpdown, and timing device to prevent excessive compressor cycling;

Hot Gas bypass

Condensing Section: Condenser coil shall be seamless copper tubing mechanically bonded to heavy-duty, configurated aluminum fins, with separate and independent refrigeration circuit for each compressor. Units shall include liquid accumulator and subcooling circuit, and backseating liquid line service access valve. Condenser coils shall be factory-tested at 450 psig, vacuum dehydrate, and filled with a holding charge of nitrogen.

Condenser fans and drives: propeller-type condenser fans for vertical air discharge; either direct drive or belt drive. Additional features include:

Permanent lubricated ball bearing condenser fan motors;

Separate motor for each condenser fan;

Constant speed condenser fan motors;

Each fan assembly shall be dynamically and statically balanced.

Head pressure control to modulate condenser fan motor speed, thermostatic expansion valve, evaporator freeze stat, compressor start assist kit for low ambient conditions.

Provide subcooler and accumulator.

PART 3 - EXECUTION

EXAMINATION:

Verify roof structure, mounting supports, and membrane installations are completed to the proper point to allow installation of roof mounted units. Do not proceed with work until unsatisfactory conditions have been corrected.

INSTALLATION:

General: Install condensing units in accordance with manufacturers installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

Where units and refrigerant piping are located a distance of 10 feet or more from the building exit, provide 4" pvc sleeve with full radius elbows for refrigerant piping.

Support: Install ground-mounted units on 4" thick reinforced concrete pad, 4" larger on each side than condensing unit. Unit shall be anchored to the concrete pad. Concrete is specified in Division 3. Coordinate installation of anchoring devices.

Install roof-mounted units on equipment supports specified in Division 7. Anchor unit to supports with removable fasteners.

Air-Cooled Condensing Units:

Connect refrigerant piping to unit; maintain required access to unit.

Install furnished field-mounted accessories.

Filter Drier (replaceable cartridge)
Sight Glass
King Valve at Evap. and Cond.

FIELD QUALITY CONTROL:

Testing:

Charge systems with refrigerant and oil, and test for leaks. Repair leaks and replace lost refrigerant and oil.

DEMONSTRATION:

Provide services of manufacturer's authorized service representative to provide start-up service and to instruct Owner's personnel in operation and maintenance of condensing units.

Start-up condensing units, in accordance with manufacturer's start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

Train Owner's personnel on start-up and shut-down procedures, troubleshooting procedures, servicing, and preventative maintenance schedule and procedures. Review with the Owner's personnel, the data contained in the Operating and Maintenance Manuals specified in Division One.

Schedule training with Owner, provide at least 7-day prior notice to Architect/Engineer.

END OF SECTION

SECTION 15776

HIGH EFFICIENCY GAS FIRED FURNACE

PART 1 - GENERAL

DESCRIPTION OF WORK:

Extent of Split System Furnaces required by this section is indicated on drawings and schedules, and by requirements of this section.

Refer to Division 16 sections for the following work; not work of this section.

Power supply wiring from power source to power connection on Air Conditioning units. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.

Provide the following electrical work as work of this section, complying with requirements of Division 16 sections:

Interlock and Control wiring between field-installed controls, indicating devices, and unit control panels.

PART 2 - PRODUCTS

HIGH EFFICIENCY GAS FIRED FURNACE:

General: Provide factory-assembled and tested units as indicated, consisting of insulated casing, filter and rack, fan, motor and drive, fan and limit controls, two stage heat exchanger, mono-port burner direct vent sealed combustion chamber and control transformer. Provide evaporator coil.

Refrigeration Circuit: Provide refrigerant thermal expansion valve for refrigerant control. Provide access valves in suction and liquid lines.

Compressors: Provide welded shell, hermetic compressors, or serviceable hermetic compressors, 1750 RPM. Provide crankcase heaters. Provide 5 year extended warranty on compressor.

Evaporator Coil: Construct of copper tubing and aluminum fins, pressure and leak tested at 1.5 times working pressure.

Fans: Provide direct double-inlet, forward curved, centrifugal fans with drive. Provide permanently lubricated fan and motor bearings, and thermal overloads in motor.

Heat Exchanger: four-pass heat exchangers-both primary and condensing.
Condensing section to be high grade stainless steel.

Monoport Inshot Burners:

Electronic Ignition:

Direct Vent sealed combustion chamber.

Filters: Provide 1" thick throwaway filters.

Integral Air-Cooled Condensing Units: Provide condenser coil constructed of copper tubes and aluminum fins. Factory leak-test at 1.5 times working pressure, dehydrate and provide full charge of refrigerant. Provide subcooler and accumulator.

Low Ambient Control: Provide head pressure control, designed to operate at temperatures down to 0 deg. F (-18 deg. C).

Controls: Provide factory-installed and wired controls, with terminal strip. Provide connections for remote thermostat.

Provide the Following:

- Concentric Vent Termination Kit.
- Schedule 40 PVC combustion intake and exhaust piping with long radius elbows.
- Motor with individual overload protection.
- High and low refrigerant cutouts.
- Fan-auto and heat-off-cool switches.
- Time delay relay to prevent short cycling compressor.
- Manual indoor change-over thermostat.
- Two stage heat/cool for dual circuit units.
- Outdoor thermostat.
- Crankcase heater.
- Low ambient control.
- Moisture indicator.
- Filter drier.
- Refrigerant service valves.
- Sub base for bottom return for all units above 1800 CFM.

Manufacturer: Subject to compliance with requirements, provide AC units of one of the following:

- Bryant.
- Trane Co.
- Carrier.

PART 3 - EXECUTION

INSPECTION:

Examine areas and conditions under which furnaces are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

INSTALLATION OF HIGH EFFICIENCY FURNACES:

General: Install units in accordance with manufacturers installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

Support: Install interior units on 2" thick concrete pad.

Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-16 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment Installer.

Ductwork: Connect supply and return ducts to unit with flexible duct connections. Provide transitions to exactly match unit duct connection size. Provide 1" acoustic duct lining on return air side a minimum of 10' from fan. Connect outside air duct to unit with flexible connection, provide manual damper and motorized damper.

Combustion Intake & Exhaust Piping: Provide long radius elbows on all combustion intake and exhaust piping. Provide 1/2" flexible unicellular insulation on all combustion intake and exhaust piping routed through uninsulated areas. Refer to section 15250 Mechanical Insulation.

Contractor shall provide pressure drop reading across the intake and combustion exhaust piping. Restrictors or piping changes shall be made as necessary to achieve manufacturer's recommended pressure drops. The findings shall be reported to the engineer at project closeout.

Drain Piping: Connect unit drain to nearest indirect waste connection. Piping to be type L copper.

Start-up Furnaces units, in accordance with manufacturer's start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

TRAINING OF OWNER'S PERSONNEL:

Provide services of manufacturer's technical representative for 1-half day to instruct Owner's personnel in operation and maintenance of units. Schedule training with Owner, provide at least 7-day notice to Contractor and Engineer of training date.

SPARE PARTS:

General: Furnish to Owner, with receipt, the following spare parts for AC unit:

- 1 set of matched fan belts for each belt driven fan.
- 1 set filters for each unit.

END OF SECTION

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SECTION 15783

ROOFTOP HEATING AND VENTILATING UNITS

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

Extent of rooftop heating and ventilating unit work required by this section is indicated on drawings and schedules, and by requirements of this section.

Types of rooftop heating and ventilating units specified in this section include the following:

Gas-fired heating and ventilating.

Refer to Division-16 sections for the following; not work of this section.

Power supply wiring from power source to power connection on rooftop heating and cooling units.

Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory installed, by manufacturer.

Provide the following electrical work as work of this section, complying with requirements of Division-16 sections.

Control wiring between field-installed controls, indicating devices, and unit control panels.

Refer to other Division-15 sections for automatic temperature controls not factory-installed, required in conjunction with rooftop heating and ventilating units; not work of this section.

QUALITY ASSURANCE:

Manufacturer's Qualifications: Firms regularly engaged in manufacture of rooftop heating and cooling units, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.

Regulatory Requirements:

UL Compliance: Provide rooftop heating and ventilating units which are listed by UL and have UL label affixed.

AGA Compliance: Construct gas-fired furnace sections in accordance with AGA safety standards and provide AGA label.

SUBMITTALS:

Product Data: Submit manufacturer's technical product data, including rated capacity of selected model clearly indicated, weights, furnished specialties and accessories; and installation and start-up instructions.

Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loadings, required clearances, and methods of assembly of components.

Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring for rooftop units. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.

Maintenance Data: Submit maintenance data and parts list for each rooftop unit, control and accessory; including "trouble-shooting" maintenance guide.

Include this data and product data in maintenance manual; in accordance with requirements of Division-1.

PRODUCT DELIVERY, STORAGE AND HANDLING:

Handle rooftop heating and ventilating units and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged rooftop units or components; replace with new.

Store rooftop units and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

Comply with Manufacturer's rigging and installation instructions for unloading rooftop units, and moving them to final location.

SPECIAL PROJECT WARRANTY:

Warranty On Heat Exchanger: Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, heat exchangers with inadequate and deflection materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only, and does not include labor for removal and reinstallation.

Warranty Period: Ten (10) years from date of final acceptance completion.

PART 2 - PRODUCTS

ROOFTOP UNITS:

General: Specifically designed for outdoor rooftop installation on roof. Completely assembled and tested, piped, internally wired and shipped in one piece. Units for natural gas, filters, outside air system and all operating and safety controls furnished factory installed. All units and safety controls furnished factory installed. All units are factory run tested. Units available with UL approval. All units have decals and tags to aid in service and indicate caution areas. Electrical diagrams on long life water resistant material ship attached to control panel door.

Heat Exchanger: Basic standard heat exchangers are furnished employing type 409 stainless steel on the entire primary and secondary surface. There are three (3) collector boxes and tube sheets. The collector boxes and tube sheet are fabricated from stainless steel.

Blower Assemblies: The standard main supply fan blower and motor assembly is furnished using three phase motors. These motors are open NEMA design B. Rigid frames are employed attached to an adjustable motor base.

Blower assemblies are furnished with adjustable drive motor sheaves. The standard blower access is at the rear of the blower assembly when facing the burner. Blowers are furnished with permanently lubricated ball bearings supporting a turned, ground and polished shaft. Extended grease lines are provided.

Heat Exchanger Casing: The heat exchanger casings are constructed of galvanized steel. All casings are furnished with 1" - 1-1/2# fiberglass insulation and galvanized metal radiation shields or liners and will maintain a jacket loss less than 2% of the heat output. A louvered galvanized enclosure suitable for outdoor application is attached to the heat exchanger protecting the power exhauster, burner and control cabinet.

Return Air Section: Fresh and returned air mixing dampers constructed of 16 gauge galvanized steel glades and framing with nylon bearings are furnished as standard. Filter rails arranged in a "V" configuration furnished with 2" throw-away filters. A galvanized steel inlet louver with rain shield is furnished on the fresh air inlet. Casings are insulated with 1" - 1-1/2# fiberglass insulation.

Provide the following unit configuration:

- Mixing Box with outdoor air intake hood and damper, down flow return damper and filters.
- DX cooling coil with (2) separate refrigeration circuits.
- Forward curved centrifugal fan with control panel
- Duct Furnaces
- Down flow supply plenum

Unit Base Frame: The entire bottom of the unit including return air section and heat exchanger is attached to a fabricated base frame designed for mounting on a perimeter roof curb.

Accessories: Provide the following accessories as indicated and/or scheduled:

- Provide matching roof curb for each unit.
- Central control panel.

Available Manufacturers: Subject to compliance with requirements, manufacturers offering rooftop units which may be incorporated in the work include, but are not limited to, the following:

- King Company
- Trane
- Reznor

PART 3 - EXECUTION

INSPECTION:

Examine areas and conditions under which rooftop units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

INSTALLATION OF ROOFTOP UNITS:

General: Install rooftop units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

Support installed units as detailed on plan, in accordance with National Roofing Contractor's Association (NRCA) installation recommendations.

Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirement of Division-16 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment Installer.

Ductwork: Refer to Division-15 section "Ductwork". Connect supply and return ducts to unit with flexible duct connections. Provide transitions to exactly match unit duct connection sizes.

Gas Piping: Connect gas piping to unit gas train with shut-off cock and drip let. Connect to gas tee provided by plumbing contractor.

Start-up rooftop units in accordance with manufacturer's start-up instructions. Test controls and demonstration compliance with requirements. Replace damaged or malfunctioning controls and equipment.

Balancing of rooftop unit systems is specified in Division-15 section "Testing, Adjusting, and Balancing"; not work of this section.

GROUNDING:

Provide positive equipment ground for rooftop unit components.

TRAINING OF OWNER'S PERSONNEL:

Provide services of manufacturer's technical representative for one half day to instruct Owner's personnel in operation and maintenance of rooftop units.

Schedule training with Owner, provide at least seven-day notice to Contractor and Engineer of training date.

SPARE PARTS:

General: Furnish to Owner, with receipt, the following spare parts for each rooftop unit:

- One set of matched fan belts for each belt-driven fan.
- One set filters for each unit.

END OF SECTION

SECTION 15830

TERMINAL UNITS

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplemental Conditions and Division 1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

Extent of terminal unit work is indicated by drawings and schedules, and by requirements of this section.

Types of terminal units required for project include the following:

Unit heaters.
Coils.

Refer to Division 16 sections for the following work; not work of this section.

Power supply wiring from power source to power connection on terminal unit. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.

Interlock wiring between electrically-operated terminal units; and between terminal units and field-installed control devices.

Interlock wiring specified as factory-installed is work of this section.

Provide the following electrical work as work of this section, complying with requirements of Division 16 sections:

Control wiring between field-installed controls, indicating devices, and terminal unit control panels.

PART 2 - PRODUCTS

UNIT HEATERS:

General: Provide unit heaters in locations as indicated, and of capacities, style, and having accessories as scheduled.

Gas Fired Unit Heaters:

Provide Unit Heaters as scheduled on the plans. Heaters shall be equipped with day/night thermostat, single stage, standing pilot, seam welded aluminized steel tubes and 18 gauge aluminized steel headers for the heat exchanger, aluminized steel burners which are individually removeable, 24 volt automatic gas valve including pilot safety shutoff, main operating valve, pressure regulator and adjustable pilot valve. Provide winter/summer switch.

Vent Pipe to be type B gas vent.

Manufacturer: Subject to compliance with requirements, provide unit heaters of one of the following:

McQuay Inc.
Modine Mfg. Co.
Reznor
Trane (The) Co.
Wing (The) Co., Div. Wing Industries, Inc.
Marlo

COILS:

General: Provide coils of size and in location indicated, and of capacities and having performance data as scheduled. Certify coil capacities, pressure drops, and selection procedures in accordance with ARI 410.

Cooling Coils:

Fins: Construct of continuous aluminum or copper configured plate-fin type with full fin collars for accurate fin spacing and maximum fin-tube contact.

Tubes: Construct of 5/8" seamless copper tubes, arranged in parallel pattern with respect to air flow.

Casings: Construct of 16-ga continuous coated galvanized steel for coil heights 33" and smaller; 14-ga for coil heights over 33". Provide formed end supports and top and bottom channels. Provide 16-ga steel center tube support for coil lengths 42" to 96", 2 or more supports for coil lengths over 96".

Air Bypass Arrestor: Provide foam sealing strip located between casing channels and fins along top and bottom.

U-Bends: Construct of 5/8" copper tubes, machine die-formed on each end to provide accurate fit for silver brazed joints.

Testing: Proof test water coils at 300 psi and leak test at 200 psi under water. Proof test refrigerant coils at 450 psi and leak test at 300 psi under water; clean, dehydrate, and seal with dry nitrogen charge.

Coil Types: Provide the following coil types as indicated, and as scheduled:

Refrigerant Coils: Provide refrigerant distributor of venturi type with low pressure drop design, arranged for down feed and maximum of 12 circuits per distributor. Provide seamless copper tube suction header. Construct distributor tubes of 5/16" copper tube for R-12, 1/4" copper tube for R-22.

Manufacturer: Subject to compliance with requirements, provide coils of one of the following:

American Air Filter, Allis-Chalmers Co.
Carrier Corp.
McQuay Inc.
Trane (The) Co.
York Div., Borg-Warner Corp.
HeatCraft Coils
Marlo Coils

PART 3 - EXECUTION:

INSPECTION:

Examine areas and conditions under which terminal units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

INSTALLATION OF UNIT HEATERS:

General: Install unit heaters as indicated, and in accordance with manufacturer's installation instructions.

Uncrate units and inspect for damage. Verify that nameplate data corresponds with unit designation.

Hang units from building substrate, not from piping. Mount as high as possible to maintain greatest headroom possible unless otherwise indicated.

Support units with rod-type hangers anchored to building substrate.

Install piping as indicated.

Protect units with protective covers during balance of construction.

INSTALLATION OF COILS:

General: Install coils as indicated, and in accordance with manufacturer's installation instructions.

Mount coils on steel supports to form banks or stacks as indicated, brace, secure to air intake chamber. Place in location to permit installation of bypass damper if required, provide steel baffles where required to prevent bypassing of air.

Pitch coil casings for drainage, not less than 1/8" toward return connections, except where drainage feature is included in coil design.

Provide for each bank of cooling coils, stainless steel drain pan under each coil supported off of floor of sufficient height to allow installation of condensate trap to allow drainage of condensate from pan when installed on suction side of fan.

ELECTRICAL WIRING:

General: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-16 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

ADJUSTING AND CLEANING:

General: After construction is completed, including painting, clean unit exposed surfaces, vacuum clean terminal coils and inside of cabinets.

Retouch any marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

Install new filter units for terminals requiring same.

END OF SECTION

SECTION 15860
FANS AND VENTILATORS

PART 1 - GENERAL

DESCRIPTION OF WORK:

Extent of fans work required by this section is indicated on drawings and schedules, and by requirements of this section.

All fans with outboarded motors shall be factory wired with metallic raceway to their respective factory mounted disconnect switch.

Types of fans required for project include the following:

Inline Centrifugal Fans.
Centrifugal Roof Ventilators.
Prefabricated Roof Curbs.

Refer to Division 16 sections for the following work; not work of this section.

Power supply wiring from power source to power connection on fan motor. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.

Interlock wiring between fan units; and between fans and field-installed control devices.

Interlock wiring specified as factory-installed is work of this section.

Provide the following electrical work as work of this section, complying with requirements of Division 16 sections:

Control wiring between field-installed controls, indicating devices, and fan starters.

PART 2 - PRODUCTS

INLINE CENTRIFUGAL FANS:

General: Provide inline centrifugal fans of sizes and arrangement as indicated, and of capacities and having accessories as scheduled.

Housing: Aluminum or galvanized steel housing inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

Direct-Drive Units: Provide ball bearing motor encased in housing so as to be out of air stream. Provide factory wiring to disconnect switch located on outside of fan housing.

Provide NEMA 1 disconnect factory mounted. For single phase fractional HP fans use a toggle type disconnect switch. On three phase integral HP fans use a NEMA 1 safety switch.

Belt-Drive Units: Provide ball bearing motor mounted on adjustable base, with adjustable sheaves. Provide enclosure around belts. Provide lubricating tubes from fan bearings to outside of fan housing.

Wheel: Backward or forward inclined as scheduled, non-overloading, statically and dynamically balanced.

Vibration Control: Provide as listed, the following types of vibration isolators to meet intended service, with number and size of isolators selected by manufacturer.

Base Type A: No base, isolators attached directly to equipment.

Accessories: Provide the following accessories as indicated.

Volume Control Damper: Provide manual controlled volume damper in fan outlet with quadrant and lock.

Companion Flanges: Provide matching flanges on inlet and outlet to connect ductwork to fan.

Motor, Belt and Fan Guards: Provide guards on inlets and outlets not connected to ductwork, constructed of expanded metal in removable frame.

Duct Lining: Provide 1" thick, 3-lb density duct liner a minimum of 10' (ten feet) up and down stream of fan.

Speed Control: For direct drive fans, provide variable speed switch with off-on control, and speed control for 100% to 50% of fan air delivery.

Manufacturer: Subject to compliance with requirements, provide inline centrifugal fans of one of the following:

Acme
Carnes
Cook (Loren) Co.
Greenheck.
Penn Ventilator Co.
Jenn Fan

CENTRIFUGAL ROOF VENTILATORS:

Provide centrifugal roof type, curb mounted, power ventilators of type, size, and capacity as scheduled, and as specified herein.

Type: Centrifugal fan, direct or belt driven as scheduled. Provide aluminum, galvanized steel, or fiberglass weatherproof housings as scheduled. Provide square base to suit roof curb. Provide permanent split-capacitor type motor for direct driven fans; capacitor-start, induction-run type motor for belt driven fans.

Provide the Following Types of Housing Design:

Hooded dome type.
Upblast type for Fume Hoods

Electrical: Provide factory-wired non-fusible type disconnect switch at motor in fan housing. Provide thermal overload protection in fan motor. Provide conduit chase within unit for electrical connection.

Provide NEMA 1 disconnect factory mounted. For single phase fractional HP fans use a toggle type disconnect switch. On three phase integral HP fans use a NEMA 1 safety switch.

Bird Screens: Provide removable bird screens, 1/2" mesh, 16-ga aluminum or brass wire.

Dampers: Provide motor-actuated louvered dampers in curb bases.

Dampers utilized for pressure relief applications shall be tight seal, motorized, with blade and edge seals.

Duct Lining: Provide 1" thick, 3-lb density duct liner a minimum of 10' (ten feet) up stream of fan.

Coatings: Provide factory applied coating to fan blades and all parts of the fan in contact with the exhaust air stream, equal to Greenheck "Greenkote" finish. This shall be applied to all rooftop fans.

Roof Curb: Provide factory fabricated roof curb by the same manufacturer as the equipment. Roof curb to be insulated.

Manufacturer: Subject to compliance with requirements, provide centrifugal roof ventilators of one of the following:

Acme
Carnes
Cook Co., Loren.
Greenheck Fan Corp.
Penn Ventilator Co., Inc.
Jenn Fan

PREFABRICATED ROOF CURBS:

General: Provide manufacturer's standard shop-fabricated units, modified if necessary to comply with requirements.

Fabricate structural framing for units of structural quality sheet steel, formed to manufacturer's standard profiles for coordination with roofing, insulation and deck construction. Include 45 deg. cant strips and deck flanges with offsets to accommodate roof insulation. Weld corners and seams to form watertight units.

Clean and paint units with manufacturer's standard rust-inhibitive metal primer paint.

Reinforce continuous runs of over 3'-0" length, by inserting welded stiffeners of heavy gage with flanges as required to provide sufficient rigidity and strength to withstand maximum lateral forces in addition to superimposed vertical loads.

Sloping Roof Decks: For deck slopes of 1/4" per foot and more, fabricate support units to form level top edge.

Gage and Height: Fabricate units of metal gage and to height above roof surface as indicated.

Where gage or height are not indicated, fabricate units of 14-ga metal, and nominal height of 14".

Provide pressure treated wood nailer, not less than 1-5/8" thick and of width indicated, but not less than width of support wall assembly. Anchor nailer securely to top of metal frame unit.

Provide lumber pressure treated with water-borne preservatives for "above ground" use.

Insulate units inside structural support wall with rigid glass fiber insulation board of approximately 3-lb. density and 1-1/2" minimum thickness, except as otherwise indicated.

Manufacturer: Subject to compliance with requirements, provide prefabricated roof curbs of one of the following:

Custom Curb, Inc.
Equipment Manufacturer.
Pate Co.
Shipman.
Thycurb.

PART 3 - EXECUTION

INSPECTION:

General: Examine areas and conditions under which power and gravity ventilators are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

INSTALLATION OF POWER AND GRAVITY VENTILATORS:

Coordinate ventilator work with work of roofing, walls, and ceilings, as necessary for proper interfacing.

Provide access door in duct below ventilator to service damper.

Solder bottom joints and up 2" of side joints of duct under roof ventilator to retain any moisture entering ventilator.

Access: Provide access and service space around and over fans as indicated, but in no case less than that recommended by manufacturer.

Roof Curbs: Furnish roof curbs to roofing installer for installation. Install according to roofing manufacturer's recommendation and specifications.

Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-16 sections. Ensure that rotation is in direction indicated and intended for proper performance. Do not proceed with centrifugal fan start-up until wiring installation is acceptable to fan installer.

FIELD QUALITY CONTROL:

Testing: After installation of ventilators has been completed, test each ventilator to demonstrate proper operation of units at performance requirements specified. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

ADJUSTING AND CLEANING:

Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

SPARE PARTS:

General: Furnish to Owner, with receipt, one spare set of belts for each belt drive power ventilator.

END OF SECTION

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SECTION 15891
METAL DUCTWORK

PART 1 - GENERAL

DESCRIPTION OF WORK:

Extent of metal ductwork is indicated on drawings and in schedules, and by requirements of this section.

Codes and Standards:

SMACNA Standards:

ASHRAE Standards:

NFPA Compliance:

PART 2 - PRODUCTS

DUCTWORK MATERIALS:

Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, stains and discolorations, and other imperfections, including those which would impair painting.

Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel, lock forming quality; with G 90 zinc coating and mill phosphatized for exposed locations. Minimum gauge shall be 24.

PVC Coated Sheet Metal: All fume exhaust ductwork shall be Polyvinyl Coated Ductwork, (PCD). All ducts shall be PCD formed into spiral tubes. All couplings and fittings shall be factory fabricated of PCD. All joints and connections shall be screw fastened and taped in accordance with the manufacturer's recommendations to assure an air tight system. Any damage to the coating shall be repaired with PCD touch up paint or PCD aerosol spray. All ducts and fittings shall be installed according to manufacturer's recommendations. Manufacturer equal to Foremost Manufacturing Company.

Aluminum sheet: Where indicated, provide aluminum sheet, Alloy 3003, Temper H14.

MISCELLANEOUS DUCTWORK MATERIALS:

Fittings: Provide radius type fittings fabricated of multiple sections with maximum 15 deg. change of direction per section. Unless specifically detailed otherwise, use 45 deg. laterals and 45 deg. elbows for branch takeoff connections. Where 90 deg. branches are indicated, provide conical type tees.

Duct Liner: Fibrous glass of thickness indicated. 3-lb density.

Duct Liner Adhesive:

Duct Liner Fasteners: Comply with SMACNA HVAC Duct Construction Standards.

Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.

Duct Cement: Non-hardening migrating mastic or liquid neoprene based cement, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for cementing fitting components, or longitudinal seams in ductwork.

Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.

For aluminum ductwork, provide aluminum support materials except where materials are electrolytically separated from ductwork.

Flexible Ducts: Either spiral-wound spring steel with flameproof vinyl sheathing, or corrugated aluminum. Unless specifically mentioned, the maximum length of flex duct on the supply equals 5 feet. Flex is not allowed for return, relief or exhaust applications.

Where installed in unconditioned spaces other than return air plenums, provide 1" thick continuous flexible fiberglass sheath with vinyl vapor barrier jacket.

Installation is not permitted above inaccessible ceilings.

FABRICATION:

Shop fabricate ductwork in 4, 8, 10 or 12-ft lengths, unless otherwise indicated or required to complete runs. Preassemble work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for reassembly and coordinated installation.

All ductwork shall be Pittsburgh Construction with a minimum of thickness of 24 gauge. In addition, ductwork used in systems over 3" H₂O shall have cold sealant applied.

Size of ductwork shown on the drawings is free net area, outside dimension of ducts will need to be increased if lined duct is used.

Shop fabricate ductwork of gages and reinforcement complying with SMACNA "HVAC Duct Construction Standards".

Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to associated duct width; and fabricate to include turning vanes in elbows where shorter radius is necessary. Limit angular tapers to 30 deg. for contracting tapers and 20 deg. for expanding tapers.

Fabricate ductwork with duct liner in each section of duct where indicated. Laminate liner to internal surfaces of duct in accordance with instructions by manufacturers of lining and adhesive, and fasten with mechanical fasteners. Duct liner to be 3 lb density for acoustic requirements 1" thick or as noted. Size of ductwork shown on the drawings is free net area, outside dimension of ducts will need to be increased if lined duct is used.

FACTORY-FABRICATED LOW PRESSURE DUCTWORK:

General: At installer's option, provide factory-fabricated duct and fittings, in lieu of shop-fabricated duct and fittings.

Material: Galvanized sheet steel, lock forming quality, G90 zinc coating, mill phosphatized.

Gage: 28-gage minimum for round and oval ducts spiral ducts, 24 gauge for round duct and fittings, 4" through 24" diameter.

Elbows: One piece construction for 90 deg. and 45 deg. elbows 14" and smaller. Provide multiple gore construction for larger diameters with standing seam circumferential joint.

Divided Flow Fittings: 90 deg. tees, constructed with saddle tap spot welded and bonded to duct fitting body.

Manufacturers: Subject to compliance with requirements, provide factory-fabricated ductwork of one of the following:

Semco Mfg., Inc.
United Sheet Metal Div., United McGill Corp.

PART 3 - EXECUTION

INSPECTION:

INSTALLATION OF METAL DUCTWORK:

General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air-tight (5% leakage for systems rated 3" and under; 1% for systems rated over 3") and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum number of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling. Support vertical ducts at every floor.

Inserts: Install concrete inserts for support of ductwork in coordination with form work, as required to avoid delays in work.

Sealing: Seal all longitudinal seams, S's and drives and all joints with mastic or cement. Install according to Smacna standards.

Balancing Dampers: The sheet metal contractor shall be fully responsible for installing balancing dampers in the ductwork, (whether shown on the drawing or not) in order to arrive at the intended air flow. The balancing sub-contractor shall provide direction and assistance in determining locations where dampers are required. Additional dampers, if required shall be installed at no additional cost to the owner.

Wall Penetrations: Seal and pack around all ducts and piping sleeves which pass through walls that extend to bottom side of structure and rated walls.

Field Fabrication: Complete fabrication of work at project as necessary to match shop-fabricated work and accommodate installation requirements.

Routing: Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Run ductwork in shortest route which does not obstruct useable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or

above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

Electrical Equipment Spaces: Do not route ductwork through transformer vaults and their electrical equipment spaces and enclosures.

Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-1/2". Fasten to duct and substrate.

Where ducts pass through fire-rated floors, walls, or partitions, provide fire dampers and firestopping between duct and substrate, in accordance with requirements of Division-7 Section "Firestopping".

Coordination: Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.

INSTALLATION OF DUCT LINER:

General: Install duct liner in accordance with SMACNA HVAC Duct Construction Standards. Size of ductwork shown on the drawings is free net area, outside dimension of ducts will need to be increased if lined duct is used.

Store internally lined ductwork up off of the floor. Protect internally lined ductwork from water and dust. Butter the leading edge of all internal duct lining with the manufacturer's recommended adhesive.

Inspect and repair all damaged lining prior to installation of ductwork.

INSTALLATION OF FLEXIBLE DUCTS:

Maximum Length: For any duct run using flexible ductwork, do not exceed 5' - 0" extended length. Installation shall have smooth full radius turns down to diffuser.

Installation not permitted above inaccessible ceilings.

FIELD QUALITY CONTROL:

Leakage Tests: After each duct system which is constructed for duct classes over 3" is completed, test for duct leakage in accordance with SMACNA HVAC Air Duct Leakage Test Manual. Repair leaks and repeat tests until total leakage is less than 1% of system design air flow.

EQUIPMENT CONNECTIONS:

General: Connect metal ductwork to equipment as indicated, provide flexible connection for each ductwork connection to equipment mounted on vibration isolators, and/or equipment containing rotating machinery. Provide access doors.

ADJUSTING AND CLEANING:

Clean ductwork internally, unit by unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.

Strip protective paper from stainless ductwork surfaces, and repair finish wherever it has been damaged.

Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until time connections are to be completed.

END OF SECTION

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SECTION 15910
DUCTWORK ACCESSORIES

PART 1 - GENERAL

DESCRIPTION OF WORK:

Extent of ductwork accessories work is indicated on drawings and in schedules, and by requirements of this section.

Types of ductwork accessories required for project include the following:

- Dampers.
- Low pressure manual dampers.
- Control dampers.
- Fire and smoke dampers.
- Turning vanes.
- Duct hardware.
- Duct access doors.
- Flexible connections.

PART 2 - PRODUCTS

DAMPERS:

Low Pressure Manual Dampers: Provide dampers of single blade type or multiblade type, constructed in accordance with SMACNA "HVAC Duct Construction Standards".

Control Dampers: Provide dampers with parallel blades for 2-position control, or opposed blades for modulating control. Construct blades of 16-ga steel, provide heavy-duty sealed ball bearings, 1/2" diameter steel axles spaced on 9" centers. Construct frame of 2" x 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under; 4" x 1-1/4" x 16-ga channel for face areas over 25 sq. ft. Provide galvanized steel finish with aluminum touch-up.

Control Damper size shall be based on an air velocity of 1200 to 1500 fpm and 1/4" s.p. drop when wide open. HVAC contractor shall provide transition in ductwork to arrive at this velocity (if required). Consult engineer for exact type of transition.

Damper shall be low leak with extruded vinyl edge seals and flexible metal compression type jamb seals.

Manufacturer: Subject to compliance with requirements, provide dampers of one of the following:

- Air Balance, Inc.
- American Warming & Ventilating, Inc.
- Arrow Louver and Damper, Div. of Arrow United Industries, Inc.
- Louvers & Dampers, Inc.
- Penn Ventilator Co.
- Ruskin Mfg. Co.

FIRE AND SMOKE DAMPERS:

Fire Dampers: Provide fire dampers, of types and sizes indicated. Construct casings of 11-ga galvanized steel with bonded red acrylic enamel finish or galvanized steel. Provide fusible link rated at 160 to 165 deg. F (71 to 74 deg. C) unless otherwise indicated. Dampers in their opened position shall be located out of the air stream, (high hat dampers).

Blade Material: Steel, match casing.

Fire/Smoke Dampers: Provide fire/smoke dampers, of types and sizes indicated. Construct casings of 11-ga galvanized steel with bonded red acrylic enamel finish. Provide fusible link rated at 160 to 165 deg. F (71 to 74 deg. C) unless otherwise indicated. Provide additional frangible link containing explosive charge, connected in series with fusible link. Provide stainless steel spring loaded leakage seals in sides of casing, and 36" long wire leads for connecting smoke link to smoke detector. Dampers in their opened position shall be located out of the air stream, (high hat dampers).

Blade Material: Steel, matching casing.

Motor-Driven Fire/Smoke Dampers: Provide motor-driven fire/smoke dampers in types and sizes indicated, with casing constructed of 11-ga galvanized steel with bonded red acrylic enamel finish, fusible link 160 to 165 deg. F (71 to 74 deg. C), unless otherwise indicated, and curtain type stainless steel interlocking blades, with electric motor equipped with instant closure clutch, stainless steel cable damper blade linkage, motor mounting bracket, and 32" long wire leads for connecting to smoke detector, and with the following construction feature:

Unit Assembly: Motor mounted outside air stream.

Dampers in their opened position shall be located out of the air stream, (high hat dampers).

Manufacturer: Subject to compliance with requirements, provide fire and smoke dampers of one of the following:

Air Balance, Inc.
American Warming & Ventilating, Inc.
Arrow Louver and Damper, Div. of Arrow United Industries Inc.
Louvers and Dampers, Inc.
Penn Ventilator Co.
Prefco
Ruskin Mfg. Co.

TURNING VANES:

Fabricated Turning Vanes: Provide fabricated turning vanes and vane runners, constructed in accordance with SMACNA "HVAC Duct Construction Standards".

Manufactured Turning Vanes: Provide turning vanes constructed of 1-1/2" wide curved blades set at 3/4" o.c., supported with bars perpendicular to blades set at 2" o.c., and set into side strips suitable for mounting in ductwork.

Acoustic Turning Vanes: Provide acoustic turning vanes constructed of airfoil shaped aluminum extrusions with perforated faces and fiberglass fill.

Manufacturer: Subject to compliance with requirements, provide turning vanes of one of the following:

Aero Dyne Co.
Anemostat Products Div., Dynamics Corp. of America.
Barber-Colman Co.
Hart & Cooley Mfg. Co.
Register & Grille Mfg. Co., Inc.

DUCT HARDWARE:

General: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:

Test Holes: Provide in ductwork at fan inlet and outlet, and elsewhere as indicated, duct test holes, consisting of slot and cover, for instrument tests.

Quadrant Locks: Provide for each damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12". Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork.

Manufacturer: Subject to compliance with requirements, provide duct hardware of one of the following:

Ventfabrics, Inc.
Young Regulator Co.

SPLITTER DAMPERS:

General: Provide splitter dampers made of 16 ga. galvanized steel installed in branch ducts.

DUCT ACCESS DOORS:

Construction: Construct of same or greater gage as ductwork served, provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one side hinged, other side with one handle-type latch for doors 12" high and smaller, 2 handle-type latches for larger doors.

Latch equal to Ventlok-figure 140 and 260

Manufacturer: Subject to compliance with requirements, provide duct access doors of one of the following:

Air Balance Inc.
Register & Grille Mfg. Co., Inc.
Ruskin Mfg. Co.
Ventfabrics, Inc.
Zurn Industries, Inc., Air Systems Div.

FLEXIBLE CONNECTIONS:

General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for

thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.

Manufacturer: Subject to compliance with requirements, provide flexible connections of one of the following:

American/Elgen Co., Energy Div.
Duro Dyne Corp.
Flexaust (The) Co.
Ventfabrics, Inc.

PART 3 - EXECUTION

INSPECTION:

Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

INSTALLATION OF DUCTWORK ACCESSORIES:

Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.

Balancing dampers shall be installed in the duct system to arrive at intended air quantities. These dampers, whether shown on the drawings or not, shall be installed at no additional cost to the owner.

Install turning vanes in square or rectangular 90 deg. elbows in supply and exhaust air systems.

Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter.

Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

FIELD QUALITY CONTROL:

Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leakproof performance.

ADJUSTING AND CLEANING:

Adjusting: Adjust ductwork accessories for proper settings, install fusible links in fire dampers and adjust for proper action.

Label access doors.

Final positioning of manual dampers shall be based on the Testing, Adjusting and Balancing of the duct system.

Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

EXTRA STOCK:

Furnish extra fusible links to Owner, one link for every 10 installed of each temperature range; obtain receipt.

END OF SECTION

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SECTION 15932
AIR OUTLETS AND INLETS

PART 1 - GENERAL

DESCRIPTION OF WORK:

Extent of air outlets and inlets work is indicated by drawings and by requirements of this section.

Types of air outlets and inlets required for project include the following:

Ceiling air diffusers.
Registers and grilles.
Louvers.

PART 2 - PRODUCTS

CEILING AIR DIFFUSERS:

Ceiling Compatibility: Provide diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffuser.

Types: Provide ceiling diffusers of type, capacity, and with accessories as listed. The following requirements shall apply.

Diffuser Faces:

Square: Square housing, core of square concentric louvers, square or round duct connection.

Diffuser Mountings: Coordinate mounting type with architectural ceiling type prior to ordering:

Flush: Diffuser housing above ceiling surface with flush perimeter flange and gasket to seal against ceiling.

Lay-In: Diffuser housing sized to fit between ceiling exposed suspension tee bars and rest on top surface of tee bar.

Diffuser Patterns:

Adjustable: Manual adjustable core with concentric rings or louvers, fully adjustable for horizontal to vertical air flow.

Diffuser Acoustic Performance:

NC less than or equal to - 30

Diffuser Dampers:

Opposed Blade Dampers: Multiple opposed blade dampers connected to linkage adjustable from face of diffuser with key.

Diffuser Accessories:

Equalizing Deflectors: Adjustable parallel blades in frame for straightening air flow.

Plaster Ring: Perimeter ring designed to act as plaster stop and diffuser anchor.

Diffuser Finishes:

White Enamel: Semi-gloss white enamel prime finish.

Type:

Square:

Model: Titus, Model TMS with opposed blade damper and operating key.

Note: Provide aluminum diffusers with "Greenkote" finish in Glass Wash and Pot Wash.

Manufacturer: Subject to compliance with requirements, provide diffusers of one of the following:

Anemostat Products Div., Dynamics Corp. of America.
Krueger
Metal-Aire
Titus Products Div., Philips Industries, Inc.
Tuttle and Bailey.
Price

REGISTERS AND GRILLES:

Performance: Provide wall and ceiling registers and grilles that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.

Wall and Ceiling Compatibility: Provide registers and grilles with border styles that are compatible with adjacent wall and ceiling systems, and that are specifically manufactured to fit into wall construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of wall and ceiling construction which will contain each type of register and grille.

Types: Provide registers and grilles of type, capacity, and with accessories and finishes as listed.

Register and Grille Materials:

Steel Construction : Manufacturer's standard stamped sheet steel frame and adjustable blades.

Aluminum Construction: Manufacturer's standard extruded aluminum frame and adjustable blades.

Register and Grille Faces:

Horizontal Straight Blades: Horizontal blades, individually adjustable, at manufacturer's standard spacing.

Vertical Straight Blades: Vertical blades, individually adjustable, at manufacturer's standard spacing.

Horizontal 45 deg. Fixed Blades: Horizontal blades, fixed at 45 deg., at manufacturer's standard spacing.

Register and Grille Patterns:

Double Deflection: 2-sets of blades in face, rear set at 90 deg. to face set.

Register and Grille Dampers:

Opposed Blade: Adjustable opposed blade damper assembly, key operated from face of register.

Register and Grille Accessories:

Plaster Frame: Perimeter frame designed to act as plaster stop and register or grille anchor.

Operating Keys: Tools designed to fit through register or grille face and operate volume control device and/or pattern adjustment.

Register and Grille Acoustic Performance:

NC less than or equal to - 30

Register and Grille Finishes:

White Enamel: Semi-gloss white enamel prime finish.

Type:

Supply:

Model: Titus, model 300RL with opposed blade damper
(301RL is aluminum)

Return:

Model: Titus, model 350RL with opposed blade damper
(3/4" slot, 35 degree deflection, steel)

Note: Provide aluminum supply & return registers with "Greenkote" finish in Glass Wash and Pot Wash.

Manufacturer: Subject to compliance with requirements, provide registers and grilles of one of the following:

Anemostat Products Div., Dynamics Corp. of America.
Krueger
Price
Metal-Aire
Titus Products Div., Philips Industries, Inc.
Tuttle and Bailey.

LOUVERS:

Performance: Provide louvers that have minimum free area, and maximum pressure drop for each type as listed in manufacturer's current data, complying with louver schedule.

Substrate Compatibility: Provide louvers with frame and sill styles that are compatible with adjacent substrate, and that are specifically manufactured to fit into construction openings with accurate fit and adequate support, for weatherproof installation. Refer to general construction drawings and specifications for types of substrate which will contain each type of louver.

Materials: Construct of aluminum extrusions. Weld units or use stainless steel fasteners.

Louver Screens: On inside face of exterior louvers, provide 1/2" square mesh anodized aluminum wire bird screens mounted in removable extruded aluminum frames.

Color: Architect shall select factory painted color of louver from manufacturer's standard range of 20 colors.

Provide the following types of Finish for louvers:

Finish: Coating to be ACROFLUR, consisting of 50% PVDF (Kynar or Hylar) spray paint. System shall include a 20 year warranty.

Provide the following equivalent Model:

Model: Ruskin, Model ELF-375DX
Model: Airo-Lite, Brick Vent

Manufacturer: Subject to compliance with requirements, provide louvers of one of the following:

Airolite Co.
American Warming & Ventilating, Inc.
Arrow United Industries, Inc.
Carnes
Louvers & Dampers, Inc.
Penn Ventilator Co., Inc.
Ruskin Mfg. Co.
Dowco.

PART 3 - EXECUTION

INSPECTION:

Examine areas and conditions under which air outlets and inlets are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

INSTALLATION:

General: Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended functions.

Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.

Locate ceiling air diffusers, registers, and grilles, as indicated on general construction documents. Coordinate installation with Reflected Ceiling Plan and Electrical Lighting Plan. Locate diffusers in the center of ceiling modules.

SPARE PARTS:

Furnish to Owner, with receipt, 3 operating keys for each type of air outlet and inlet that require them.

END OF SECTION

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SECTION 15960

AUTOMATIC CONTROL SEQUENCES

PART 1 - GENERAL

DESCRIPTION OF WORK:

Control sequences are hereby defined as the manner and method by which automatic temperature controls function. Requirements for each type of operation are specified in this section.

Controls equipment and control panels to provide control sequences as outlined herein.

Coordinate control work with controls provided by Equipment Manufacturers.

SUBMITTALS

Shop drawings: Submit shop drawings for each system automatically controlled, containing the following information:

Schematic flow diagram of system showing fans, pumps, coils, dampers, valves, and control devices.

Label each control device with setting or adjustable range of control.

Indicate electric wiring; factory and field wiring.

Indicate each control panel required, with internal and external wiring clearly indicated. Provide detail of panel face, including controls, instruments, and labeling.

General Control Requirements:

This contractor shall be familiar with and responsible for wiring of all auxiliary equipment (control and power wiring), and controllers required under the mechanical division 15. Equipment and controllers shall include but not be limited by the following items.

All fresh air intakes and exhaust louvers shall have motor operated dampers. Dampers shall be low leak with blade and edge seals. Motor operated dampers shall be line voltage, provided, installed and wired by the mechanical contractor unless otherwise noted. Provide all necessary transformers, contactors, controls and wiring for interlocking equipment to motor operated dampers.

Split System ACU:

The unit shall operate on a 7-day/night schedule with three hour occupied and/or un-occupied override. Provide motorized outdoor air damper. During the day cycle, the unit shall operate with the outdoor air damper opened. The fan shall run 100 percent of the time and the heating/cooling coils shall cycle to maintain space temperature. The heating/cooling switch-over shall be automatic. During the night cycle, the outdoor air damper shall remain closed. The fan shall cycle in sequence with the heating/cooling coils to maintain night setback space temperature.

Provide Low Ambient Controls on condensing unit for operation down to -20 degrees F.

Rooftop Unit:

The unit shall operate on a 7-day/night schedule with three hour occupied and/or un-occupied override. Provide motorized outdoor air damper and return air dampers. Provide a room static pressure sensor that will modulate the outside air damper open and return air damper closed on a negative pressure reading in the space. During the day cycle, the unit shall operate with the outdoor air damper opened at minimum position and modulated as required to maintain equal pressure in the space. The fan shall run 100 percent of the time and the heating/cooling coils shall cycle to maintain space temperature. The heating/cooling switch-over shall be automatic.

During the night cycle, the outdoor air damper shall remain closed. The fan shall cycle in sequence with the heating/cooling coils to maintain night setback space temperature.

Provide drybulb economizer cycle. An outdoor air thermostat, mixed air thermostat and receiver controller shall modulate the outdoor air damper and return damper in sequence to maintain setpoint during economizer operation.

Toilet Exhaust Fans:

Exhaust fans shall be tied to timeclock with 3 hour manual override switch. Timeclock shall be provided and installed by electrical contractor. All wiring and interlocks shall be by mechanical contractor. When activated, exhaust fan motor damper shall open and fan shall start.

Fume Hood Exhaust Fans:

Provide connection to fume hood switch for control. Upon activation, exhaust fan motor damper shall open and fan shall start.

Unit Heaters:

Provide a remote mounted line voltage room thermostat to cycle the unit fan motor and coil in order to maintain the space temperature at its setpoint.

General Control Wiring:

Control Wiring: Install control wiring, without splices between terminal points, color-coded. Install in neat workmanlike manner, securely fastened. Install in accordance with ANSI/NFPA 70, "National Electrical Code".

Install circuits over 25-volt with color-coded No. 12 wire in electric metallic tubing.

Install circuits under 25-volt with color-coded No. 18 wire with 0.031" high temperature (105 degrees F (41 degrees C) plastic insulation on each conductor and plastic sheath over all. All wiring shall be plenum rated.

Install electronic circuits with color-coded No. 18 wire with 0.023" polyethylene insulation on each conductor with plastic-jacketed copper shield over all.

Install low voltage circuits, located in concrete slabs and masonry walls, or exposed in occupied areas or mechanical rooms, in electric conduit.

Final Adjustment of Equipment: After completion of installation, adjust thermostats, control valves, motors and similar equipment provided as work of this section.

Final adjustment shall be performed by specially trained personnel in direct employ of manufacturer of primary temperature control system.

Provide owner personnel with 8 hours of instruction of complete control sequences. Instructions shall be video taped and turned over to owner (2 copies) for future use.

END OF SECTION

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SECTION 16010

GENERAL ELECTRICAL REQUIREMENTS

RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplemental Conditions and Division-1 Specification sections, apply to work of all Division-16 sections.

SCOPE

The base bid shall include furnishing all materials, labor, tools, equipment and installation of all work required to install complete electrical systems as shown on the plans and outlined in all Division-16 sections.

Submittal of a bid indicates that the contractor has examined the drawings, specifications, and visited the site and has included all required allowances.

Contractor: shall be designated as the sub-contractor for that section of work unless specifically stated otherwise.

Work includes but is not limited to the following.

Relocation/rerouting of existing electrical work as required to accommodate new construction.

Providing all new electrical work as required to accommodate new construction.

The following work is not included under this contract.

Painting of any equipment, except as hereinafter mentioned in the specifications or shown on drawings.

Temperature Control Wiring, except as hereinafter mentioned in the specifications or shown on drawings.

Telephone and Data Wiring (see Section 16880).

ALLOWANCES

In addition to all work shown on the drawings, the electrical contractor shall include a \$5000. cost allowance in the base bid for miscellaneous moves, adds and/or changes to the electrical systems which may occur. This allowance or portions of this allowance shall not be used unless written permission is first obtained in the form of a change order from the Architect or Engineer. Any and all unused portions of this allowance shall be refunded by the respective contractor at the close of the contract.

SPECIAL CONDITIONS

Owner's representative or engineer shall be permitted to relocate any fixture, device or equipment outlet prior to installation within a 15 foot limit at no additional change in contract price.

The electrical contractor shall complete his work or any part thereof at such time as may be designated by the owner's representative, so that it can be used for temporary or permanent use. Such use of the system shall not be construed as an acceptance of same by Owner.

MATERIALS AND EQUIPMENT

Materials installed shall be new, full weight, of the best quality. All similar materials shall be of the same type and manufacturer. All materials, apparatus and equipment shall bear the Underwriter's Laboratory, Inc. label where regularly supplied.

Contractor is responsible for the safety and good condition of the materials and equipment installed until final acceptance by the Owner. Materials shall be stored to prevent damage or weathering prior to installation.

When several materials, products or items of equipment are specified by name for one use, the contractor may select any one of those specified and shall include with his bid an Equipment List listing the equipment selected.

Bidders may bid on other materials, products or equipment. All material manufacturers listed in the contract documents as an equal shall be equal in quality, performance, aesthetics, and product support to that specified. Other products, material, article, device, fixture or form of construction not mentioned as approved equal must be approved by the Engineer. Request for approval must be made in writing and approved by the Architect ten (10) days prior to bid opening date, and issued by addendum.

The responsibility for costs incurred from deviation from the base equipment shall be the equipment supplier and this contractor. Use of any equipment will be considered as a statement that clearances and arrangements have been checked and found satisfactory.

GENERAL STANDARDS

The applicable provisions of the following standards shall govern. All electrical equipment must contain UL label and be manufactured and assembled in the USA.

All work shall be installed in strict accordance with the latest edition of all applicable codes including (but not limited to) the following codes and standards.

- National Electrical Code, NFPA 70.
- Kentucky Basic Building Code.
- Life Safety Code, NFPA 101.
- Local Electrical Codes.
- Local utility company requirements.
- A.D.A. requirements.

EXPLANATION AND PRECEDENCE OF DRAWINGS

For the purposes of clearness and legibility, drawings are essentially diagrammatic and although size and locations of equipment are drawn to scale wherever possible, Subcontractor shall make use of all data in all of the contract drawings and shall verify this information at building site.

The drawings indicate required size and points of termination of conduit and suggest proper routes to conform to the structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets, and it shall be the work of this section to install conduit and

equipment in such manner as to conform to structure, avoid obstructions, preserve headroom and keep openings and passageways clear without further instructions or cost to the Owner.

The electrical contractor shall coordinate his work with all other trades and locate equipment accordingly. This contractor shall refer to coordination drawings of the other trades. Any mechanical and/or electrical work fabricated or installed before the above referenced coordination with all other trades will be done at the respective contractors' risk.

It is intended that all apparatus be located symmetrical with architectural elements and shall be installed at exact height and locations as shown on architectural drawings.

The Subcontractor shall fully inform himself regarding all peculiarities and limitations of space available for installation of all work and materials furnished and installed under the contract. He shall exercise due and particular caution to determine that all parts of his work are made quickly and easily accessible. Although the locations of the equipment and conduit may be shown on the drawings in certain positions, the Subcontractor shall be guided by the architectural details and conditions existing at the job site, correlating his work with that of others. Provide all offsets as required to provide a neat workmanlike arrangement.

Immediately upon award of contract and before any work is started, the Subcontractor shall confer with the Engineer or his representative concerning the work under these sections.

PERMITS AND REGULATIONS

All electrical materials used in this work and all workmanship tests performed therein, unless otherwise specified shall conform to the latest rules, regulations and specifications of the National Electrical Code, the National Board of Fire Underwriters, local and state codes having jurisdiction and utility company.

Any discrepancy between these drawings and specifications and the codes, laws, ordinances, rules and regulations shall be immediately brought to the attention of the engineer, prior to any installation.

This Subcontractor shall obtain and pay for all permits or certificates of inspection and approval required for this branch of the work.

Owner shall be furnished with certificates of final inspection and approval prior to final acceptance of this branch of the work.

ELECTRICAL SUPERINTENDENT

The Subcontractor shall furnish the service of an experienced superintendent who shall be constantly in charge of the work, together with the qualified journeymen wireman and specialists as required to properly install, connect, adjust, start, operate and test the work involved.

The superintendent's qualifications shall be subject to the review and acceptance by the owner's representative. Unless prior special permission is granted by the owner's representative, the same electrical superintendent shall be utilized throughout the duration of the project.

SUBMITTALS

All items of material and equipment shall be listed on an Equipment List prepared by the Subcontractor and shall be reviewed by the Engineer prior to the start of any work. Submittal shall be provided in a timely manner allowing for long lead items. No item of equipment will be permitted on the site until acceptance of that equipment has been given. Copies of drawings and manufacturer cuts and performance data will be required for approval. Submittals shall be organized in same order as listed in equipment list and include

reference to page and paragraph numbers of the specifications and shall be bound in sets; all sets identical. The Subcontractor is not authorized to purchase any material until the shop drawings are approved by the Engineer.

Submittals shall clearly indicate sufficient definition so that they can be properly reviewed for compliance with contract documents.

See Division 1 Section "Submittals".

PRODUCT DELIVERY, STORAGE AND HANDLING

Deliver equipment and materials according to factory shipping requirements. Pack components in factory-fabricated protective containers. Units shall be delivered in sections of such size as will pass through available openings.

Store equipment and materials in clean dry place and protect from weather and construction traffic. When stored inside, do not exceed structural capacity of the floor.

Handling and rigging of equipment and products shall be as recommended by the manufacturer. Components and equipment damaged during shipment or handling shall not be installed. Replace and return damaged components to the manufacturer.

QUALITY ASSURANCE

Contractor if requested shall demonstrate his ability to perform all work to be included under the contract. Assurance if requested, shall be in the form of a list of past projects of similar size and complexity and a list of six (6) references pertaining to those projects. Failure to demonstrate these quality assurances shall be taken as a statement of the contractors inability to perform.

Contractor shall have a minimum five (5) years experience in the installation of electrical systems similar to the systems specified.

The quantity or quality level shown or specified shall be the minimum provided or performed. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for the context of the requirements. Should there be a conflict between the plans and specifications, the greater quantity or better quality shall be furnished.

Install all equipment and materials in strict accordances with manufacturer's written instructions.

Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified by applicable UL Standards. Accomplish tightening by utilizing proper torquing tools, including torque screwdriver, beam-type torque wrench, and ratchet wrench with adjustable torque settings. Ensure that sealing grommets expand to form watertight seal.

Upon completion of installation of equipment and electrical circuitry, energize circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

Prior to energizing, check installed wires and cables with megohm meter to determine insulation resistance levels to assure requirements are fulfilled. Prior to energizing, test wires and cables for proper phase to

phase connections, for electrical continuity and for short-circuits. Ensure that direction of rotation of each motor fulfills requirement.

SPECIFICATIONS

Wherever the words "Contractor" or "This Contractor" "Subcontractor" or "E.C." appears in Division 16 specifications or on electrical drawings, it shall refer to the Electrical Contractor (or sub-contractor of the Electrical Contractor where applicable).

Wherever the word "Provide" appears on electrical drawings or in Division 16 specifications, it shall be interpreted to mean that the electrical contractor shall "Furnish and Install", including all necessary accessories to render respective system fully operational.

Specifications shall be interpreted in connection with the drawings hereinbefore described, and if anything is shown on drawings and not mentioned in the specifications, or vice versa, it is to be included in the work the same as though clearly set forth by both.

Furthermore, all materials or labor previously required to fully complete the work shall be included in the contractor's work even though each item necessarily involved be not specifically mentioned or shown. Such work and/or materials shall be of the same grade or quality as the parts actually specified and shown. Should there be a conflict between the plans and specifications, the greater quantity or better quality shall be furnished.

TEMPORARY ELECTRICAL SERVICE

Refer to Section 01500.

Electrical contractor shall furnish all temporary light (including lamps) and power complete with all wiring and similar equipment as required, for all work on the site and within the affected buildings during the construction period.

Where applicable, provide temporary security site lighting as required and/or as directed in field.

Make all necessary arrangements with local utility companies for temporary electrical service and pay all associated fees for inspections, connections, initiation, etc.

Feeders shall be properly fused and ground fault protected per N.E.C. and per all authorities having jurisdiction. Feeders and lamps shall be physically protected along their entire length. Temporary branch circuit wiring shall be installed per NEC in each area with receptacles on minimum ten foot centers to accommodate lamps and extension cords provided by the contractor in need of them.

The electrical contractor shall furnish and maintain all lamps required for the duration of the job. Sufficient sockets and circuit capacity shall be provided for all construction areas. A minimum of 10 foot candles of illumination shall be maintained in all spaces or as required by OSHA. Provide all necessary specialty temporary power and/or supplementary light for all trades requiring same.

At the conclusion of the project, all temporary electric service materials shall be removed by the electrical contractor and become the property of same.

Unless directed otherwise, the general contractor will pay for all current for all trades during construction.

The electrical contractor shall provide and maintain all power lines (including circuit protection, physical protection, grounding, etc.) to the temporary offices and sheds of all trades requiring same, extending from

the temporary electrical service. Electrical wiring, lighting, etc. within the trailers, sheds, etc. shall be provided by the individual contractor supplying such trailers, sheds, etc.

Route all temporary service lines on the site overhead as required so that the work does not interfere with existing site operations or new construction related work of any trade. Unless directed otherwise in field by owner's representative, all overhead lines shall be at least 18 feet (from the lowest point) above grade/pavement. Coordinate carefully in field prior to installation. All overhead lines shall be properly supported by messenger cable, shall be physically protected at risers and drops and shall be properly mounted to supporting structures with insulators and drip loops.

CLEANING EQUIPMENT AND PREMISES

Clean all parts of the apparatus and equipment. Exposed parts which are to be painted shall be cleaned of cement, plaster and other materials and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all corners and cracks scraped out.

Exposed metal work shall be brushed down with steel brushes to remove rust and other spots and left smooth and clean. Remove trapped elements during cleaning and flushing period, after which they shall be replaced and adjusted.

During the progress of the work, the contractor shall clean up after his men and leave the premises and all portions of the building in which he is working in a clean and safe condition. This cleaning shall occur on a daily basis.

PROJECT CLOSEOUT

General

Final payment of contract will not be made until receipt, review and acceptance, by the owner's representative, of all documentation defined hereafter.

Refer to Division 1 Section 01700 "Contract Closeout".

Where applicable, refer to applicable General Conditions and similar sections of the project manual for details on record drawing submittals. In addition to the requirements specified in Division 1 or other applicable project manual sections, include the following as a minimum.

Owner shall be furnished with certificates of final inspection and approval prior to final acceptance of this branch of the work.

The system shall ring entirely free from ground when tested out in the presence of the owner's representative.

At the conclusion of the project when the system is in full operation, a final balance of circuits shall be made by the electrical contractor, witnessed by the Engineer. The electrical contractor shall provide necessary man-power, metering, etc., to accomplish this task. Provide written documentation of same.

The owner's representative shall make arrangements for a meeting at such time as will be convenient to all parties concerned for the purpose of instructing the designated personnel on the correct operation and maintenance of each individual system furnished and/or installed by this contractor under this contract. These instructions shall be video-taped (VHS format) by the electrical contractor with one tape submitted for each O & M manual.

The electrical contractor shall be responsible for the proper instruction of each system to the satisfaction of the owner's representative.

Record Documents

In addition to the requirements specified in Division 1 or other applicable project manual sections, include the following for record documents.

Make arrangements for obtaining two complete sets of electrical prints which shall be used to provide record drawings which shall be separate, clean, prints reserved for the purpose of showing a complete picture of the work as actually installed (including routing of all conduit and cables).

These drawings shall also serve as work progress report sheets and the electrical contractor shall make any notations, neat and legible thereon daily as work proceeds. The drawings shall be available for inspection at all times and shall be kept at the job at a location designated by the owner's representative.

Maintain the clean, undamaged set of prints of Contract Drawings as well as a set of submittal drawings and coordination drawings where applicable. Mark the sets to show the actual installation where the installation varies from the Contract Documents as originally shown. Record drawings shall include locations of underground and concealed items if placed other than shown on the Contract Documents. Do not permanently conceal any construction until this required information is recorded. Mark which drawing is most capable of showing conditions fully and accurately. Where shop drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

Record documents shall show changes in: size, type, capacity, etc., of material device or piece of equipment, location of device or piece of equipment; location of outlet or source of building service systems; routing of piping, conduit, or other building services. These drawings shall also record location of concealed equipment, electrical service work, conduits and other piping/work by indication of measured dimensions to each line from readily identifiable and accessible walls or corners of building. Indicate all approved substitutions, contract modifications, and actual equipment and materials installed.

For electrical work installed below slabs, pavements, grade, etc., these drawings shall also record location of nearby concealed water piping, sewers, wastes, vents, ducts, conduit and other piping, etc. by indication of measured dimensions to each line from readily identifiable and accessible walls or corners of building and from adjacent electrical work. Show invert elevation of underground electrical work relative to work installed by other trades.

Upon substantial completion of the work, pay for and make arrangements for obtaining a complete set of erasable blackline reproducible drawings. All information from the print record drawings shall be neatly drafted onto the above referenced reproducibles. Neatly erase and redraft work on the reproducibles as required to reflect the work as actually installed. Perform drafting in a manner in which all work shall be shown in its actual locations, existing as well as new, by erasing inaccurate locations and redrawing proper routing/locations. This applies for all concealed work as well as work visible.

Affix near the titleblock on each drawing of the set of record drawing prints and the set of reproducibles the Contractors' Company Names, signature of Contractors' Representative and current date. Deliver one set of prints to the engineer. Deliver the second set of prints, the original reproducibles and the marked-up field prints to the architect.

All prints and reproducibles shall be signed and dated by the both the general contractor and the electrical contractor.

In addition to the above, provide "as-built" record documentation for shop drawings (and coordination drawings where applicable).

Maintenance Manuals

In addition to the requirements specified in Division 1 or other applicable project manual sections, include the following.

Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.

Manufacturer's printed operating procedures shall include start-up, break-in, normal operating instructions, regulation, control, stopping, shutdown, and emergency instructions.

Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

Provide a minimum of three neatly bound (3-ring binder) copies of maintenance and instruction (O & M) manuals, including a parts list pertaining to all equipment furnished and/or installed by the electrical contractor. Submit to owner's representative for review.

Manuals shall be bound in hard cover, post type binders.

Manuals shall contain the following as a minimum:

- 1) Index, typed at front w/typed tabs for each section;
- 2) Lists of all materials and equipment furnished with name, address and telephone number of vendor;
- 3) Itemized list of each piece of mechanical equipment having electrical connections with circuit and panelboard locations. Also list with each item any related expendable equipment required such as fuse size and type, pilot lights, Cat. no. of magnetic starter overload, etc.;
- 4) Operating Instruction Manuals and Service Manuals for all equipment furnished by the Electrical Contractor;
- 5) A complete set of final approved shop drawings as submitted during construction;
- 6) An itemized list of each fixture type with catalog number of replacement lamps and ballasts.
- 7) A complete spare parts schedule for all components of all equipment furnished and/or installed under this contract; the schedules shall not be factory generic information, but shall be complete and accurate for the equipment actually provided.
- 8) A complete set of detailed wiring diagram and schematic drawings for all components of all systems furnished and/or installed under this contract; the drawings shall not be factory generic information, but shall be complete and accurate for the equipment actually provided.

Guarantee

The contractor shall provide a guarantee in written form stating that all work, materials, equipment and parts shall be free of defect for a period of one year from the date of owner's final acceptance, and shall repair, revise or replace at no cost to the owner any such defects occurring within the guarantee period.

Contractor shall also state in written form that any items or occurrences arising during the guarantee period will be attended to in a timely manner and will in no case exceed four (4) working days from date of notification by owner.

Any defective items or work shall be removed and replaced at the contractor's expense and to the satisfaction of the owner's representative and the Engineer.

END OF SECTION

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SECTION 16020

BASIC ELECTRICAL MATERIALS AND METHODS

EXPLOSIVES

Use of explosives shall not be permitted.

WELDING

Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel." Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

HEIGHT OF BOXES

Outlet mounting heights as indicated on the plans are approximate to be used for bidding purposes only. The exact mounting height of outlets shall be determined in the field with relation to architectural detail and equipment being served. It shall be the responsibility of the electrical contractor to coordinate outlet location with equipment, with furniture plans and with architectural elevation plans. Where mounting heights are not detailed or dimensioned, contact the owner's representative for direction.

Prior to rough-in, coordinate final mounting heights of all system outlet boxes in field with Owner's representative. Height of boxes from finished floor to center of boxes shall be as follows, unless directed otherwise in field or otherwise noted on plans.

Switches	4'0"
Receptacles	
Counters	3'8" (verify)
Elsewhere	1'6"
Telephone Outlets	
Desk Phone	1'6"
Wall Phone	4'0"
Data Outlets	1'6"
Starters	4'0"
Disconnects	4'0"
Circuit Breaker Panelboards	6'0" to top of panel,
Wall Mounted Lighting Fixtures	As noted on plans or as directed in field by Architect.
Fire Alarm Manual Pull Stations	3'10"
Fire Alarm Audio/Visual Alarm Indicating Devices	6'8"
Control Stations	4'0"
Other Outlets/Fixtures/Equipment	As directed by Arch.

Height of boxes dimensioned from ceiling as given above apply to rooms having ceilings 9' or less. In rooms having higher ceilings, these outlets shall be located as directed in the field.

ACCESS DOORS

Access doors shall not be used unless special prior written permission is granted from the Owner's representative. All pull boxes, junction boxes, etc. shall be installed in areas which are readily accessible

after completion of construction. Pull boxes and junction boxes shall not be installed above gypsum board or similar ceiling systems.

For installation in masonry, concrete, ceramic tile, or wood paneling provide 1 inch-wide-exposed perimeter flange and adjustable metal masonry anchors. For gypsum wallboard or plaster provide perforated flanges with wallboard bead. For full-bed plaster applications provide galvanized expanded metal lath and exposed casing bead, welded to perimeter of frame.

Set frames accurately in position and securely attached to supports, with face panels plumb and level in relation to adjacent finish surfaces. Adjust hardware and panels after installation for proper operation. Locking Devices shall be flush, screwdriver-operated cam locks.

Provide factory-fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel, with welds ground smooth and flush with adjacent surfaces. Frames shall be 16-gage steel, with a 1-inch-wide exposed perimeter flange for units installed in unit masonry, pre-cast, or cast-in-place concrete, ceramic tile, or wood paneling. Standard Flush Panel Doors shall be 14-gage sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees; factory-applied prime paint. Fire-Rated Units shall be insulated flush panel doors, with continuous piano hinge and self-closing mechanism.

Subject to compliance with requirements, provide products by one of the following:

Bar-Co., Inc.
J.L. Industries.
Karp Associates, Inc.
Milcor Div. Inryco, Inc.
Nystrom, Inc.

ELECTRICAL INSTALLATIONS

All electrical work installed in finished areas shall be concealed. All electrical work installed in unfinished areas may be exposed at the discretion of the Owner's representative. Where exposed conduit and boxes are installed in areas which are already finished, such work shall be painted by the electrical contractor to match adjacent surfaces as directed in field.

Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work.

Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible.

Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and architectural/structural components.

Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations.

Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

Verify all dimensions by field measurements. Take measurements and be responsible for exact size and locations of all openings required for the installation of work. Figured dimensions are reasonably accurate and should govern in setting out work. Where detailed method of installation is not indicated or where variations exist between described work and approved practice, direction of the owner's representative on job shall be followed. Where applicable, remove and/or relocate any existing electrical work conflicting with new construction.

Branch subfeeder circuits shall be installed as shown on the plans. The symbols used to indicate the purpose of which the various outlets are intended are identified in the Legend. Where outlets are indicated by letters on plans, they shall be controlled by corresponding switches.

No wire size smaller than No. 12 shall be used for any branch circuit unless otherwise noted on plans for control circuits. Larger sizes shall be used where required and/or indicated on the plans. Minimum conduit size shall be 3/4".

Device or fixture outlets shall not be installed directly back to back, where located on opposite sides of common walls.

All wires shall be run continuous from outlet to outlet and all joints shall be properly spliced. Insulation value of joints shall be 100% in excess of that of the wire. Mechanical wire splicers may be used. Friction and rubber tape shall conform to Federal Specifications HH-T-11 and HH-T-111. Plastic electrical tape shall be Scotch #33 or approved equal. The conductors terminating at each wired outlet shall be left not less than 8" long at their outlet fittings to facilitate installment of devices or fixtures.

If during construction it becomes apparent that certain minor changes in layout will effect a neater job or better arrangement, such alterations shall be made a part of the contract. Engineer's review shall be obtained before making such changes.

Workmanship throughout shall conform to the standards of best practice. Marks, dents or finish scratches will not be permitted on any exposed materials, fixtures or fittings. Inside of panels and equipment boxes shall be left clean.

COORDINATION

Coordination shall commence immediately upon award of contract. Failure of this contractor in coordinating (including providing related information to other trades for review) in a timely manner, shall not result in any subsequent additional reimbursement, special allowances or additional construction time being made for any facet of the project. Any work fabricated or installed before properly coordinating with all other trades will be done at this contractor's risk.

Plans are diagrammatic indicating design intent and indicating required size, points of termination and, in some cases, suggested routes of raceways, etc. However, it is not intended that drawings indicate fully coordinated conduit routing, all necessary offsets, etc. All ductwork, piping, conduit, raceways, cable assemblies, etc. shall be run as straight as possible and symmetrical (perpendicular to or parallel with) with architectural items. Work installed diagonal to building members shall not be permitted.

The contract document drawings are an outline to indicate the approximate location and arrangement of ductwork, piping, equipment, outlets, raceways, cables, etc. The drawings shall be followed as closely as possible in coordination and in execution of the work.

The electrical contractor shall work in harmony with all building contractors and sub-contractors, so as not to cause any delays in pouring concrete, building masonry walls, etc. The location of risers and branch conduits are approximate, but owing to the lack of space in some instances, the all trades must work in harmony to insure space and satisfactory arrangement for all work to be installed under this contract. The

electrical contractor shall consult the Architectural, Plumbing, HVAC and Structural plans in all instances before installing his work so that his piping will not interfere with those branches.

This contractor shall participate in coordination efforts and in preparation of coordination drawings prior to fabrication or installation of any equipment, materials, etc. Coordinate actual clearances of all installed equipment. Exact location of electrical outlets, lighting fixtures, conduits, raceways, equipment, cable assemblies, applicable devices, etc. and of mechanical equipment, piping, ducts, fixtures, diffusers, grilles, louvers, dampers, etc., shall be coordinated well in advance by all affected contractors so there will be no interferences at installation between the various trades. Ensure that work of all trades, as well as working clearances, in electrical rooms or spaces complies with NEC Article 110.

Conflicts in equipment and materials shall be corrected prior to installation. Should there be a conflict with drawings of other trades, this contractor shall work with the trades to correct the conflict while coordinating the project (prior to installation). If the conflict cannot be resolved, refer the matter to the owner's representative for a final decision as to method or material. This contractor shall refer to drawings of all other trades for details, dimensions and locations of other work and route their work so as not to conflict with any other branch. Any work installed or equipment placed in position by this contractor creating a conflict shall be readjusted to the satisfaction of the owner's representative at the expense of this contractor.

IDENTIFICATION

General

Submit manufacturer's data on electrical identification materials and products. Submit detailed nameplate schedule indicating proposed nomenclature, colors, text heights, fastening methods, etc. If requested by Owner's representative, submit samples of each color, lettering style and other graphic representation required for each identification material or system.

Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.

Where identification is to be applied to surfaces which require finish, install identification after completion of painting.

Comply with governing regulations and requests of governing authorities for identification of electrical work.

Cable and Conductor Identification

Provide manufacturer's standard vinyl-cloth self-adhesive conductor markers of wrap-around type, either pre-numbered plastic coated type, or write-on type with clear plastic self-adhesive cover flap; numbered to show circuit identification. Provide on all conductors of all systems.

All conductors of all systems shall have color coded insulation. All cables of all systems shall have color coded jackets. Match color schemes with marking system used in existing systems (where applicable), shop drawings, contract documents, and similar previously established identification for project's electrical work. Apply cable/conductor identification on each cable in each box/enclosure/cabinet for cables which are not available with color coded insulation or jackets.

The following insulation color code shall be used for power system and voltage identification. This shall apply to both feeder and branch circuit wiring. Interchange of colors shall not be permitted. The use of Scotch color coding tapes for phase identification shall be permitted on feeder cables only (#4 AWG and larger).

- 208Y/120V System - Black, Red, Blue & White (neutral)
- Equipment Grounding - Green
- Electronic Ground - Green with Yellow tracer (neutral)

Raceway Identification

Provide manufacturer's standard self-adhesive vinyl tape not less than 3 mils thick by 1-1/2" wide. Unless otherwise indicated or required by governing regulations provide black lettering on orange base with minimum 1/2" high lettering. As a minimum, neatly install markers at each and every entry point to rooms, junction boxes, pull boxes, equipment connections, etc. Do not install these markers on exposed raceways in finished areas which will be occupied.

Where electrical conduit is exposed in spaces with exposed mechanical piping which is identified by color-coded method, apply painted color-coded identification on all electrical conduit, boxes, etc. in color schemes as indicated on the chart at the end of this section or as otherwise directed in field.

Emergency and Fire Alarm Systems

Provide permanent identification for all boxes, enclosures, etc. that are associated with emergency system work. All emergency and fire alarm system pull boxes, junction boxes, and other access/pull points shall be painted red (boxes and covers) by this contractor and shall be marked "EMERGENCY CIRCUITS" or "FIRE ALARM" as applicable. All emergency system equipment components, cabinets, enclosures, etc. shall be provided with red mechanically fastened engraved nameplates with the first line of text to read "EMERGENCY CIRCUITS" and the remaining lines to include the necessary descriptive text.

Underground Cable Identification

Provide manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide X 4 mils thick. Provide tape with printing which most accurately indicates type of service of buried cable. During back-filling/top-soiling of each exterior underground electrical, signal or communication cable, install continuous underground-type plastic line marker, located directly over buried line at 6" to 8" below finished grade. Where multiple small lines are buried in a common trench and do not exceed an overall width of 16", install a single line marker. Install line marker for every buried cable, regardless of whether direct-buried or protected in conduit.

All conductors/cables installed in manholes, grade mounted junction boxes and/or handholes shall be correctly identified and shall be tagged in each location with not less than two tags per cable, one near each duct through which the cable enters and leaves the hole. Tags shall be attached immediately after cable is installed. Tags shall be of non-corroding metal and shall be plainly marked (engraved).

Tags shall be circular in shape, 2 inches in diameter (minimum) and of not less than 0.020" thick copper or brass. Steel lettering dies, 1/4" minimum height of letters or figures, or the equivalent engraving process, may be used to mark the tags. The 14 copper wire tags shall be marked so as to contain an abbreviation of the name of the system/facility served by the cable. Verify all identification nomenclature in field prior to fabrication of tags. Attach all tags in strict accordance with manufacturer's recommendations.

The identification described below is shown for schematic purposes only. Where applicable, identify electrical primary loop at all manholes, JB's, building penetrations and at all switchgear. Electrical HV primary conduits shall be identified as to which switches (at either end of run) control same.

- "P" - Power
- "T" - Telephone
- "C" - Control
- "F" - Fire Alarm
- "S" - Signal
- "6" - 600V Class

"1"	-	Under 100V Class of System
"A,B,C,N"	-	Phase or Neutral

Operational Identifications and Warnings

Provide pre-manufactured operational and/or warning signage if indicated on drawings and where required by NEC and/or the local authority having jurisdiction.

Engraved Plastic-Laminate Signs

Install signs at locations for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with stainless steel fasteners, except use permanent adhesive where fasteners should not or cannot penetrate substrate.

All equipment & system identification nomenclature shown on drawings or listed herein is shown for general design and installation reference only. The actual nameplate, etc. nomenclature for this project shall be verified by electrical contractor in field prior to fabrication and where applicable, shall be an extension of existing nomenclature used on the site as determined in field by electrical contractor. Record documents shall be prepared accordingly. Unless determined otherwise in field, provide text matching terminology and numbering of the contract documents and shop drawings.

Unless directed otherwise, provide black face and white core plies (letter color) for normal power applications and red face and white core plies (letter color) for emergency power applications, punched for mechanical fastening except where adhesive mounting is mandatory because of substrate. Provide 1/2" minimum text height for all equipment identification and 1/4" minimum text height for all nameplates with narrative descriptions/instructions. Thickness shall be 1/16", for units up to 20 sq. in. or 8" length; 1/8" for larger units. As a minimum provide signs for each unit of the following categories of electrical work where such work exists on the project.

- Electrical access panel doors.
- Starters and disconnects.
- Panelboards, electrical cabinets and enclosures.
- Control panels for all systems.
- Other similar equipment designated by owner's representative or engineer in field.

CUTTING, PATCHING AND SEALING

General

The electrical contractor shall do all cutting as required for the admission of his work. Any damage done by this contractor to the building during the progress of his work shall be made good at his expense. Unless directed otherwise in field, all patching and painting shall be provided by the electrical contractor.

Perform cutting, fitting, and patching of electrical equipment and materials required to:

- Uncover Work to provide for installation of ill-timed Work.
- Remove and replace defective Work.
- Remove and replace Work not conforming to requirements of the Contract Documents.
- Remove samples of installed Work as specified for testing.
- Install equipment and materials in existing structures.

Upon written instructions from the owner's representative, uncover and restore work to provide for observation of concealed work by owner's representative or by inspection authority having jurisdiction.

During cutting and patching operations, protect adjacent installations (structure, finishes, furnishings, etc.). Where applicable, provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to system components and components of other trades.

Patch existing and/or new finished surfaces and building components using new materials matching existing materials and using experienced installers. Refer to Division 1 for definition of experienced "Installer" or determine qualifications as directed in field by owner's representative.

Patching through fire rated walls and enclosures shall not diminish the rating of that wall or enclosure. All materials used for patching shall be installed to meet or exceed the smoke and fire rating of the respective surface being patched.

Neatly cut and drill all openings in walls and floors required for the installation. Secure approval of Owner's Representative before cutting and drilling in existing facilities. Neatly patch all openings cut.

Cutting and patching shall be held to a minimum by arranging with other contractors for all sleeves and openings before construction is started.

Provide factory-assembled watertight wall and floor seals, of types and sizes required; suitable for sealing around conduit, pipe, or tubing passing through concrete floors and walls. Construct seals with steel sleeves, malleable iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps, and cap screws.

Pipe sleeves shall be fabricated from Schedule 40 rigid, heavy wall, full weight galvanized steel pipe; remove burrs. Use sleeves which are two standard sizes larger than conduit passing through respective sleeve.

Provide sleeve seals for piping which penetrates foundation walls below grade, exterior walls or roofs, caulk between sleeve and pipe with non-toxic, UL-classified caulking material to ensure watertight seal. Elsewhere modular provide mechanical type seals, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

Install standard Schedule 40 black steel pipe sleeves two sizes larger than pipes passing through floors, bearing walls, fire walls and masonry construction. Sleeves through walls shall be cut flush with both faces. Sleeves through floor shall extend one inch above floor top elevation. Pipes penetrating roof shall use a pipe curb assembly equal to Pate Co. Furnish and set all forms required in masonry walls or foundation to accommodate pipes.

Grout

Provide non-shrink, nonmetallic grout, premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout, recommended for interior and exterior applications.

General Joint Sealer Application

Joint sealers, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application.

Apply joint sealers under temperature and humidity conditions within the limits permitted by the joint sealer manufacturer. Do not apply joint sealers to wet substrates.

Clean all affected surfaces, joints, etc. immediately before applying joint sealers to comply with recommendations of joint sealer manufacturer.

Apply sealant primer to substrates as recommended by manufacturer. Protect adjacent areas from spillage and migration of sealant, using masking tape. Remove tape immediately after tooling without disturbing seal.

Comply with joint sealer manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.

Comply with recommendations of ASTM C 962 for use of elastomeric joint sealers.

Comply with recommendations of ASTM C 790 for use of acrylic-emulsion joint sealants.

Immediately after sealant application and prior to time shinning or curing begins, tool sealants to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

Colors for exposed seals shall be as selected by the Owner's representative from manufacturer's standard colors.

Elastomeric Joint Sealers

One-part, nonacid-curing, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for masonry, glass, aluminum, and other substrates recommended by the sealant manufacturer.

One-part, mildew-resistant, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for glass, aluminum, and nonporous joint substrates; formulated with fungicide; intended for sealing interior joints with nonporous substrates; and subject to in-service exposure to conditions of high humidity and temperature extremes.

Silicone Sealant shall be equal to the following:

"Dow Corning 790", Dow Corning Corp.
"Gesil N SCS 2600", General Electric Co.
"Dow Corning 786", Dow Corning Corp.

Acrylic-Emulsion Sealants

One-part, nonsag, mildew-resistant, paintable complying with ASTM C 834 recommended for exposed applications or interior and protected exterior locations involving joint movement of not more than plus or minimum 5 percent.

Subject to compliance with requirements, provide one of the following:

"Chem-Calk 600", Bostik Construction Products Div.
"AC-20", Pecora Corp.
"Sonolac", Sonneborn Building Products Div.
"Tremco Acrylic Latex 834", Tremco, Inc.

General Fire Stopping Material Application

Fire stopping requirements/locations are not indicated on electrical drawings. It shall be the responsibility of the electrical contractor to review all architectural and other drawings to determine fire/smoke rated walls and floors and rating requirements of same. Electrical contractor shall provide all required fire stopping work associated with all electrically related penetrations. Provide fire stop pillows, putty and/or sealant, as applicable, with minimum UL classification for 3 hour fire and cold side temperature ratings.

Clean all affected surfaces, joints, etc. immediately before applying fire stopping to comply with recommendations of manufacturer.

Comply with fire stop material manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.

Install fire stop materials, including forming, packing, and other accessory materials, to fill openings around electrical services penetrating floors and walls, to provide fire-stops with fire-resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

Caulk between sleeves and pipes with rockwool and caulk around sleeves with sealing compound. Material must meet all applicable fire ratings required.

Patch shall be equal to rockwool, firestop, caulk or approved "rated" patch.

Where a smoke and/or fire-resistance classification is indicated on architectural drawings or otherwise, provide the following as applicable.

Fire stop pillows, putty and/or sealant with minimum UL classification for 3 hour fire and cold side temperature ratings for all electrically related penetrations.

Access door assembly with panel door, frame, hinge, and latch from manufacturer listed in the UL "Building Materials Directory" for rating required; Provide UL Label on each fire-rated access door.

Wall & Floor Opening Fire Stopping for Work Likely to Require Ongoing Moves, Adds and Changes

Provide Fire Stop Putty equal to Nelson FSP #AA400 series, UL Classified for 3 hour fire and cold side temperature ratings, reusable when penetrating items are removed or added and requiring no special tools, mixing, curing or drying time.

Fire Stopping for All Other Wall and Floor Openings

Provide Fire Stop Sealant shall be equal to Nelson #AA491 series, UL Classified for 3 hour fire and cold side temperature ratings, non-sagging, permanently flexible, non-toxic, non-shrinking, water/air/smoke-tight and easily repenetrated.

The following shall be considered equal.

For Floor Openings:	Instant Firestop; 305-SL.
For Wall Openings:	Instant Firestop; 344-GG.
Mineral Felt:	Instant Firestop; Type MW.
For Insulated Pipes:	Instant Firestop; Type PI.
For Fill Areas:	Instant Firestop; C-1000.

Apply sealant primer to substrates as recommended by manufacturer (if any). Protect adjacent areas from spillage and migration of primers, using masking tape. Remove tape immediately after tooling without disturbing joint seal.

Immediately after sealant application and prior to time shinning or curing begins, tool sealants to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

END OF SECTION

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SECTION 16030

SPECIAL ELECTRICAL SYSTEMS REQUIREMENTS

GENERAL

The system equipment suppliers shall provide complete design and installation drawings. These drawings shall show layouts, conduit sizes, number and types of cables/conductors required to all components and detailed wiring connections required at each type of device. The final vendor designs shall be in full compliance with requirements of all authorities having jurisdiction. In addition to the one year warranty required under Division 16 for all work, provide the following under base bid.

One year service contract (beginning after Owner's final acceptance of the work).

Cost of renewing each contract for an additional one, two and three year period at the Owner's option.

Unit prices (including Owner's discount) in "today's dollars" for all system components which could be affected by system expansions and by ongoing maintenance.

Provide all required design, accessories, devices, supplemental wiring, cable, programming etc. as required to render all systems fully operable. Each system shall be programmed, checked and tested by a certified factory technician. After making all tests and corrections, the systems shall be demonstrated to the Owner's Representatives and the authorities having jurisdiction.

Custom Programming, Configuration & Identification

All custom programming described below shall be provided for all programmable systems and all systems with any room number identifications which are required for successful system operation. Wherever the term "programming" is used below, it shall be taken to mean "programming, configuration and identification".

Custom programming shall be provided in full. Room names and numbers may change from architectural drawing names and numbers to actual Owner's room names and numbers. Provide all interim and permanent programming and configuration work under base bid.

All programming related services (including all required machine language, English language, etc.) associated with rendering all work fully operational shall be provided and neatly documented in detail by the respective vendors. Archive all intermediate and final programming work as required. Provide, replace and/or re-burn EPROM's and other integrated circuits as required.

All programming shall be custom and detailed to a level satisfactory to the Owner, including revised room numbers, revised room names, etc. Provide neatly typed orderly and logical submittal of proposed programming for review; prior to entering data, revise this submittal as much as required to satisfy the Owner. Determine specific requirements in field.

Provide programming for all auxiliary control and interface functions. Provide custom programming for all address labels. Provide detailed English language print statements for each system point/address and for each respective auxiliary control sequence. These print statements shall include as many characters, sentences, lines or paragraphs as required to provide extremely detailed descriptions of system status including any alarm or trouble condition and status of related auxiliary controls. The level of detail shall be

at the discretion of the Owner. Remote annunciators shall also include clear specific English language descriptions.

SOFTWARE UPGRADES

Latest release of system software shall be provided (furnished, installed and adapted) at no additional cost to base bid under the following conditions.

Year 2000 upgrades.

Upgrades at final close-out of project, where system software originally installed has been upgraded.

END OF SECTION

SECTION 16050
ELECTRICAL SITE WORK

SITE INFORMATION

Subsurface conditions may have been investigated during the design of the project. If so, reports of these investigations are available for information only; data in the reports are not intended as representations or warranties of accuracy or continuity of conditions. The Owner will not be responsible for interpretations or conclusions drawn from this information.

EXISTING UTILITIES

Locate existing underground utilities in excavation areas. Unless utilities are specifically indicated to be removed, support and protect services during excavation operations.

Remove existing underground utilities indicated to be removed.

Uncharted or Incorrectly Charted Utilities: Contact utility owner immediately for instructions.

Provide temporary utility services to affected areas. Provide minimum of 48-hour notice to Owner's representative prior to utility interruption.

EXCAVATING AND BACKFILLING

Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by excavation operations.

Comply with all codes in jurisdiction. Provide slope sides, shore and brace as required for stability. Refer to Division 2, "Earthwork" for further requirements.

The contractor shall perform all excavation and backfilling required for his work and shall consult with utilities prior to beginning excavation.

Remove materials of every nature and description encountered in obtaining indicated lines and grades as shown on drawings. No extras will be allowed due to variations of proportion and the variation of materials.

All piping shall be laid on a bed of sand, 6" deep, well tamped into place and properly graded to permit the pipe to have an even bearing throughout its entire length.

Excess excavated earth materials shall be removed from the site.

All backfilling of excavation under concrete slabs, concrete drives and walks or blacktop surfaces shall be bankrun gravel. All excavations shall be compacted to prevent settling.

Roadways, walks and slabs	100%
Yard areas	95%

Compaction shall be performed in 12" lifts and spread evenly.

The contractor shall pay for all expenses for the proper restoration of all streets, sidewalks, concrete and blacktop surfaces broken for installing piping.

Excavation Definitions

Additional Excavation: Where excavation has reached required subgrade elevations, if unsuitable bearing materials are encountered, continue excavation until suitable bearing materials are reached. The Contract Sum may be adjusted by an appropriate Contract Modification.

Subbase: Subbase, as used in this Section, refers to the compacted soil layer used in pavement systems between the subgrade and the pavement base course material.

Subgrade: Subgrade, as used in this Section, refers to the compacted soil immediately below the slab or pavement system.

Unauthorized Excavation: Unauthorized Excavation, as used in this Section, consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction from the Owner's representative.

Shoring and Bracing

Establish requirements for trench shoring and bracing to comply with local codes and authorities. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Slope sides of excavations to comply with local codes and ordinances. Shore and brace as required for stability of excavation.

Remove shoring and bracing when no longer required. Where sheeting is allowed to remain, cut top of sheeting at an elevation of 30 inches below finished grade elevation.

Install sediment and erosion control measures in accordance with local codes and ordinances.

Dewatering

Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

Do not allow water to accumulate in excavations. Remove water to prevent softening of bearing materials. Provide and maintain dewatering system components necessary to convey water away from excavations.

Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey surface water to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

Material Storage

Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.

Locate and retain soil materials away from edge of excavations. Do not store within drip-line of trees indicated to remain.

Remove and legally dispose of excess excavated materials and materials not acceptable for use as backfill or fill.

Trenching

Excavate trenches to the uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches clearance on both sides of raceways and equipment.

Excavate trenches to depth indicated or required.

Limit the length of open trench to that in which installations can be made and the trench backfilled within the same day.

Where rock is encountered, carry excavation below required elevation and backfill with a layer of crushed stone or gravel prior to installation of raceways and equipment. Provide a minimum of 6 inches of stone or gravel cushion between rock bearing surface and electrical installations.

Cold Weather Protection

Protect excavation bottoms against freezing when atmospheric temperature is less than 35 deg F (1 deg 2 C).

Backfilling and Filling

Place soil materials in layers to required subgrade elevations for each area classification listed below, using materials specified in Part 2 of this Section.

Under walks and pavements, use a combination of subbase materials and excavated or borrowed materials.

Under building slabs, use drainage fill materials.

Under piping and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation.

Other areas, use excavated or borrowed materials.

Backfill excavations as promptly as work permits, but not until completion of the following:

Inspection, testing, approval, and locations of underground utilities have been recorded.

Removal of concrete formwork.

Removal of shoring and bracing, and backfilling of voids.

Removal of trash and debris.

Placement and Compaction

Place backfill and fill materials in layers of not more than 8 inches in loose depth for material compacted by heavy equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of raceways and equipment by carrying material uniformly around them to approximately same elevation in each lift.

Compaction

Control soil compaction during construction, providing minimum percentage of density specified for each area classification indicated below.

Percentage of Maximum Density Requirements

Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture-density relationship (cohesive soils), determined in accordance with ASTM D 1557 and not less than the following percentages of relative density, determined in accordance with ASTM D 2049, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).

Areas Under Structures, Building Slabs and Steps, Pavements

Compact top 12 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for non-cohesive material.

Areas Under Walkways

Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.

Other Areas

Compact top 6 inches of subgrade and each layer of backfill or fill material to 85 percent maximum density for cohesive soils, and 90 percent relative density for cohesionless soils.

Moisture Control

Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve required moisture content and to prevent water appearing on surface during, or subsequent to, compaction operations.

Subsidence

Where subsidence occurs at electrical installation excavations during the period 12 months after Substantial Completion, remove surface treatment (i.e., pavement, lawn, or other finish), add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent areas.

Subbase Material

Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, or natural or crushed sand.

Drainage Fill

Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2-inch sieve, and not more than 5 percent passing a No. 4 sieve.

Backfill and Fill Materials

Materials complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP; free of clay, rock, or gravel larger than 2 inches in any dimension; debris; waste; frozen materials; and vegetable and other deleterious matter.

END OF SECTION

SECTION 16110

RACEWAYS

PART 1 - GENERAL

DESCRIPTION OF WORK

Types of raceways specified in this section include the following:

Electrical metallic tubing (EMT).
Rigid steel conduit.
Flexible metal conduit.
Liquid-tight flexible metal conduit.
Wireways.
Connectors.
Expansion Fittings.
Rigid nonmetallic conduit and ducts.

SPECIAL REQUIREMENTS

In addition to other contract document requirements, the following special requirements shall be strictly enforced.

All wiring of all systems shall be installed in conduit (sized per NEC, minimum 3/4"). The only permitted exceptions shall be where specifically permitted otherwise under Section 16120 and Section 16880.

All wiring for different power voltages shall be installed in raceway systems separate from each other (i.e. 24V separate from 208Y/120V, etc.).

All wiring for the various electrical systems shall be installed in raceway systems separate from each other (i.e. fire alarm separate from telephone/data separate from etc.).

Conduits shall not be installed within slabs.

Unless special case by case permission is granted in the field, no conduit shall be installed beneath slabs on grade, except where specifically indicated otherwise on drawings and where installed a minimum of 24" below the bottom of the slab.

All conduit installed indoors above the slabs shall be steel as specified hereafter; all fittings for same shall be steel, as specified hereafter, with insulated throats.

Conduit runs exceeding 100 feet in length or having in excess of three 90 degree turns shall be provided with pull boxes.

Conduit fill shall not exceed 40 percent or per NEC, whichever is less.

Refer to Section 16020 for raceway related identification requirements.

Normal system power feeders and branch circuits shall be installed in separate raceways from emergency system (battery-pack output) power.

PART 2 - PRODUCTS

Electrical Metallic Tubing (EMT)

EMT shall be FS WW-C-563, ANSI C80.3 and UL 797, galvanized or zinc coated steel.

Use galvanized or zinc coated steel compression or set-screw fittings, concrete-tight as manufactured by Steel City, T & B, Regal or Efcor.

Except where indicated otherwise herein, under other Division 16 sections or on drawings, all conduit shall be EMT.

Rigid Steel Conduit

Provide rigid steel, heavy wall, full weight, zinc-coated, threaded type (galvanized after cutting/threading) conforming to ANSI C80.1 and UL 6. Provide zinc coating fused to inside and outside walls.

Use galvanized or zinc coated steel threaded fittings.

Provide for the following applications.

Indoor conduit installed embedded in concrete or masonry.

All conduits which turn up from below grade or below slab (including the 90 degree fittings which connect to conduits 24" below grade/slab).

Other applications as indicated in contract documents or as otherwise required for special physical protection (nearby vehicular/equipment traffic, site maintenance equipment, etc.).

FLEXIBLE METAL CONDUIT

Flexible metal conduit shall be FS WW-C-566 and UL 1. Formed from continuous length of spirally wound, interlocked zinc-coated or galvanized (inside & outside) strip steel.

Provide conduit fittings for use with flexible steel conduit of threadless hinged clamp type and insulated throats.

Straight Terminal Connectors shall be one piece body, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut.

45 deg. or 90 deg. Terminal Angle Connectors shall not be used for flexible or water-tight flexible metal conduit in locations which will not be fully accessible after completion of construction.

Where applicable provide flexible metal conduit for the following applications:

- 1) Conduits within movable partitions.
- 2) Final 72" from outlet/junction boxes to recessed lighting fixtures which are located in accessible ceiling systems; optionally, AC/MC cable may be used for "fixture whips" (refer to Section 16120).
- 3) Final 24" of connection to motors or control items subject to movement or vibration.
- 4) In cells of precast concrete panels.

Provide full size insulated green ground wire for all applications, regardless of length.

Liquid-Tight Flexible Metal Conduit

Provide liquid-tight flexible metal conduit; construct of single strip, flexible, continuous, interlocked, and double-wrapped steel; galvanized inside and outside; provide smooth-wall liquid-tight jacket of flexible polyvinyl chloride (PVC).

Liquid-Tight Flexible Metal Conduit Fittings shall be FS W-F-406, Type 1, Class 3, Style G. Provide cadmium plated, malleable iron fittings with compression type steel ferrule and neoprene gasket sealing rings, with insulated, or noninsulated throat.

Straight Terminal Connectors shall be one piece body, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut.

45 deg. or 90 deg. Terminal Angle Connectors shall be two-piece body construction with removable upper section, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut. 45 deg. or 90 deg. Terminal Angle Connectors shall not be used for flexible or water-tight flexible metal conduit in locations which will not be fully accessible after completion of construction.

Where applicable provide flexible metal conduit for the following applications:

- 1) Provide for connections from wall outlet boxes/raceways to all furniture systems.
- 2) Provide for same applications as listed above for flexible metal conduit where subject to moisture or corrosive conditions.

Provide full size insulated green ground wire for all applications, regardless of length.

WIREWAYS

Provide electrical wireways of types, grades, sizes, and number of channels for each type of service as indicated. Provide complete assembly of raceway including, but not limited to, couplings, offsets, elbows, expansion joints, adapters, hold down straps, end caps, and other components and accessories as required for complete system.

Construct lay-in wireways with hinged covers, in accordance with UL 870 and with components UL-listed, including lengths, connectors, and fittings. Select units to allow fastening hinged cover closed without use of parts other than standard lengths, fittings and connectors. Construct units to be capable of sealing cover in closed position with sealing wire. Provide wireways with knockouts.

Provide wireway connectors suitable for "lay-in" conductors, with connector covers permanently attached that removal is not necessary to utilize the lay-in feature.

Protect sheet metal parts with rust inhibiting coating and baked enamel finish. Plate finish hardware to prevent corrosion. Protect screws installed toward inside of wireway with spring nuts to prevent wire insulation damage.

CONNECTORS

All steel connectors of all sizes shall have insulated throats. Where insulated throats are not available for a particular size, provide threaded bushings.

EXPANSION FITTINGS

Provide expansion fittings and appropriate couplings in raceways wherever structural expansion joints are crossed, wherever deflection is expected and as otherwise required. All expansion fittings shall be provided with ground bonding jumpers.

Provide OZ Type AX expansion fittings. Where deflection is expected, provide Crouse-Hinds XC couplings.

RIGID NONMETALLIC CONDUIT AND DUCTS

Electrical Plastic Conduit

Electrical plastic conduit shall be equal to Carlon Plus 40, Heavy Wall EPC Type EB-35.

Electrical plastic conduit shall be heavy wall, Schedule 40, 90 C, construct of polyvinyl chloride and conforming to NEMA TC-2, UL listed and labelled for direct burial, concrete encasement or above ground use, and in conformity with NEC Article 347.

Conduit Accessories

Provide conduit/duct accessories of types, sizes, and materials, complying with manufacturer's published product information, which mate and match conduit and tubing.

Duct Spacers ("chairs") shall be equal to Carlon #S288*L series for base spacers and #S289*L series for intermediate spacers (minimum of 3" spacing from outside wall of conduit to any other conduit and to outside of concrete encasement).

Horizontal elbows for service entrance conduits shall be maximum 45 degree, minimum 24" radius; provide larger minimum radius if directed in field. Provide multiple units as required to obtain required offset (i.e. provide two 45 degree elbows to obtain a 90 degree offset).

All other elbows shall be maximum 90 degree, minimum 24" radius; provide larger minimum radius if directed in field.

Provide all other couplers, adapters, "O" rings, sealing, etc. as required.

Unless noted otherwise in contract documents, provide for all horizontal conduit runs below grade and for other applications as indicated in contract documents.

Installation

Install at minimum of 24" below grade to top of conduit.

Such applications shall be securely mounted on chairs and shall be encased in concrete where located below areas subject to vehicular traffic, with base of bank in newly disturbed earth, as indicated in contract documents or as otherwise required. All extensions (including final 90 fittings) from 24" below grade to above grade shall be made using matching rigid steel conduit sweep elbow below grade and grounded rigid steel conduit extension.

Underground plastic ducts shall be electrical schedule 40 PVC. Encasement shall not be less than 4" thick on all sides and separation shall not be less than 4". Necessary excavation framework and concrete work for the underground work shall be done by the Electrical Contractor. Ducts shall be properly aligned on

chairs before concrete is poured. Provide not less than four properly located no. 4 reinforcing rods in all encased runs. Materials shall be Orangeburg, McGraw-Edison or Kyova.

Install miscellaneous fittings that have been specifically designed and manufactured for their particular application. Provide heavy nylon pull cord (200# minimum strength) in all empty conduits.

Make changes in direction of raceway run with proper fittings, supplied by raceway manufacturer. No field bends of raceway sections will be permitted unless required radius exceeds that available from manufacturer where field bends shall be made using factory kit per factory instructions.

Properly support and anchor raceways for their entire length with factory base and intermediate spacers. Provide spacers at each coupling location, each termination location and at maximum five foot intervals between. Raceways shall not span any space unsupported.

Install end bells to provide rounded pulling surfaces at all manholes, pull boxes and other end points of underground raceways. Seal all joints with Carlon Cement.

Make solvent cemented joints in accordance with recommendations of manufacturer. Install PVC conduits in accordance with NEC and in compliance with local utility practices.

Provide full parity size green insulated ground wire in all PVC runs except for those used exclusively for optical fiber cables.

Conduit Bodies

Provide galvanized cast-metal (steel) conduit bodies of types, shapes and sizes as required to fulfill job requirements and NEC requirements. Construct conduit bodies with threaded-conduit-entrance ends, removable covers, either cast or of galvanized steel, and corrosion-resistant screws.

PART 3 - EXECUTION

General

Provide conduit, tubing and fittings of types, grades, sizes and weights (wall thicknesses) for each service indicated. Where types and grades are not indicated, provide proper selection determined by Installer to fulfill wiring requirements, and comply with applicable portions of NEC for raceways.

Install concealed conduits in new construction work, either in walls, slabs, or above hung ceilings. Run conduits concealed in existing work where practicable. Where conduits can not be concealed in finished areas, use surface metal raceways.

Mechanically fasten together metal conduits, enclosures, and raceways for conductors to form continuous electrical conductor. Connect to electrical boxes, fittings and cabinets to provide electrical continuity and firm mechanical assembly. Conduit shall be continuous between outlets to make a complete installation and to effect a continuous ground.

Use of dissimilar metals shall be avoided throughout the systems to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat surfaces with corrosion inhibiting compound before assembling.

Install miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings, and plugs that have been specifically designed and manufactured for their particular application.

Use rough-in dimensions of electrically operated equipment furnished by equipment supplier. Set conduit and boxes for connection to equipment only after reviewing dimensions and after coordinating with other trades.

Provide heavy nylon pull cord in all empty conduits.

Properly support and anchor raceways for their entire length by structural materials. Raceways are not to span any space unsupported. See Section 16150.

Use boxes as supplied by raceway manufacturer wherever junction, pull or devices boxes are required. Standard electrical "handy" boxes, etc. shall not be permitted for use with surface raceway installations.

Level and square raceway runs, and install at proper elevations and heights.

Wherever possible, install horizontal raceway runs above water and steam piping.

Cut conduits straight, properly ream, and cut threads for heavy wall conduit deep and clean.

Field-bend conduit with benders designed for purpose so as not to distort nor vary internal diameter.

Fasten conduit terminations in sheet metal enclosures by 2 locknuts, and terminate with bushing. Install locknuts inside and outside enclosure.

Conduits shall not cross shafts, or ventilating duct openings.

Keep conduits a minimum distance of 12" from parallel runs of flues, hot water pipes or other sources of heat.

Support riser conduit at each floor level with clamp hangers.

Use of running threads at conduit joints and terminations is prohibited. Where required, use 3-piece union or split coupling.

Complete installation of electrical raceways before starting installation of cables/wires within raceways.

Conduit shall be cleaned inside before any wires are pulled. Conduit ends shall be capped and plugged with standard accessories as soon as conduit has been permanently installed. Conduit installed without conductors shall be provided with heavy nylon drag line for pulling.

All joints shall be made tight with water tight couplings matching conduit and all corners shall be made with long radius, except conduit sizes 1" and over where standard elbows may be used. The ends of all conduit shall be cut square and reamed and all joints brought to a shoulder.

Suitable supports and fasteners shall be provided for conduit.

Exposed conduit shall run parallel to walls and plumb on walls. Secure to walls or ceiling with pipe straps at intervals not exceeding six feet.

Conduit shall be supported by approved straps, fasteners and hangers. Hangers shall be suspended from rods. Perforated strap will not be acceptable. Fasteners shall be lead expansion shields in block or concrete, toggle bolts in hollow walls, machine screws on metal surface and wood screws on wood construction.

Conduit passing thru structural members shall be provided with sleeve in member.

Where moisture conditions are encountered, a hole shall be drilled at the lowest point in the conduit run so that drainage will not interfere with conditions below.

Conduit capped at wall for future additions shall extend not more than threads length past wall. Electrical metallic tubing shall extend not more than 3/4" past wall.

Concealed Conduits Below Slab or Grade

Necessary excavation framework and concrete work for the underground work shall be performed by the Electrical Contractor. Concrete used in construction of duct bank envelopes, junction box envelopes and hand hole envelopes shall conform to the structural concrete used in the building (3000 psi minimum). Junction boxes and hand holes shall be constructed in a manner similar to manholes and shall be of the dimensions shown on drawings or as determined in field.

Metallic raceways installed underground or in floors below grade, or outside shall have conduit threads painted with corrosion inhibiting compound before couplings are assembled. Draw up coupling and conduit sufficiently tight to ensure water tightness. Where metallic conduits are used below grade, use rigid steel.

Underground conduit shall be a minimum of 24" below finished grade to top of conduit.

Provide minimum 4" separation and 4" envelope encasement of concrete (reinforced with minimum of four #4 re-bars) where indicated on drawings.

Where conduits are run in cinders or cinder concrete, they shall be protected by a casing of concrete to a thickness of not less than 4" (reinforced).

Underground conduit capped at wall for future additions shall extend 5' beyond building.

Excavation for exterior conduits shall be arranged so that

- a) The lines are straight and true;
- b) Grades required for drainage are maintained;
- c) The top of the concrete envelope for raceways is not less than 24" below finished grade.

Conduits in Concrete Slabs

Conduits shall not be installed within concrete slabs.

Exposed Conduits

Install exposed conduits and extensions from concealed conduit systems neatly, parallel with, or at right angles to walls of building.

Install exposed conduit work as not to interfere with ceiling inserts, lights or ventilation ducts or outlets.

Run conduits for outlets on waterproof walls exposed. Set anchors for supporting conduit on waterproof wall in waterproof cement.

Above requirements for exposed conduits also apply to conduits installed in space above hung ceilings, and in crawl spaces.

Conduit Fittings

Install locknuts for securing conduit to metal enclosure with sharp edge for digging into metal, and ridged outside circumference for proper fastening.

Bushings of standard or insulated type shall have screw type grounding terminal.

Miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings, and plugs shall be specifically designed for their particular application.

END OF SECTION

SECTION 16120
WIRES AND CABLES

PART 1 - GENERAL

SUMMARY

This Section includes wires, cables, and connectors for power, lighting, signal, control and related systems rated 600 volts and less.

Refer to Section 16110 for special raceway related requirements.

PART 2 - PRODUCTS

MANUFACTURERS

Subject to compliance with requirements, provide products by one of the following:

Wire and Cable:

American Insulated Wire Corp.
Brintec Corp.
Cablec.
Carol Cable Co. Inc.
General Cable.
Senator Wire and Cable Co.
Southwire Company.

Connectors for Wires and Cable Conductors:

AMP
3M Company
O-Z/Gedney Co.
Square D Company.

General

Provide wire and cable suitable for the temperature, conditions and location where installed.

Conductors

Provide stranded conductors for all sizes unless indicated otherwise.

Conductor material shall be copper for all wires and cables.

Conductor sizes indicated are based on copper. Minimum conductor size shall be #12 AWG.

Distances from panel to first outlet of a 15 or 20 ampere branch circuit shall require the following minimum wire size to the first outlet.

Distance	AWG Wire Sizes
Up to 100 feet	#12
100 to 200 feet	#10
More than 200 feet	# 8

All branch circuits more than 200 feet in length shall be minimum No. 10 to the last outlet. Control circuits shall be No. 14 except for runs exceeding 300 feet where they shall be No. 12.

Install all wire in raceway.

All conductor insulation shall be rated at 600VAC/90 deg. C.

Provide THHN/THWN insulation for all conductors size 500 kcmil (MCM) and larger, and No. 8 AWG and smaller. For all other sizes provide THW or THHN/THWN insulation as appropriate for the locations where installed.

Provide XHHW insulation for isolated power systems, for all wiring below grade and/or for all wiring subject to moisture conditions.

Color Coding for phase identification shall be in accordance with Division 16 Section 16020.

TYPE AC/MC CABLES

Type AC and MC Cables shall be 90 deg. C. rated with all components and fittings listed for grounding and compliant with the following.

- a) NEC Articles 250 (including 250-91(b), 333 and 517 (including 517-13).
- b) UL Std.4 and UL Std. 83.
- c) ANSI E119 and E814.

Cable shall be formed from continuous length of spirally wound, interlocked zinc-coated or galvanized (inside & outside) strip steel. All conductors shall be rated for 90 deg. C. minimum. Provide with full parity sized green insulated equipment ground conductor.

Provide compatible steel fittings with integral red plastic insulated throat bushings, compliant with NEC 350-5.

Type AC and MC cable may be utilized only where NEC approved, where approved by local authority having jurisdiction and where prior approval is given by engineer. Utilize Type AC or MC cable only for the following limited applications.

Final connection to lighting fixtures which are installed in accessible tile ceiling systems (limited to 6' maximum in length).

New 15 or 20 ampere branch circuit drops to outlets in existing hollow partitions for remodeling work. This shall apply only under the following circumstances.

- a) Limited to 10' maximum cable length.
- b) And, only where Owner or Architect specifically directs contractor not to slot walls.
- c) And, only where installed for normal utility circuits (not emergency circuits).

Portable Cord

Portable Cord shall be Type S. Provide with full parity sized insulated equipment ground conductor.

Type S Portable Cord may be used for flexible pendant leads to outlets and equipment where indicated and only where NEC approved, where approved by local authority having jurisdiction and where prior approval is given by engineer.

CONNECTORS FOR CONDUCTORS

Provide UL-listed factory-fabricated, solderless metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated. Use connectors with temperature ratings equal to or greater than those of the wires upon which used.

CABLE JACKETS

Provide color coded factory-applied heat and moisture resistant PVC compound with external heat and light stabilized nylon jacket, tightly applied.

Provide conduit or plenum-rated cables for all cables passing through any air plenum ceiling cavities, etc.

SYSTEMS CABLES

Refer to respective Division 16 Section and/or to drawings. Whether or not specified on electrical documents, all necessary systems cables shall be provided under base bid as required to render all systems fully operable. Determine specific system cable requirements from respective vendor/supplier prior to bidding.

PART 3 - EXECUTION

GENERAL INSTALLATION

Wires #6 AWG and larger shall be connected to panels and apparatus by means of approved lugs or connectors large enough to enclose all strands of the conductors. Connectors shall be of the solderless type.

Solderless connectors shall be O.Z. Type XW or XTP of proper size and type required with Bakelite covers and stainless steel spring clips.

Solderless lugs shall be O.Z. Type XL of proper size as required.

Raceways shall be complete before wires are installed. No wire shall be pulled until plastering is complete and raceways are free of moisture.

Joints or splices shall be permitted only at NEC approved panels, junction boxes or accessible outlet boxes.

Pull conductors simultaneously where more than one is being installed in same raceway. Use UL listed pulling compound or lubricant, where necessary.

Use pulling means including, fish tape, cable, rope, and basket weave wire/cable grips which will not damage cables or raceways. Do not use rope hitches for pulling attachment to wire or cable.

Conceal all cable in finished spaces.

Install exposed cable parallel and perpendicular to surfaces or exposed structural members, and follow surface contours, where possible.

Keep conductor splices to minimum.

Install splice and tap connectors which possess equivalent or better mechanical strength and insulation rating than conductors being spliced. Use splice and tap connectors which are compatible with conductor material.

All wires shall be run continuous from outlet to outlet/fixture to fixture. Insulation value of joints to be 100% in excess of wire.

If wire splicing is required in new or existing grade J.B.'s, factory splice kits (U.L. approved for submersion in water and direct burial) shall be used.

Provide adequate length of conductors within electrical enclosures and train the conductors to terminal points with no excess. Bundle multiple conductors, with conductors larger than no 10 AWG cabled in individual circuits. Make terminations so there is no bare conductor at the terminal.

END OF SECTION

SECTION 16130

ELECTRICAL BOXES AND FITTINGS

PART 1 - GENERAL

DESCRIPTION OF WORK

Types of electrical boxes and fittings specified in this section include the following:

- Outlet boxes.
- Junction boxes.
- Pull boxes.
- Bushings.
- Locknuts.
- Knockout closures.

Refer to Section 16110 for further requirements regarding fittings, bushings, etc.

PART 2 - PRODUCTS

INDOOR BOXES

Outlet Boxes

Provide galvanized coated flat rolled sheet-steel outlet wiring boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct outlet boxes with mounting holes, and with cable and conduit-size knockout openings in bottom and sides. Provide boxes with threaded screw holes, with corrosion-resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding.

Minimum size for all device outlet boxes shall be 4" square X 1-1/2" deep.

Outlet Box Accessories

Provide outlet box accessories as required for each installation, including box supports, mounting ears and brackets, wallboard hangers, box extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used to fulfill installation requirements for individual wiring situations.

Device Boxes

Provide galvanized coated flat rolled sheet-steel non-gangable device boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct device boxes for flush mounting with mounting holes, and with cable-size knockout openings in bottom and ends, and with threaded screw holes in end plates for fastening devices. Provide cable clamps and corrosion-resistant screws for fastening cable clamps, and for equipment type grounding.

Device Box Accessories

Provide device box accessories as required for each installation, including mounting brackets, device box extensions, switch box supports, plaster ears, and plaster board expandable grip fasteners, which are compatible with device boxes being utilized to fulfill installation requirements for individual wiring situations.

Junction and Pull Boxes

Provide galvanized code-gage sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.

Manufacturers

Subject to compliance with requirements, provide interior outlet boxes of one of the following:

- Adalet;
- Appleton Electric;
- Bell Electric;
- Bowers;
- Eagle Electric Mfg Co., Inc.;
- Midland-Ross Corp.;
- OZ/Gedney;
- Pass and Seymour, Inc.;
- RACO;
- Hubbell;
- Thomas & Betts Co.;
- Thepitt.

RAINTIGHT OUTLET BOXES

Provide corrosion-resistant cast-aluminum raintight outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit holes for fastening electrical conduit, cast-metal face plates with spring-hinged watertight caps/doors (hinged on top) suitably configured for each application, including face plate gaskets and corrosion-resistant plugs and fasteners.

Provide weathertight outlets for interior and exterior locations exposed to weather or moisture.

Subject to compliance with requirements, provide raintight outlet boxes of one of the following:

- Appleton Electric;
- Arrow-Hart;
- Bell Electric;
- Eagle Electric Mfg Co., Inc.;
- Gould, Inc.;
- OZ/Gedney;
- Pass and Seymour, Inc.;

OUTDOOR JUNCTION AND PULL BOXES

Provide flush grade mounted junction/pull boxes, equal to "Composolite" "PC" Style #PC1212GD with #PC1212SB cover as manufactured by Quazite Corporation. If required provide larger sizes as necessary so as not to exceed 40 percent fill.

Enclosures shall be constructed of polymer concrete and reinforced by a heavy-weave fiberglass. Enclosures shall be resistant to sunlight exposure, weathering, chemicals and unaffected by freeze/thaw cycles. Enclosures shall be gasketed with stainless steel inserts and bolts.

Covers shall be provided with minimum coefficient of friction of 0.5 and with factory logo for service type contained within.

Enclosures and covers shall be rated for a minimum of 20,800 lb. load over a 10" X 20" area (H2O loading) and designed and tested to temperatures of -50 deg. F. Minimum material compressive strength shall be 11,000 psi.

All outdoor mounted junction/pull boxes shall be flush grade mounted (level & plumb) and shall be encased in concrete in strict accordance with written factory recommendations.

All required conduit holes for these outdoor junction/pull boxes shall be provided in strict accordance with written factory recommendations.

Prior to rough-in of outdoor grade mounted junction/pull boxes, verify specific installation requirements with Owner's representative and engineer in field.

Subject to compliance with requirements, provide outdoor junction and pull boxes of one of the following:

- Appleton Electric;
- Bell Electric;
- Quazite;
- Spring City Electrical Mfg Co.

BUSHINGS, KNOCKOUT CLOSURES AND LOCKNUTS

Provide corrosion-resistant box knockout closures, conduit locknuts and malleable iron conduit bushings, offset connectors, of types and sizes, to suit respective installation requirements and applications.

Subject to compliance with requirements, provide bushings, knockout closures, locknuts and connectors of one of the following:

- Adalet;
- AMP, Inc.;
- Arrow-Hart;
- Appleton Electric Co.;
- Bell Electric;
- Midland-Ross Corp.;
- Midwest Electric;
- OZ/Gedney Co.;
- RACO;
- Thomas & Betts Co., Inc.

PART 3 - EXECUTION

INSTALLATION OF ELECTRICAL BOXES AND FITTINGS

Access doors shall not be used unless special prior written permission is granted from the Owner's representative. All pull boxes, junction boxes, etc. shall be installed in areas which are readily accessible after construction. Pull boxes and junction boxes shall not be installed above gypsum board, plaster or similar ceiling systems.

Provide knockout closures to cap unused knockout holes where blanks have been removed.
Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring.

Boxes shall not be installed back-to-back in walls. Provide not less than 6" (150 mm) separation in general and not less than 24" separation in acoustic rated walls. Where outlet boxes are shown back-to-back on common walls, they shall be offset accordingly when installed.

Where outlet boxes occur in block, cinder or concrete block, facing tile or other material where such materials form the finished wall surface, the opening for the box shall be neatly cut and shall be of the same size that the standard size (i.e. not "midway" or "jumbo") cover plate will cover all parts of the opening.

Aluminum products shall not be installed in concrete.

Position recessed outlet boxes accurately to allow for surface finish thickness.

Round boxes shall not be used.

Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry.

All box supports shall be independent of conduit.

Refer to Section 16150 for further supporting requirements.

Provide electrical connections for installed boxes.

Subsequent to installation of boxes, protect boxes from construction debris and damage.

The outlet, junction and pull box locations indicated on the drawings shall be considered approximate, and therefore, it shall be incumbent upon this contractor to study the general construction with relation to spaces and equipment surrounding each outlet.

All junction and pull boxes shall be recorded by this contractor on as-builts and shall be permanently marked and labeled (as directed by owner's representative in field) as to which types of electrical services are within. Refer to Section 16020 for further related requirements.

END OF SECTION

SECTION 16140

ELECTRICAL CONNECTIONS

PART 1 - GENERAL

DESCRIPTION OF WORK

Electrical connections are hereby defined to include connections used for providing electrical power, control or monitoring to equipment.

Refer to sections of all other Divisions and/or to drawings of all other trades for specific individual equipment power, control and/or signal requirements, which are work of this section.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

Subject to compliance with requirements, provide products of one of the following (for each type of product):

Adalet-PLM Div, Scott and Fetzer Co.
Allen-Stevens Conduit Fittings Corp.
AMP Incorporated.
Appleton Electric Co.
Arrow-Hart Div, Crouse-Hinds Co.
Atlas Technologies, Inc.
Bishop Div, General Signal Corp.
Burdny Corporation.
Eagle Electric Mfg Co., Inc.
Electroline Mfg Co.
Gardner Bender, Inc.
General Electric Co.
Gould, Inc.
Harvey Hubbell Inc.
Ideal Industries, Inc.
Pyle National Co.
Reliable Electric Co.
Square D Company.
Thomas and Betts Corp.

MATERIALS AND COMPONENTS

General

For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs), electrical insulating tape, electrical solder, electrical soldering flux, heat-shrinkable insulating tubing, cable ties, solderless wire-nuts, and other items and accessories as needed to complete splices and terminations of types indicated.

Provide wires, cables, and connectors complying with Division-16 basic electrical materials and methods section "Wires and Cables".

Wires/Cables

Unless otherwise indicated, provide wires/cables (conductors) for electrical connections which match, including sizes and ratings, of wires/cables which are supplying electrical power. Provide copper conductors with conductivity of not less than 98% at 90 deg. C.

Connectors and Terminals

Provide electrical connectors and terminals which mate and match, including sizes and ratings, with equipment terminals and are recommended by equipment manufacturer for intended applications.

Electrical Connection Accessories

Provide electrical insulating tape, heat-shrinkable insulating tubing and boots, wirenuts, cable ties, etc. as recommended for use by accessories manufacturers for type services indicated.

PART 3 - EXECUTION

INSTALLATION OF ELECTRICAL CONNECTIONS

Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.

Maintain existing electrical service and feeders to existing facilities, unless otherwise indicated, or when authorized otherwise in writing by Owner, or Architect/Engineer. Provide temporary service during interruptions to existing facilities. When necessary, schedule momentary outages for replacing existing wiring systems with new wiring systems. When that "cutting-over" has been successfully accomplished, remove, relocate, or abandon existing wiring as indicated.

Cover splices with electrical insulating material equivalent to, or of greater insulation resistivity rating, than electrical insulation rating of those conductors being spliced.

Prepare cables and wires, by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Also avoid "ringing" copper conductors while skinning wire.

The electrical contractor shall connect all electrical equipment furnished under all branches as well as the equipment hereinbefore specified and/or equipment furnished by the owner.

Metal frames of all portable and stationary electricity heated and motor driven equipment shall be grounded by connecting frames to the grounded metal raceway.

The electrical contractor shall make the necessary electrical connections between the specified equipment and the junction box near equipment with flexible metallic conduit and matched connectors. No flexible conduit shall be exposed in finished areas.

Review contract documents of all other trades to identify all electrically operated/controlled equipment which shall be furnished and/or installed by the owner or by other trades.

Unless specifically directed otherwise in field, this contractor shall be responsible, under base bid, for providing all required electrical power, signal and/or control work to render such equipment (and associated ancillary components) fully operable (including relays, disconnects, starters, etc. as may be applicable).

Determine exact requirements in field from respective trade and/or manufacturer's representative.

END OF SECTION

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SECTION 16150
SUPPORTING DEVICES

PART 1 - GENERAL

It shall be the responsibility of the electrical contractor to supervise the installation of and pay for all additional members, wood or metal and labor which may be required to support any type of permanent or temporary electrical apparatus employed in the execution of the electrical contractor's work. Supports, anchors, sleeves and seals furnished as part of factory-fabricated equipment shall be provided as required.

PART 2 - PRODUCTS

Provide materials of the contractor's choice as required.

Provide supporting devices which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation; and as herein specified.

Provide clevis hangers for supporting rigid metal conduit; galvanized steel; with 1/2" dia. hole for round steel rod.

Provide riser clamps for supporting rigid metal conduit; galvanized steel; with 2 bolts and nuts, and 4" ears.

Provide galvanized steel rod reducing couplings, 1/2" x 5/8".

Provide galvanized steel clamps; 1/2" rod size.

Provide galvanized steel clamps, 1-1/4" x 3/16" stock; 3/8" cross bolt; flange width 2".

Provide one-hole conduit straps for supporting 3/4" rigid metal conduit; galvanized steel.

Provide two-hole conduit straps for supporting 3/4" rigid metal conduit, galvanized steel; 3/4" strap width; and 2-1/8" between center of screw holes.

Provide hexagon nuts for 1/2" rod size; galvanized steel.

Provide galvanized steel rods; 1/2" dia.

Provide offset conduit clamps for supporting rigid metal conduit; galvanized steel.

Provide 1/2" lead expansion anchors.

Provide springhead galvanized steel toggle bolts; 3/16" x 4".

Provide cable supports with insulating wedging plug for non-armored type electrical cables in risers; construct body of galvanized steel.

Provide U-channel strut system for supporting electrical equipment, 12-gage hot-dip galvanized steel, of types and sizes indicated; construct with 9/16" dia. holes, 8" o.c. on top surface, with standard green finish, and with the all necessary fittings which mate and match with U-channel.

PART 3 - EXECUTION

GENERAL

ALL ELECTRICALLY RELATED WORK SHALL BE SUPPORTED DIRECTLY FROM BUILDING STRUCTURAL MEMBERS. ELECTRICALLY RELATED WORK SHALL NOT BE SUPPORTED FROM DUCTWORK, DUCTWORK HANGERS, CEILING SUPPORTS, ETC. ALL CONDUITS (AND CABLE ASSEMBLIES, WHERE APPLICABLE) SHALL BE ROUTED PARALLEL TO BUILDING STRUCTURAL MEMBERS. ANY AND ALL NONCOMPLYING WORK INSTALLED BY THE ELECTRICAL CONTRACTOR SHALL BE REMOVED AND REINSTALLED TO THE SATISFACTION OF THE OWNER'S REPRESENTATIVE AND THE ENGINEER, AT THE EXPENSE OF THE ELECTRICAL CONTRACTOR.

Install hangers, supports, clamps and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with spacings indicated and in compliance with NEC requirements.

Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor electrical materials and equipment. Field welding shall comply with AWS "Structural Welding Code."

Stem lengths of all pendant fixtures shall be as directed by the owner's representative. All fasteners, hangers and method of hanging exposed work in finished areas shall be submitted to the owner's representative for review before installation.

Fasteners shall be zinc-coated, type, grade, and class as required.

WOOD SUPPORTS AND ANCHORAGE

Standard Grade, light-framing-size lumber of any species. Number 3 Common or Standard Grade boards complying with WCLIB or AWPA rules, or Number 3 boards complying with SPIB rules. Lumber shall be preservative treated in accordance with AWPB LP-2, and kiln dried to a moisture content of not more than 19 percent.

Provide plywood panels; APA C-D PLUGGED INT, with exterior glue; thickness as indicated, or if not indicated, not less than 3/4 inches. Provide marine grade plywood where subject to moisture conditions.

Provide Ackerman-Johnson (or equal) expansion screw anchors. Unless otherwise noted, board shall be painted with two coats of good grade weatherproof flat gray non-conductive fire-retardant paint on all sides and edges (prior to mounting) and plumbed in a true vertical position. Provide nominal 1" spacers between back of plywood and wall.

Unless directed otherwise in field, plywood equipment boards shall be provided for all surface mounted distribution and systems "head-end" equipment. Unless directed otherwise in field, boards shall be 8 feet high by width shown on drawings (as dimensioned or as scaled) or width as required to accommodate equipment.

Cut, fit, and place wood grounds, nailers, blocking, and anchorage accurately in location, alignment, and elevation to support and anchor electrical materials and equipment. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members. Attach to substrates as required to support applied loads.

CONCRETE BASES/HOUSEKEEPING PADS

Concrete bases/housekeeping pads shall be installed by the electrical contractor beneath all electrical power and systems distribution equipment which is floor mounted or wall mounted within 4" of the floor. Extend the pads at least 4" beyond the bed or frame of the supported equipment. Bases shall be at least 4" thick and shall have straight and finished sides and a 1"-45 degree chamfer at the top perimeter. Reinforcing steel bars shall be placed in both directions of the bases. Where required for supplemental support, provide lateral support work to adjacent wall(s).

END OF SECTION

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SECTION 16160

GROUNDING

PART 1 - GENERAL

Minimum requirements for the all grounding related work shall be Article 250 (and all related articles/sections) of the latest edition of N.E.C. Grounding and bonding work is defined to encompass all systems, circuits, and equipment.

PART 2 - PRODUCTS

Subject to compliance with requirements, provide grounding and bonding product manufacturers of the contractor's choice.

Except as otherwise indicated, provide copper electrical grounding and bonding systems and materials; with assembly of materials, including, but not limited to, cables/wires, connectors, solderless lug terminals, grounding electrodes and plate electrodes, bonding jumper braid, surge arresters, and additional accessories needed for a complete installation. Where materials or components are not indicated, provide products which comply with NEC, UL, and IEEE requirements and with established industry standards for those applications indicated. Utilize compatible metallic materials throughout system to eliminate galvanic action.

Grounding electrodes shall be Steel with copper welded exterior, 3/4" dia. by 10 feet. Plate electrodes shall be sheet copper plate, 20-gage by 36" by 36", with 2 cable attachments sized for either 1/0 or 2/0 cables as required. Provide copper ground plates where ground rods cannot be used. Connections to ground electrodes shall be made at a point not less than 1 foot below grade level and not less than 2 feet away from foundations/footings. Weld grounding conductors to underground grounding electrodes where mechanical connections can not or should not be utilized.

Provide exterior mounted, watertight lightning/surge arrester at each service disconnect location and install in strict accordance with manufacturer's recommendations.

PART 3 - EXECUTION

GENERAL

Terminate feeder and branch circuit insulated equipment grounding conductors with grounding lug, bus, or bushing. Route grounding connections and conductors to ground and protective devices in shortest and straightest paths as possible to minimize transient voltage rises.

Apply corrosion-resistant finish to field-connections, buried metallic grounding and bonding products, and places where factory applied protective coatings have been destroyed, which are subjected to corrosive action.

Install clamp-on connectors on clean metal contact surfaces, to ensure electrical conductivity and circuit integrity. Install braided type bonding jumpers with ground clamps on valved water piping where such piping penetrates fire walls. Install clamp-on connectors on clean metal contact surfaces, to ensure electrical conductivity and circuit integrity. All water pipe connector fittings shall make contact with the water pipe for a minimum distance of 1-1/2", measured along the axis, and having a minimum contact

surface area of 3 square inches. Install clamp-on connectors only on thoroughly cleaned metal contact surfaces, to ensure electrical conductivity and circuit integrity.

All ground conductors used for bonding shall be routed in protective conduit sleeves. Both ends of such conduit sleeves shall be provided with ground bushings which shall be bonded to enclosures and ground terminations at both ends via jumpers. Such ground jumper conductors shall be sized same as the respective ground conductor which is being protected within the respective conduit.

All ground potentials associated with the electrical distribution system, separately derived systems and steel structural related systems shall be equalized (bonded together) by the electrical contractor under this installation.

SERVICE ENTRANCE AND DERIVED SERVICE GROUNDING REQUIREMENTS

General

Each service feeder shall include a parity sized insulated grounded conductor (neutral), terminated and bonded to all service equipment (i.e. to each and every disconnect). This shall apply whether or not downstream loads require a grounded conductor/neutral. Such conductors shall be installed unspliced and unbroken.

All electrical service locations shall be provided with an external accessible means for intersystem ground bonding. Provide a minimum 8" X 8" X 4"D. junction box at each service location, with screw cover and knockouts as required. Provide a single ground bus (or lug block), bonded to J.B. and bonded to service ground with full parity sized green insulated ground conductor (sized same as service ground conductor). The ground bus shall contain quantity and size of lugs large enough to accommodate bonding to service ground plus 200 percent spare lugs. In addition, provide a minimum of 12 lugs, each rated at #14 AWG to #2/0 AWG. Lugs shall be UL listed for use with copper or aluminum conductors.

Connect together system neutral, service equipment enclosures, exposed noncurrent carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.

New Service Entrances

Connect grounding electrode conductors to 1-inch diameter, or greater, metallic cold water pipe at service entrance using a suitably sized ground clamp. Provide connections to flanged piping at street side of flange. Ground electrical service system neutral at service entrance equipment to grounding electrodes. Install braided type bonding jumpers with code-sized ground clamps on water meter piping to electrically bypass water meter(s) and service entrance valve(s).

Upon completion of installation of electrical grounding and bonding systems, test ground resistance with ground resistance tester. Where tests show resistance-to-ground is over 3 ohms, take appropriate action to reduce resistance to 3 ohms, or less, by driving additional ground rods and/or installing additional ground plates and/or by chemically treating adjacent soil; then retest to demonstrate compliance.

Derived Services (downstream from service entrance equipment).

Ground each separately-derived system neutral to effectively grounded structural steel member or effectively grounded metallic water pipe or to separate grounding electrode system as required per National Electrical Code. Connect grounding electrode conductors to 1-inch diameter, or greater, metallic cold water pipe using a suitably sized ground clamp.

END OF SECTION

SECTION 16210
WIRING DEVICES

PART 1 - GENERAL

SUMMARY

Refer to Section 16020 for requirements for legends to be engraved on wall plates.

Provide wiring devices, in types, characteristics, grades, colors, and electrical ratings for applications indicated which are UL listed and which comply with NEMA WD 1 and other applicable UL and NEMA standards. Verify color selections with Owner's representative.

PART 2 - PRODUCTS

MANUFACTURERS

Subject to compliance with requirements, provide products by one of the following.

Receptacles:	Leviton, Hubbell, Bryant, Pass & Seymour.
Switches:	Leviton, Hubbell, Bryant, Pass & Seymour.
Dimmers:	Lutron.
Occupancy Sensors:	Watt Stopper Inc., Leviton, Tork, P & S.
Wall Plates:	Leviton, Hubbell, Bryant, Pass & Seymour.

WIRING DEVICE COLORS

Wiring device colors shall ivory.

RECEPTACLES

Standard Specification Grade Duplex/Single Receptacles

Duplex receptacles shall be equal to Leviton #5362 series.

Single receptacles shall be equal to Leviton #5361 series.

Clock hanger receptacles shall be equal to Leviton #5361-CH.

Provide self-grounding, duplex and single specification grade receptacles, 2-pole, 3-wire grounding, self-grounding, green grounding screw, ground terminals and poles internally connected to mounting yoke, color coded base, 20-amperes, 125-volts, with metal plaster ears, back & side wiring, NEMA configuration 5-20R.

Ground-Fault Interrupter Specification Grade Receptacles

Ground fault circuit interrupter duplex receptacles shall be equal to Leviton #6898 series.

Provide commercial specification grade, duplex receptacles, ground-fault circuit interrupters; feed-thru type, capable of protecting connected downstream receptacles on single circuit, grounding type UL-rated 943, Class A, Group 1, specification grade, 20-amperes rating (device & feed-thru), 125-volts, 60 Hz; with solid-state ground-fault sensing and signaling (maximum threshold of 5mA at 0.025 seconds maximum); equip with 20-ampere plug configuration, NEMA 5-20R.

Surge Suppression Specification Grade Receptacles

Surge suppressor duplex receptacles for standard applications shall be equal to Hubbell #5362_S series.

Surge suppressor quadruplex (4-plex) receptacles for retrofit isolated ground applications shall be equal to Hubbell #HBL420_S series with #HBL4AP_ surface mounted adapter plate for use on 1-gang or 2-gang outlet boxes.

Provide commercial specification grade, duplex receptacles, surge suppressor; feed-thru type, capable of protecting connected downstream receptacles on single circuit, grounding type UL-rated 1449 and 498; suitable for ANSI/IEEE C 62.41-1980 (IEEE 587 A & B), specification grade, 20-amperes rating (device & feed-thru), 125-volts, 60 Hz; with solid-state transient voltage surge sensing and suppression; power-on light, damage alert audible beeper; blue in color; equip with 20-ampere plug configuration, NEMA 5-20R. Where isolated ground surge suppression receptacle units are called for in contract documents, provide same unit as above except with isolated ground construction with factory triangular marking on face.

SWITCHES

Wall switches, in general shall be flush self-grounding with green ground screw and color coded cover, toggle type, back & side wired, specification grade, rated 20A, 120/277 volts, 1 HP at 120V, A.C. quiet type, equal to Leviton catalog numbers as follows:

Single pole, toggle:	1221-2 series.
Double-pole, toggle:	1222-2 series.
3-way, toggle:	1223-2 series.
4-way, toggle:	1224-2 series.

Locking type switches shall be same as above except with "L" suffix. Provide six keys.

DIMMER SWITCHES

Dimmer switches shall be specification grade, equal to Lutron "Nova T" (NT) series with thin profile and matching factory wall plates. Dimmer and wall plate colors shall be to match other wiring devices in the respective room.

Incandescent Lamp Dimmer Switches shall be solid state type, conforming to NEMA WD 1, modular dimmer switches for incandescent fixtures; switch poles and wattage as required to serve respective load, 120-volts, 60-Hz, with continuously adjustable slide control (down to off). Equip with filter to eliminate noise, RF and TV interference, and 5 inch wire connecting leads. Provide separate neutrals for the circuits which feed lighting served by dimmer switches. Do not break off side sections when ganging.

OCCUPANCY SENSORS

Occupancy sensor lighting switches for individual room applications shall be equal to Watt Stopper Inc. #WS-120 or WS-277 series as required. Install these sensors at standard switch heights and locations.

WIRING DEVICE WALL PLATES

Provide single and combination, of types, sizes, and with ganging and cutouts as required. Provide plates which mate and match with wiring devices to which attached. Provide metal screws for securing plates to devices with screw heads colored to match finish of plates. Provide wall plate color to match wiring devices except as otherwise indicated. Provide wall plates with engraved legends where indicated on drawings and/or where required per Section 16020. Provide plates possessing the following additional construction features.

All device wallplates shall be standard size; "midway", "oversized" ("jumbo") or "extra deep" wallplates shall not be acceptable. Construct with metal screws for securing plates to devices; screw heads colored to match finish of plates.

Wallplates in finished areas shall be commercial specification grade, satin finish stainless steel, with beveled edges, equal to Leviton Type 430 series. Wallplates in unfinished areas shall be galvanized steel.

PART 3 - EXECUTION

INSTALLATION OF WIRING DEVICES AND ACCESSORIES

Install wiring devices only in electrical boxes which are clean; free from building materials, dirt, and debris.

Install galvanized steel wallplates in unfinished spaces.

Install wiring devices after wiring work is completed.

Install wall plates only after respective wall surfaces have received their final finish.

FIELD QUALITY CONTROL

Prior to energizing circuits, test wiring for electrical continuity, and for short-circuits. Ensure proper polarity and grounding of connections is maintained. Subsequent to energizing, test wiring devices and demonstrate compliance with requirements, operating each operable device at least six times.

Test ground fault interrupter operation with both local and remote fault simulations in accordance with manufacturer recommendations.

END OF SECTION

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SECTION 16220

PEDESTAL COUNTERTOP OUTLETS

PART 1 - GENERAL

DESCRIPTION OF WORK

Types of electrical outlets specified in this section include the following:

Pedestal activation outlets
Outlet Accessories

PART 2 - PRODUCTS

MANUFACTURERS

Subject to compliance with requirements, provide outlets of one of the following:

Wiremold.
Hubbell.
Steel City.

PEDESTAL ACTIVATION OUTLETS

Outlet assemblies shall be as indicated on drawings. Provide watertight seals at bases of units.

OUTLET ACCESSORIES

Provide receptacles and plates as specified under Section 16210 and/or specialty communication related outlets/plates as required. Provide factory plates, adapters, inserts, extensions, nipples, flanges, mudcaps, rings, conversion kits, etc. accessories as required for complete working units for each application.

PART 3 - EXECUTION

INSTALLATION

Do not scale outlet locations from drawings. Determine exact locations of each outlet, case by case, after consulting with Owner and Architect and reviewing architectural documents so that outlets are properly located to accommodate the final furniture and equipment layouts.

The locations indicated on the drawings shall be considered approximate, and therefore, it shall be incumbent upon this contractor to study the general construction with relation to spaces and equipment surrounding each outlet.

Provide sealed knockout closures to cap unused knockout holes where blanks have been removed.

Install outlets in those locations which ensure ready accessibility to enclosed electrical wiring.

Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which attached.

All box supports shall be independent of conduit.

Refer to Section 16150 for further supporting requirements.

Provide electrical connections for installed boxes.

Subsequent to installation of boxes, protect boxes from construction debris and damage.

END OF SECTION

SECTION 16310
SERVICE ENTRANCES

PART 1 - GENERAL

DESCRIPTION OF WORK

Electrically related service entrances shall consist of the following.

Electrical Power Service.
Telephone Service.
CATV Service.

Electrical Power Service

The electric service shall consist of a pad mounted transformer as indicated on drawings, furnished by local utility company, with secondary voltage as indicated on drawings.

The electric contractor shall provide pad, primary ducts and secondary ducts and cable. Primary ducts shall consist of minimum two 4" conduits from terminal pole to pad. Provide a minimum of one spare secondary duct. Utility Company shall furnish and install primary cables, transformer and make all service transformer connections.

Metering shall be installed at the utility transformer in strict accordance with utility company requirements.

This contractor shall make all arrangements with the utility company to provide the service in strict accordance with regulations of utility company and of all authorities having jurisdiction. This contractor shall pay all related utility company charges and shall include same in bid.

Telephone Service

Provide empty conduits (minimum of two 4" conduits) with drag lines as shown on drawings or as otherwise directed by local telephone operating company for telephone service entrance to building. Terminate the service entrance conduits directly beneath the telephone plywood equipment board and stub up 4" above slab as directed by telephone company.

This contractor shall make all arrangements with the telephone company prior to rough-in to provide the service in strict accordance with regulations of telephone company and of all authorities having jurisdiction. This contractor shall pay all related telephone company charges, if any, and shall include same in bid. As a minimum, provide the following.

- a) Provide a minimum of 12" earth separation between telephone related conduits and other conduits (or minimum of 4" separation where encased in concrete).
- b) Telephone conduit shall be installed at a minimum depth of 24" and a maximum depth of 36". Provide record documentation.
- c) Provide minimum 200 lb. test pull line in all conduits.
- d) All bends shall be long sweeping bends with radii not less than ten times the internal diameter of conduit.

- e) Conduit entering the building interior shall extend not less than 4" above finished floor elevation.
- f) Provide a 4'W. X 8'H. X 3/4"D. plywood equipment panel (painted on all sides & edges with 2 coats of nonconductive, fire retardant paint - see Section 16150) within the building in a continually accessible, well lighted and environmentally clean room.
- g) Provide a double duplex receptacle (on dedicated circuit) on the plywood equipment board.
- h) Provide 1 #6 AWG green insulated ground conductor (in 3/4" EMT) from electrical service entrance ground junction box to telephone plywood equipment board. Terminate as directed by telephone company. Refer to Section 16160 for further requirements as relates to system grounding.

CATV Service

Provide empty conduit (minimum of one 3" conduit) with drag lines as shown on drawings, or as otherwise directed by local CATV operating company, for future CATV services.

This contractor shall make all arrangements with the CATV company prior to rough-in to provide the service in strict accordance with regulations of CATV company and of all authorities having jurisdiction. Terminate the service conduit adjacent to the telephone equipment board in the electrical equipment room on the lower level. Install the service conduit using parameters set forth above for the telephone service conduits.

PART 2 - PRODUCTS

Refer to applicable Division 16 Sections.

PART 3 - EXECUTION

INSTALLATION

Coordinate with other electrical work, including utility company wiring, as necessary to interface installation of service entrance equipment work with other work.

Where indicated in project manual or on drawings or where required by NEC, install ground-fault protection devices complying with electrical winding polarities indicated. Set field-adjustable GFP devices and circuit breakers for pickup and time-current sensitivity ranges as indicated, subsequent to installation of devices and CB's.

All service entrance conduits shall be provided with sweep L's and shall be properly sealed, immediately upon installation, to prevent water, moisture, dirt, rodents, insects, etc. from entering ducts.

Prior to trenching, during installation and at terminations, carefully coordinate installation of all service work with all affected utility companies, with the Owner's representative, with all other trades and/or affected parties and with all authorities having jurisdiction.

Provide tight system and equipment grounding and bonding connections for service-entrance equipment and wiring/cabling as required. Refer to Section 16160 for further grounding requirements.

END OF SECTION

SECTION 16320

TRANSIENT VOLTAGE SURGE SUPPRESSORS (TVSS)

PART 1 - GENERAL

SUMMARY

Specific Transient Voltage Surge Suppressor (TVSS) related work may not be indicated on drawings. Work indicated hereafter is intended to schematically describe all related work. All TVSS related work shall be included by electrical contractor under base bid.

The Electrical Contractor shall provide a complete TVSS installation. Verify all conditions in field.

All equipment described herein shall be the product of a manufacturer of established reputation and experience who has been in operation of sufficient length of time to establish proof of high quality, acceptable to the Owner.

The TVSS installation shall be Underwriter's Laboratory UL Standard 1449 Listed, CSA Certified and ANSI/IEEE C62.41-1980 compliant.

Submit manufacturer's TVSS data. Submittals shall include a tabulation of all system features and performance characteristics. If equipment other than that specified herein is proposed, the tabulation shall include line by line comparison of all data for the proposed equipment to the specified equipment. All characteristics shall meet or exceed those specified.

PART 2 - PRODUCTS

TRANSIENT VOLTAGE SURGE SUPPRESSION SYSTEM (TVSS)

General

Provide TVSS materials and components, that comply with manufacturer's standard design, in accordance with published product information.

Where TVSS components are provided with factory installed box connector fitting with factory leads, the leads shall not be spliced. All wiring shall be installed in strict accordance with manufacturer's recommendations.

Leviton equipment is listed below as the basis of design. Liebert and Advanced Protection Technologies (APT) shall be considered as an equal manufacturer.

Service Entrance Distribution Panel Mount 208Y/120V, 3 Ph., 4W Units

TVSS units shall be equal to Leviton #57120-M3. Provide one 30 Amp, 3 Pole branch circuit breaker. Connect the field phase leads to the breaker, the neutral lead to the neutral bar and the ground lead to the equipment ground bar. Provide flush mounted units where indicated on the riser diagram on the drawings.

Provide Remote Supervisor Unit equal to Leviton #52000-RS. Provide conduit and wiring (per manufacturer) as required to the remote location indicated on drawings. If location is not indicated on drawings, allow for a run 300 feet run from the TVSS location and determine exact location in field. In addition, provide conduit and wiring (per manufacturer) as required to the Building Automation System

(BAS) control panel; provide connections to contacts in the BAS control panel as directed by BAS supplier and TVSS supplier in field.

Branch Panel Mount 208Y/120V, 3-Phase, 4-Wire TVSS Units

TVSS units shall be equal to Leviton #42120-DY3. Provide one 30 Amp, 3 Pole branch circuit breaker. Connect the factory phase leads to the breaker, the neutral lead to the neutral bar and the ground lead to the equipment ground bar.

PART 3 - EXECUTION

INSTALLATION

Minimum requirements for grounding work shall be the latest edition of the National Electrical Code (NEC), including Article 250.

Coordinate with existing conditions as necessary to interface installation of TVSS.

Unless otherwise indicated on drawings, provide one appropriately rated TVSS unit for each service, distribution and branch panel. Provide flush mounted enclosures where protecting flush mounted distribution equipment.

Install conductors with direct paths to and from TVSS devices avoiding sharp bends, loops and excessive lengths. Factory leads shall not be spliced. Install TVSS components to the panelboard boxes as near as possible to the interior connection points; position the related branch breakers accordingly. Cut factory or field leads as required to minimize cable lengths.

Provide minimum of one year written full labor and materials warrantee covering installation and defective materials.

END OF SECTION

SECTION 16470

PANELBOARDS

PART 1 - GENERAL

SUMMARY

Types of panelboards and enclosures required for the project include the following.

Power-distribution panelboards.
Lighting and appliance panelboards.

PART 2 - PRODUCTS

MANUFACTURERS

Subject to compliance with requirements, provide panelboard products of one of the following (for each type and rating of panelboard and enclosure):

Square D Company.
General Electric Company.
Siemens/ITE.
Westinghouse/Cutler-Hammer.

PANELBOARDS

General

Except as otherwise indicated, provide panelboards, enclosures and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials; with the design and construction in accordance with published product information; equip with proper number of unit panelboard devices as required for complete installation. Where types, sizes, or ratings are not indicated, comply with NEC, UL and established industry standards for those applications indicated.

Panelboards shall be new and manufacturer's latest standard catalog design.

Panelboards shall bear UL labels for their specific applications.

Panelboards shall be suitable for service voltage with number of branch circuits of capacity scheduled. Unless otherwise indicated, panelboards and sections thereof, if any, shall have main lugs only of capacity equal to, or greater than, the rating or setting of the over the current protective device next back on the line.

The panelboards shall be arranged for their specific services as applicable to this project. In general, 20 amp circuits shall feed lighting and receptacles.

Panels shall incorporate branches as scheduled on the drawings.

All bus assemblies shall be copper.

All circuit breaker panelboard bus assemblies shall be of the distributed (sequence) bussing type throughout, so that any 2 adjacent single pole breakers and/or spaces shall be replaceable by a 2 pole internal common trip breaker, and any 3 adjacent single pole breakers and/or spaces shall be replaceable by a 3 pole internal common trip breaker, 15 amp through 70 amp inclusive, without disturbing any other breaker.

All panelboards shall be UL listed and labeled for use as service entrance equipment.

Power Distribution Circuit Breaker Panelboards

Provide dead-front safety type power distribution panelboards as indicated, with panelboard switching and protective devices in quantities, ratings, types, and with arrangement shown; with anti-turn solderless pressure type main lug connectors approved for use with copper conductors.

Equip with copper bus bars with not less than 98-percent conductivity, and with full-sized neutral bus; provide suitable lugs on neutral bus for outgoing feeders requiring neutral connections.

Provide molded-case main and branch circuit-breaker types for each circuit, with toggle handles that indicate when tripped. Where multiple-pole breakers are indicated, provide with common trip so overload on one pole will trip all poles simultaneously.

Provide panelboards with bare uninsulated grounding bars suitable for bolting to enclosures. Select enclosures fabricated by same manufacturer as panelboards, which mate and match properly with panelboards.

Power distribution circuit breaker panelboards shall be equal to Square D I-Line, with bolt-on branch breakers.

Lighting and Appliance Circuit Breaker Panelboards

Provide dead-front safety type lighting and appliance panelboards as indicated, with switching and protective devices in quantities, ratings, types and arrangements shown.

Provide with anti-burn solderless pressure type lug connectors approved for use with copper conductors. Construct unit with copper bus bars, full-sized neutral bar and with bolt-in type heavy-duty, quick-make, quick-break, single or multi-pole circuit-breakers, with toggle handles that indicate when tripped.

Provide suitable lugs on neutral bus for each outgoing feeder required; and provide bare uninsulated grounding bars suitable for bolting to enclosures. Select enclosures fabricated by same manufacturer as panelboards, which mate and match properly with panelboards.

208Y/120V Lighting and Appliance panelboards shall be equal to Square D NQOD with bolt-on branch breakers.

Circuit Breaker Panelboard Enclosures

Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gage, minimum 16-gage thickness.

Boxes shall have code size side and end gutters, minimum 4" constructed of code gauge galvanized steel. Boxes shall be 20" wide minimum and 5-3/4" deep minimum. Construct with multiple knockouts and wiring gutters.

Panelboard trims shall be flush or surface as required, constructed of code gauge steel, finished with rust inhibiting prime coat and then factory applied hot spray lacquer or baked-on enamel, manufacturer's standard light gray. Trims shall be complete with concealed hinges and concealed trim clamps, door with

flush chromium plated combination cylinder lock and catch and directory suitable for glass or clear plastic. All locks shall be keyed alike. Directory shall be typewritten.

Provide enclosures which are fabricated by same manufacturer as panelboards, which mate and match properly with panelboards to be enclosed.

Molded-Case Circuit Breakers

Provide factory-assembled, molded-case circuit breakers of frame sizes, characteristics, and ratings including RMS symmetrical interrupting ratings required. Provide breakers with permanent thermal and instantaneous magnetic trip, and with fault-current limiting protection, ampere ratings as indicated.

Construct breakers for mounting and operating in any physical position, and operating in a minimum ambient temperature of 40 deg C. Provide breakers with mechanical screw type removable connector lugs, AL/CU rated.

All branch circuit breakers shall be full ambient compensated thermal magnetic molded case with quick-make and quick-break action and positive handle trip indication, both on manual and on automatic operation. Breakers shall be of the over-the-center toggle operating type with the handle going to a position between "on" and "off" to indicate automatic tripping.

All circuit breakers shall be full size. "Tandem" or "split" breakers shall not be permitted.

All multi-pole breakers shall have internal common trip with all load side box lugs of one breaker in the same gutter. All circuit breakers shall have sealed cases to prevent tampering.

All circuit breakers above 225 ampere capacity shall be equipped with adjustable trip mechanism, compliant with NEC requirements.

All 15-70 ampere branch circuit breakers shall be HACR Type.

All circuit breakers serving all ballasted (fluorescent/HID) lighting loads shall be HID rated.

All 15 and 20 ampere branch circuit breakers shall be UL Listed as SWD (switching duty).

All GFI circuit breakers shall be UL Class A with maximum threshold of 5 mA.

Fault Current Ratings

All electrical distribution related equipment shall be provided with appropriately rated/braced fuses/equipment for the fault currents indicated on the drawings.

Accessories

Provide panelboard accessories and devices including, but not necessarily limited to, branch circuit breakers, neutral & ground busses, ground-fault protection units, etc., as recommended by panelboard manufacturer for ratings and applications indicated.

All distribution equipment shall be equipped with ground bus bars. Except where used as service entrance equipment, provide insulated stand-off for all neutral bus bars.

Provide a minimum of 20 handle, lock-on devices of the non-padlocking type for life safety, special systems and other essential circuits.

PART 3 - EXECUTION

INSTALLATION OF PANELBOARDS

Fasten enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically anchored.

Provide properly wired electrical connections for panelboards within enclosures.

Anchor enclosures firmly to walls and structural surfaces, ensuring that they are level, and permanently & mechanically secure.

Fill out panelboard's circuit directory card upon completion of installation work. Directories shall be neatly typewritten.

All specific scheduling shown on drawings is shown to indicate new branch circuiting requirements. Exact numbering sequence of circuits shall be determined by this contractor in field after this contractor has performed final balancing.

END OF SECTION

SECTION 16490

DISCONNECTS, STARTERS AND CONTACTORS

PART 1 - GENERAL

Provide units as indicated on drawings and as indicated under Division 16 sections.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

Subject to compliance with requirements, provide equipment of one of the following (for each type and rating):

Allen-Bradley Co.
General Electric Co.
Siemens/ITE
Square D Co.
Westinghouse/Cutler-Hammer

DISCONNECT SWITCHES

All Safety Switches/Disconnects shall be heavy duty, safety type, quick make and quick break and externally operated.

Unless noted otherwise on drawings or directed otherwise in field, all disconnect switches shall be fused. Unless noted otherwise on drawings or directed otherwise in field, brace all disconnect switches for 200,000 A.I.C.

Provide heavy duty switches, with fuses of classes and current ratings indicated and UL listed for use as service equipment under UL Standard 98 or 869. See Section "FUSES" for specifications. Where current limiting fuses are indicated, provide switches with non-interchangeable feature suitable only for current limiting type fuses.

Install disconnect switches within sight of controller position unless otherwise indicated.

Disconnect switches shall be equal to Square D Type HD.

STARTERS

General

Except as otherwise indicated, provide motor starters and ancillary components; of types, sizes, ratings and electrical characteristics indicated, which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installations.

All starters shall be equipped with pilot lights.

All starters shall be sized according to load being served or as noted on drawings, whichever requirement is larger.

Manual and magnetic starters thermal overload elements shall be rated between 115% and 125% full load current or as called for under NEC. Install and connect capacitors furnished by HVAC Contractors ahead of overloads where applicable.

Manual Starters

Provide single-phase AC fractional HP manual motor starters, of sizes and ratings required. Equip with manually operated quick-make, quick-break toggle mechanisms; and with one-piece melting alloy type thermal units. Equip with thermal overload relay with field adjustment capability of plus or minus 10% variation of nominal overload heater rating, for protection of fractional HP motors as shown on drawings. Starter shall become inoperative when thermal unit is removed. Provide starters with double break silver alloy contacts, visible from both sides of starter; green pilot lights, and switch capable of being padlocked-OFF.

Manual Starters shall be equal to the following.

Manual Starter in Finished Areas:

Square D #2510 (or Allen-Bradley Bul. 600-TQX109) flush mounted, 2 pole toggle switch type with neon pilot and NEMA 1 Type B enclosure for flush wall installation.

Manual Starter for Exposed Conduit Installation:

Square D #8536 (or Allen-Bradley Bul. 600-TAX109) surface mounted, 2 pole toggle switch type with neon pilot and NEMA 1 Type FG-2P enclosure for surface wall installation.

Combination H.O.A. Starters

Provide AC motor starters, of types, ratings and electrical characteristics required; equip with thermal overload relays with field adjustment capability of plus or minus 10% variation of nominal overload heater rating, for protection of motors as shown on drawings.

Coordinate specific coil voltage requirements (case-by-case) in field with the respective contractor who is providing the equipment to be served.

Provide each Combination H.O.A. Starter with the following:

- External quick-make/quick-break non-fused disconnect switch in cover;
- External "HAND-OFF-AUTO" selector switch in cover (for local or remote control as required);
- External green pilot light in cover;
- External reset button in cover;
- Form 2 auxiliary contacts (rated at 15A/120V);
- Fused control power transformer.

Combination H.O.A. Starters shall be equal to the following.

3-Phase Combination H.O.A. Starters in Finished Areas

Provide Size I minimum, equal to Square D #8538 (or Allen-Bradley Bul. 512) with NEMA 1 Type B enclosure for flush wall installation.

3-Phase Combination H.O.A. Starters for Exposed Conduit

Provide Size I minimum, equal to Square D #8538 (or Allen-Bradley Bul. 512) with NEMA 1 surface mount enclosure.

1-Phase Combination H.O.A. Starters

Same as above described 3-Phase equipment/applications except reconnect 3-pole units for single phase application per factory recommendations.

CONTACTORS

General

All contactors shall be equipped with external green pilot lights in cover and external H.O.A. selector switches in cover. Lighting contactors shall be wired so that the "AUTO" position is the normal photocell activated condition; the "OFF" position shall be a manual override to turn lighting off; the "HAND" position shall be a manual override to turn lighting on.

Contactors

Lighting contactors shall be equal to Square D Class 8903 (or Allen-Bradley Bul. 500L-BA*94 series) for tungsten & ballast lighting and resistance heating loads. Lighting contactors shall be electrically held in NEMA 1 enclosure, with 120V coil and characteristics as indicated on drawings or as required. "Dry" contacts shall be rated at 30A, 250V or 600V as required. Provide number of poles (minimum of four poles) and number of contactors as required for each application. Verify all coil voltage ratings in field.

Magnetic Contactors

Magnetic contactors shall be equal to Square D Class 8502 (or Allen-Bradley Bul. 500-BA*930 series) for heating, capacitor, transformer, motor, etc. loads. Magnetic contactors shall be provided with NEMA 1 enclosures, with 120V coils, with holding circuit contacts and with characteristics as indicated on drawings or as required. Magnetic contactors shall be NEMA Size 1 minimum and shall be rated 250V or 600V as required. Provide three pole units and number of contactors as required for each application. Verify all coil voltage and NEMA Size ratings in field and, under base bid, provide units sized as required for each application.

PART 3 - EXECUTION

Provide units with horsepower ratings suitable to the loads. All units shall be sized according to load being served or as noted on drawings, whichever requirement is larger.

Install overloads/fuses as required.

For types and ratings required, furnish additional fuses/overloads, amounting to 10 percent of fuses supplied, but not less than one set of 3 of each kind.

Where units are installed outdoors, in moist areas or in other atmospheres subject to similar moisture or exposure, provide minimum NEMA 3R enclosures.

Inspect operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.

Subsequent to completion of installation of equipment, energize circuits and demonstrate capability and compliance with requirements. Begin by demonstrating switch operation through six opening/closing cycles with circuit unloaded. Open each switch enclosure for inspection of interior, mechanical and electrical connections, fuse/overload installation, and for verification of type and rating of fuses/overloads installed. Correct deficiencies then retest to demonstrate compliance. Remove and replace defective units with new units and retest.

END OF SECTION

SECTION 16491

FUSES

PART 1 - GENERAL

DESCRIPTION

Types of fuses specified in this section include the following.

- Class L current limiting/time-delay.
- Class RK1 current limiting/time-delay.
- Class RK5 current limiting/time-delay.
- Class J current-limiting/time-delay.
- Class T current-limiting.

PART 2 - PRODUCTS

MANUFACTURERS

Subject to compliance with requirements, provide fuses of one of the following.

- Bussmann.
- Shawmut (A4BQ series).

FUSES

General

Except as otherwise indicated, provide fuses of types, sizes, ratings, and average time-current and peak let-through current characteristics indicated, which comply with manufacturer's standard design, materials, and constructed in accordance with published product information, and with industry standards and configurations.

Fuses 1 ampere through 600 amperes shall be rejection type.

Fuses 601 amperes through 6000 amperes shall be Hi-Cap, bolt type.

Class L Current-Limiting/Time-Delay Fuses

Provide UL Class L current-limiting, time-delay, dual-element (with pure silver links) fuses equal to Bussman # KRP-C (low peak) rated 600 volt, 60 Hz with 200,000 RMS symmetrical interrupting current rating for protecting transformers, motors, circuit-breakers, service entrances and distribution feeders above 600 amperes.

Class RK1 Current-Limiting/Time-Delay Fuses

Provide UL Class RK1 time-delay, dual-element (with pure silver links) fuses equal to Bussman #LPS-RK1 (600V) or Bussman #LPN-RK1 (250V) rated 60 Hz with 200,000 RMS symmetrical interrupting current rating for protecting service entrances and distribution feeders 600 amperes and below.

Class RK5 Current-Limiting/Time-Delay Fuses

Provide UL Class RK5 time-delay, dual-element (with pure silver links) fuses equal to Bussman #LPS-RK5 (600V) or Bussman #LPN-RK5 (250V) rated 60 Hz with 200,000 RMS symmetrical interrupting current rating for protecting general duty motors.

Class J Current-Limiting/Time-Delay Fuses

Provide UL Class J time-delay, dual-element (with pure silver links) fuses equal to Bussman #JJS (600V) or Bussman #JJN (250V) rated 60 Hz with 200,000 RMS symmetrical interrupting current rating for protecting service entrances and distribution feeders. Class J fuses shall only be used in equipment which is specifically designed to incorporate this size fuse.

Class T Current-Limiting Fuses

Provide UL Class T current limiting fuses rated 600-volts, 60 Hz with 200,000 RMS symmetrical interrupting current rating. Provide Class T fuses only where specifically called for on specialty applications in contract documents or where specifically directed in field.

Cable Limiters

Provide cable limiters rated 600-volts, 60 Hz with tubular type terminals for compression connection to 500 MCM copper cable. Provide cable limiters only where specifically called for in contract documents or where specifically directed in field.

ACCESSORIES

Maintenance Stock

For types and ratings required, furnish additional fuses, amounting to 10 percent of fuses supplied, but not less than one set of 3 of each kind.

Spare Fuse Cabinet

Provide a spare fuse cabinet mounted on the wall of the electrical service room or as otherwise shown on drawings or as otherwise directed in field. Cabinet shall be Buss #SFC or approved equal (minimum 30"H X 24"W X 12"D). Cabinet shall be sized to accommodate all required spare fuses.

Fuse Identification Labels

Provide factory fuse identification labels, installed on the inside of the door of each switch indicating type and size of fuses installed.

PART 3 - EXECUTION

INSTALLATION

All fuses shall be rated at 600 volts minimum unless the service entrance voltage does not exceed 240V.

Each fuse shall be clearly factory marked with classification, characteristics, ampere ratings, voltage ratings, etc.

Fuses shall not be shipped installed in switches nor shall they be installed in the equipment until the equipment until the equipment is ready to be energized.

All fuses shall be of the same manufacturer.

Prior to installing fuses for protection of specific equipment, motors, etc., verify recommended fuse size/type in field from respective equipment manufacturer. If a conflict in fuse size/type results between manufacturer's recommendations and above specifications, contact engineer. Provide all required fuses under base bid.

Install fuses in fused switches.

END OF SECTION

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SECTION 16492
MECHANICAL EQUIPMENT

PART 1 - GENERAL

DESCRIPTION OF WORK

Furnish and install all necessary electrically related work as required to render all plumbing, heating, ventilating, air conditioning, miscellaneous equipment, etc. fully operational and fully compliant with NEC.

PART 2 - PRODUCTS

Refer to applicable Division 16 sections.

PART 3 - EXECUTION

INSTALLATION REQUIREMENTS

General

Drawn locations of disconnects, starters, rooftop receptacles, motors, equipment, etc. are shown for schematic indication of wiring requirements. Coordinate with other trades as required to determine specific locations and termination requirements. Provide all related work under base bid.

The electrical contractor shall connect all electrical equipment furnished under all branches as well as the equipment hereinbefore specified and/or equipment furnished by the owner.

The electrical contractor shall provide all starters and disconnect switches for all mechanical equipment except as specifically indicated otherwise herein or as specifically noted or scheduled otherwise on the drawings. All starters shall be provided with nameplates listing equipment and areas served. Accordingly, this contractor shall furnish and install all necessary power conduit, wiring, starters, disconnects and fused disconnects (whether specifically shown on drawings or not) to operate the heating, ventilating, air conditioning systems and other mechanical equipment as indicated on drawings and/or as described elsewhere in the contract documents. All starters shall be provided with nameplates listing equipment and area served.

Each motor shall have disconnect switch ahead of motor magnetic starter, or manual starter ahead of motor, installed by the electrical contractor.

Provide NEMA 3R enclosures where installed outdoors or in areas subject to moisture.

Metal frames of all equipment shall be grounded by connecting frames to the grounded metal raceway and/or to a full size green ground conductor.

The electrical contractor shall make the necessary electrical connections between the specified equipment and the junction box near equipment with flexible metallic conduit and matched connectors (see Section 16120).

Sizes of HVAC related equipment and wiring shown on drawings are based on the HVAC design base manufacturers. If different manufacturer(s) or model(s) are actually supplied, it shall be this contractor's

responsibility to provide necessary coordination in field and provide the necessary size of related electrical equipment, wiring, conduit, etc. Coordinate all work carefully with the HVAC contractor prior to rough-in.

Refer to specifications and drawings of all trades for additional electrically related requirements or concerns and for schematic representation of this work. Exact locations, mounting heights, rough-in requirements, etc. of outlets, J.B.'s, etc. shall be as determined in field.

Prior to furnishing submittals and prior to rough-in, determine exact electrically related characteristics, loads, voltages, disconnect/starter requirements, locations, mounting heights, etc. of all mechanical equipment and rough-in as directed by contractor of the respective trade. No additional compensation shall be given to this contractor in the event that mechanical equipment requirements differ from the design base shown on the drawings. Provide all required coordination and all required electrical work.

HACR Breakers

The electrical contractor shall coordinate in field with the HVAC contractor and determine, case by case, which equipment is factory listed for use with Heating and Air Conditioning Rated (HACR) breakers. In an effort to minimize requirements for stocking of fuses by the owner, utilize HACR breakers at the source panelboards as the NEC required overcurrent protection wherever possible (in lieu of fusing the local disconnect switches).

Rooftop Unit Receptacles and Lights

Provide receptacle and switched lighting fixture at each rooftop mounted HVAC unit (RTU's, ACU's, MAU's and HRU's). Provide a "2-gang" w/p box with a duplex GFI receptacle on one side and a w/p single pole snap switch to control the lighting fixture on the other side. Provide a UL Wet Label 150W incandescent globe & guard lighting fixture with cast aluminum housing and guard, glass lense and 90 degree fitting threaded (water tight) to a threaded opening on the side of the w/p receptacle/switch box. See detail on drawings.

Rooftop Exhaust Fan Receptacles

Provide receptacle at each rooftop mounted exhaust fan where such fans are located more than 25 feet from another unit with a receptacle. Provide a weatherproof (w/p) box with a duplex GFI receptacle. Connect the receptacles ahead of the local disconnect switch.

HEATING, VENTILATING AND AIR CONDITIONING (HVAC) EQUIPMENT

Unit Heaters

HVAC contractor shall furnish and install unit heaters. The electrical contractor shall provide power connections and a local manual starter/disconnect device on the wall below each unit (48" AFF). Provide engraved wall plates for these local disconnects to read "Unit Heater". The electrical contractor shall wire the units to operate thru a line voltage thermostat which will be furnished by the HVAC contractor and installed by the electrical contractor.

Exhaust Fans

Fans shall be provided by the HVAC contractor. Provide all required power wiring and connections. Control wiring for manual operation of fans shall be provided by the electrical contractor. Control wiring for automatic operation shall be provided by the HVAC contractor unless indicated otherwise herein or on drawings. Unless local disconnects are furnished with the fans by the HVAC contractor, all local disconnects shall be furnished and installed by the electrical contractor. All starters shall be furnished and installed by the electrical contractor (with pilot light and engraved plate to read "Exhaust Fan E-_" . All fans

shall be furnished with electric motor operated dampers which shall be powered/connected by the electrical contractor.

Package Rooftop Air Conditioning Unit (ACU)

The HVAC contractor shall provide package air conditioning units with prewired control panels. The electrical contractor shall provide NEMA 3R fusible disconnect switch at each unit and shall provide all required power wiring connections to control panels. The HVAC contractor shall provide control wiring.

Indoor Air Conditioning Unit (ACU)

The ACU shall be provided by the HVAC contractor. The electrical contractor shall provide a local disconnect and power wiring work.

Condensing Units (CU's)

The units shall be provided by the HVAC contractor. The electrical contractor shall provide NEMA 3R local disconnects at each unit and make power wiring connections to same and to the control panel on each unit. Routing of conduit/wiring to the units shall follow refrigerant piping routing. Control wiring shall be provided by the HVAC contractor.

H.V.A.C. CONTROL WIRING

General

Unless specifically shown as empty conduit, all electrical control and interlock work shown on electrical drawings shall be provided by this contractor. Provide additional control work as specifically indicated herein.

All other control related conduit and wiring shall be provided by HVAC contractor in accordance with Section 16110 and shall include insulated throat fittings (or bushings), sweep bends, pullboxes, etc.

Low Voltage Thermostats

Low voltage thermostats shall be furnished, installed and wired by the HVAC contractor. Provide wall outlet box at 60" A.F.F. (with single gang ring) and 3/4" conduit stubbed from outlet box and turned out above accessible ceiling (in joist space or against overhead slab/deck). Conduit shall be identified in ceiling cavity and shall be provided with sweep bends, bushings and drag line. Verify all thermostat locations, case by case, to ensure that they will not conflict with room finishes or be blocked by furniture/equipment.

Line Voltage Thermostats

Line voltage thermostats shall be furnished by the HVAC contractor and installed/wired by the electrical contractor. Provide wall outlet box at 60" A.F.F. (with single gang ring) and 3/4" conduit, with line voltage power wiring, from outlet box to equipment which is to be controlled by the thermostat. Verify all thermostat locations, case by case, to ensure that they will not conflict with room finishes or be blocked by furniture/equipment.

Motor Operated Dampers

Provide all wiring associated with interlock of motors to associated motor dampers for all exhaust fans.

PLUMBING EQUIPMENT

Domestic Water Heaters (Gas)

Water heater shall be gas fired with electric controls. Provide electrical 120VAC power connection for controls and/or electronic ignition. Provide interlock wiring with circulating pumps, flow switches and aquastat controls as applicable. Refer to wiring diagrams on drawings for further definition where applicable.

Domestic Hot Water Circulating Pumps (Return Line)

In-line circulating pumps shall be furnished and installed by the plumbing contractor and shall be 120V, single phase, 1/12 HP or 1/6 HP (verify in field). The plumbing contractor shall furnish and install a strap-on aquastat on the building hot water return line. The electrical contractor shall furnish and install a toggle type manual starter and shall wire pump to operate through the aquastat. Refer to wiring diagrams on drawings for further definition where applicable.

Air Compressor

Air compressor shall be provided by the relocated and installed by the Plumbing Contractor. Provide duplex receptacle on a dedicated circuit at the unit. Verify exact location and mounting height in field.

Vacuum Pump

The vacuum pump and control package units shall be furnished and installed by the plumbing contractor. The system consists of a pump package with an integral unit mounted control panel which includes a factory installed disconnect switch. The electrical contractor shall make single-point line voltage connections to the controller.

Electric Water Coolers (Surface)

Electric water coolers shall be furnished and installed by the plumbing contractor with a cord & plug electrical connection. The electrical contractor shall provide 120V duplex receptacle, centered below cooler at 8" above floor (verify in field with plumbing contractor).

END OF SECTION

SECTION 16510
LIGHTING FIXTURES

PART 1 - GENERAL

DESCRIPTION OF WORK

Provide lighting fixtures as indicated on drawings and/or as indicated herein.

Provide submittals for all fixtures, ballasts, lamps and applicable accessories. Submit fixture shop drawings in booklet form with separate sheets for each fixture, assembled in luminaries "type" alphabetical order, with proposed fixture and accessories clearly indicated on each sheet. Submit details indicating compatibility with ceiling grid system. Provide separately tabbed sections for lamp submittals and for ballast submittals. The lamp and ballast submittal sections shall include lamp/ballast schedules (by fixture type) and related technical submittal data.

If indicated, submit one complete operating unit for each type of light fixture specified.

Upon request by engineer or owner's representative, provide isofotocandle plot diagram of footcandles on horizontal surfaces which show composite values of illuminance projected from the arrangement of light sources from indicated fixture locations and heights. Show on these graphic plots the locations, spacings and heights of Luminaries.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

Subject to compliance with requirements, provide products of one of the manufacturers listed on the fixture schedule and/or herein. Various fixture types required are indicated within the lighting fixture schedule. Fixtures must comply with minimum requirements as stated therein. Review drawings and specifications of all other trades to verify ceiling types, modules, suspension systems appropriate to installation. Manufacturers for ballasts and lamps are specified hereafter.

All "approved equal" fixture, lamp and ballast manufacturers shall be subject to compliance with and equality in quality, performance, dimensions and aesthetics as the respective basis of design.

FIXTURES

General

All lighting fixtures shall be U.L. listed and labelled for their specific application for this project.

Provide lighting fixtures, of sizes, types and ratings indicated; complete with, but not limited to, housings, energy-efficient lamps, lampholders, reflectors, energy efficient ballasts, starters and wiring. Ship fixtures factory-assembled, with those components required for a complete installation. Design fixtures with concealed hinges and catches, with metal parts grounded as common unit, and so constructed as to dampen ballast generated noise.

Luminaries having medium base and mogul base sockets shall be wired with not smaller than No. 16 or No. 14 wire respectively in accordance with the latest requirements of the National Electric Code. Fluorescent Luminaries shall be wired with not smaller than No. 16 wire. All H.I.D. fixtures shall be fused.

All Metal-Halide fixtures with lamp wattages below 400 watts shall be provided with clear tempered glass lenses to protect persons from possible violent end of lamp life. This shall apply throughout the project whether or not indicated on drawings or on fixture schedule.

All surface mounted ballasted fixtures shall be mounted with air spaces between fixture and surface per latest edition of NFPA/NEC.

All factory fixture wiring shall be per NEC, #16 AWG minimum

Recessed Fixtures

All recessed fixtures shall be equipped with necessary plaster frames and surface trim.

All recessed fluorescent fixtures shall be equipped and suitably constructed to operate with "P" rated ballasts as specified hereafter.

All recess mounted incandescent and H.I.D. fixtures shall have UL approved thermal protection per latest edition of NFPA/NEC.

All junction boxes and serviceable components (ballasts, thermal protection devices, fuses, etc.) for recessed fixtures shall be readily accessible for service or replacement from below the ceiling, without removing any ceiling components.

Where plaster frames are inferred for lighting fixtures (either by narrative or by catalog number or by application) the actual function shall be taken to mean for mounting within gypsum board, wet plaster or similar type inaccessible ceiling system; verify requirements in field and provide all required accessories (frames, etc.).

Lighting Fixture Types

Fixtures designated by letters are defined as indicated on the Lighting Fixture Schedule.

BALLASTS

General

All ballasts of the same type shall be of the same manufacturer and catalog number.

Refer to Lighting Fixture Schedule and drawings for input voltage requirements.

If fusing requirements are indicated on Lighting Fixture Schedule, each ballast shall be separately fused with a replaceable fuse external to the ballast.

All fixtures shown on drawings with multi-level switching or similar special circuiting shall be provided with multiple ballasts to accommodate same. All other fixtures may contain either single ballasts or multiple ballasts as required to fulfill required function and as required to comply with construction schedule.

Solid State Rapid Start Electronic Fluorescent Lamp Ballasts

Provide low energy solid state **rapid start** electronic fluorescent lamp ballasts for all fluorescent lamps, specifically designed for operating lamp types indicated. Fluorescent lamp ballasts for specialty applications are specified in the "Energy Saving Rapid Start Core & Coil Fluorescent Lamp Ballasts" sub-section which follows this sub-section.

Electronic Ballasts shall be manufactured by Advance, Motorola or Magnetek, 100% electronic with reduced harmonics and the following characteristics:

- 1) High power factor (0.9 minimum).
- 2) Full and constant lumen output at voltage ranges of 90V to 145V (120V ballast) and 200V to 320V (277V ballast).
- 3) Minimum Ballast Factor of 0.95.
- 4) Rapid-start.
- 5) Type 1, Class P.
- 6) Sound rated "A".
- 7) Maximum sound level of 2 dB above 16 dB ambient.
- 8) Automatic reset type thermal protection.
- 9) U.L., CSA and CBM approved, listed and labeled.
- 10) NAECA/1988 and EPCA/1987 compliant.
- 11) FCC compliant (as relates to EMI and RFI).
- 12) Input current Third Harmonic Content (THD) maintained equal to or less than 20% of input current.
- 13) Crest Factor of less than 1.4.
- 14) Internal fusing.
- 15) Operation without visible flicker.
- 16) Capability of operating all types of Long Twin Tube fluorescent lamps and all types of two, three or four foot rapid start lamps.
- 17) Line transient withstand capability per IEEE 587-A.
- 18) Two year factory warrantee.

Energy Saving Rapid Start "Core & Coil" Fluorescent Lamp Ballasts

Magnetic "core & coil" ballasts shall be used only where solid state electronic ballasts can not properly operate special application lamps (i.e. outdoor applications, etc.).

These ballasts shall be energy saving, Class P high power factor (0.9 minimum) type, capable of operating lamp types indicated; and shall be manufactured by Advance, Motorola, Valmont or Magnetek, with the following characteristics:

- 1) High power factor (0.9 minimum).
- 2) Full and constant lumen output at voltage ranges +/- 10% of input voltage.
- 3) Minimum Ballast Factor of 0.95.
- 4) Rapid-start, instant start or pre-heat as required to accommodate respective lamps.
- 5) Type 1, Class P, encapsulated.
- 6) Sound rated "A".
- 7) Automatic reset type thermal protection.
- 8) U.L., CSA and CBM approved, listed and labeled.
- 9) NAECA/1988 and EPCA/1987 compliant.
- 10) External fusing (within fixture housing).
- 11) Operation without visible flicker.
- 12) Line transient withstand capability per IEEE 587-A.
- 13) Minimum one year factory warrantee.
- 14) Provide -20 deg. F. starting temperature ballasts for all outdoor applications.

High-Intensity-Discharge (HID) Lamp Ballasts

HID lamp ballasts shall be manufactured by Advance, Valmont or Magnetek. Provide HID lamp ballasts, capable of operating lamp types and ratings indicated; constant wattage type, high power factor, fused (one per ungrounded power conductor) extra-quiet core and coil assembly encapsulated in non-melt resin; install capacitor outside ballast encapsulation for easy field replacement; and enclose assembly in drawn aluminum alloy housing(s) unless otherwise specified.

Provide H.I.D. lamp ballasts, of ratings, types and makes as recommended by lamp manufacturer, which properly matches lamps to power line by providing appropriate voltages and impedances for which lamps are designed. Design of ballasts shall operate lamp within the lamp's power trapezoid requirements. All ballasts shall be low noise, low temperature (-20 deg. F. starting temperature) type.

LAMPS

General

All lamps of the same type shall be of the same manufacturer and catalog number.

If a fixture manufacturer requires a special lamp that is not addressed herein, electrical contractor shall contact engineer for direction prior to ordering such fixtures.

Unless specifically indicated otherwise on fixture schedule, wherever available all H.I.D. lamps shall be universal mount type.

Unless specifically indicated otherwise on fixture schedule, wherever possible, all H.I.D. lamps of same wattage and type shall have matching bases.

Incandescent Lamps

Incandescent lamps shall be General Electric, Sylvania or Philips. Incandescent lamps shall be of long life type (3000 hours). All incandescent lamps shall be inside frosted unless specifically directed otherwise. Provide socket adapters/extenders if required for accommodating the specified lamp.

F32T8 Fluorescent Lamps

F32T8 fluorescent lamps shall be rapid start, energy saving type, minimum 75 CRI, minimum 2850 initial lumens and minimum 20,000 hours rated. Lamps shall be manufactured by G.E., Sylvania, Osram or Philips, equal to Sylvania #FO32/RS series.

Lamp color temperature shall be 4000-4100 deg. K.

F25T8 Fluorescent Lamps

F25T8 fluorescent lamps shall be rapid start, energy saving type, minimum 75 CRI, minimum 2150 initial lumens and minimum 20,000 hours rated. Lamps shall be manufactured by G.E., Sylvania, Osram or Philips, equal to Sylvania #FO25/RS series.

Lamp color temperature shall be 4000-4100 deg. K.

Metal-Halide Lamps

Metal-Halide lamps shall be manufactured by Sylvania, General Electric or Philips, phosphor coated type (unless specifically directed otherwise), minimum 10,000 hours rated.

High Pressure Sodium Lamps

Outdoor High Pressure Sodium lamps, if required, shall be manufactured by Sylvania, General Electric or Philips, clear (unless specifically directed otherwise) universal mounting type, equal to G.E. "LU" series, minimum 24,000 hours rated.

PART 3 - EXECUTION

INSTALLATION OF LIGHTING FIXTURES

General

All surface and recessed ceiling fixtures installed on grid or tile ceilings shall be installed to agree with module of ceiling either displacing a tile, or unit on center of tile, or centered on grid lines.

Install flush mounted fixtures properly to eliminate light leakage between fixture frame and finished surface.

No splice or tap shall be located within an arm, stem or chain. Wire shall be continuous from splice in outlet box of the building wiring system to lamp socket or to ballasts terminals in fluorescent Luminaries.

All "drops" to suspended ceiling mounted lighting fixtures shall be made with AC/MC Cable per Section 16120 or with flexible metal conduit (1/2" minimum diameter, 72" maximum length and with full parity sized green ground wire - see Section 16110). All "drops" to lighting fixtures in gypsum board, and similar inaccessible ceiling systems, shall be made from identified fully and readily accessible junction boxes.

All lighting fixtures utilized for emergency egress lighting shall be connected ahead of switching.

Aim all adjustable lighting fixtures as directed in field by Owner's representative. All adjustable outdoor lighting shall be aimed after dark during a night test of the systems as directed by Owner's representative. Where applicable, verify that measure illuminance values comply with respective isolux (or equivalent) plot diagram values.

Fixture Support

Provide fixtures and/or fixture outlet boxes with hangers to properly support fixture weight. Submit design of hangers, method of fastening, other than indicated or specified herein, for review by Owner's representative.

All lighting fixtures installed in or on suspended ceiling systems shall be anchored in strict compliance with NEC, including all necessary advance coordination with the ceiling installation contractor.

Support surface mounted fixtures greater than 2 feet in length at a point in addition to the outlet box fixture stud.

Fasten electrical lighting fixtures and brackets securely to structural supports, including poles/standards. Install all lighting fixtures level and plumb. Where special mounting conditions are encountered, (i.e., mounting to rounded columns, etc.) provide special factory fabricated mounting means (i.e., brackets designed to conform with curvature of rounded columns, etc.).

Where necessary, provide stems or chains for fixtures as designated by the Owner's representative. If mounting height is not specified, stem/chain length shall be as directed in the field.

Provide plaster frames for recessed fixtures installed in other than suspended grid type acoustical ceiling systems. Brace frames temporarily to prevent distortion during handling.

FIELD QUALITY CONTROL

Where applicable, refer to Division-1 sections for the replacement/restoration of lamps in interior lighting fixtures, where used for temporary lighting prior to Date of Substantial Completion.

Where used for temporary lighting prior to time of Substantial Completion, replace all incandescent lighting fixture lamps, as well as any lamps which are defective, damaged or burned out.

Furnish stock of unused, unopened replacement lamps amounting to 15%, but not less than 4 lamps in each case, of each type and size lamp used in each type fixture. Deliver replacement stock as directed to Owner's storage space.

Replace defective and prematurely burned out lamps for a period of one year following the time of Substantial Completion.

LIGHTING STANDARDS

Utilize belt slings or rope (not chain or cable) to protect finishes of poles and standards when raising and setting finished poles and standards.

Provide sufficient space encompassing hand access and cable entrance holes for installation of underground cabling where applicable.

Fasten electrical poles, fixtures and brackets securely to structural supports.

Provide concrete base for each fixture standard pole. Base shall be reinforced and, unless indicated otherwise on drawings, shall be of the depth recommended by the manufacturer.

Provide galvanized steel anchor bolts, in diameters, lengths and classes as directed by pole manufacturer.

After ensuring that the poles are plumb, neatly fill the entire space between top of concrete bases and bottom of pole bases with grout.

All poles shall be provided with matching factory base covers ("skirts"). This shall apply whether specifically indicated on fixture schedule or not.

All luminaires shall be separately fused within the pole-base handhole.

END OF SECTION

SECTION 16720
FIRE ALARM SYSTEM

PART 1 - GENERAL

DESCRIPTION OF WORK

Provide Fire Protective Signaling System (NFPA 72) suitable for type occupancy as defined by Local Building Code and as approved by local Fire Marshall.

STANDARDS

The equipment and installation shall comply with the current applicable provisions of the following standards:

National Electric Code (including Article 760);

National Fire Protection Standards (including but not limited to):

NFPA 71 Central Station Signaling Systems-Protected Premises Unit

NFPA 72 Protective Signaling Systems

NFPA 72E Automatic Fire Detectors

Local and State building codes;

All requirements of the Local Authority Having Jurisdiction (AHJ);

Underwriters Laboratories, Inc.:

The system and all components shall be listed by Underwriters Laboratories, Inc. for use in Fire Protective Signaling Systems under the following standards as applicable:

UL 864 Control Units for Fire Protective Signaling Systems (including UUKL sublisting)

UL 268 Smoke Detectors for Fire Protective Signaling Systems

UL 268A Smoke Detectors for Duct Applications

UL 217 Smoke Detectors, Single and Multiple Station

UL 521 Heat Detectors for Fire Protective Signaling Systems

UL 228 Door Closers-Holders for Fire Protective Signaling Systems

UL 464 Audible Signaling Appliances

UL 1638 Visual Signaling Appliances

UL 38 Manually Actuated Signaling Boxes

UL 346	Waterflow Indicators for Fire Protective Signaling Systems
UL 1481	Power supplies for Fire Protective Signaling Systems

GENERAL REQUIREMENTS

The Fire Alarm System supplier shall submit complete documentation for the Fire Alarm/Life Safety System showing the Model Number, type, rating, size, style, Manufacturer's Names, and Manufacturer's Catalog Data Sheets for all items to ensure compliance with these specifications.

The Fire Alarm System supplier shall furnish detailed submittals clearly showing the intended location of all field devices and their connections to the system. Submittals shall be prepared utilizing AutoCad Release 14 Computer Aided Drafting system.

Copies of this information shall be submitted as required to the Engineer and shall be subject to the review of the Engineer.

The Authority Having Jurisdiction shall be notified prior to installation or alteration of equipment and wiring. At the AHJs request, complete information regarding the system or system alterations, including specifications, wiring diagrams, and floor plans, shall be submitted for approval.

Successful vendor shall pay all inspection fees and shall provide all necessary product data submittals, shop drawing submittals, working drawings, supervision, etc. and shall have submittals approved (in writing) by the State Fire Marshal's office and/or the local authority having jurisdiction prior to submittal to Engineer for review.

Manufacturer/Supplier shall supply detailed wiring diagrams and riser diagrams showing color coding of all wiring per manufacturer recommendations. Include also catalog information of each supplied and calculations showing adequate capacity of the standby batteries as required by code.

Submit maintenance data and parts lists for each type of fire alarm equipment installed, including furnished specialties and accessories. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of Division 1.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

Subject to compliance with requirements, provide fire alarm systems of one of the following (for each type of product):

Notifier Co. (basis of design);
EST (approved equal);
Simplex (approved equal).

FIRE ALARM SYSTEM

The system shall be equal to Notifier "intelligent" multiplex package Model AFP200 consisting of the following.

Panel shall contain:

Central Processor Unit

Display Interface Board With Keypad and LCD

Loop Interface Boards With 99 Intelligent Detectors and 99 Monitor/Control Functions Per Loop.

Serial Interface Board For Printer and/or CRT

Eighty Character Wide Display.

Each smoke detector shall be intelligent/addressable for the exact location in the building, capable of giving a print out of the sensitivity and have a sensitivity adjustment remotely from the console. This sensitivity shall also be adjusted automatically from the system clock if the user wishes changes during a 24 hour period. The system shall use analog data transmission in order to accomplish the previous requirements. Manual stations, sprinkler devices and all other "contact only" closing devices shall be Addressable. An Addressable only system will not be acceptable.

The system must have the following features:

- walk-test
- alarm verification
- warning message for smoke detector requiring "cleaning"
- multiple password protection
- enable and disable of any Addressable point
- manual on/off for any output point
- read status of any programmable point
- field programmable at the panel keyboard

Provide one LCD-80TM liquid crystal display remote annunciator on the Lower Level of the new building, near the main entrance.

Also, provide one LCD-80TM liquid crystal display remote annunciator on the main entry level of the existing office building, inside the main entrance at the existing location of the multi-system wall annunciator board. Determine exact location in field and utilize one of the new underground communication conduits for the fire alarm cable (see site plan).

The intelligent addressable photo smoke detectors shall be SDX-551 with BX-501 bases. Install per manufacturer's instructions, no further than 15 feet from a wall, no further than 30 feet from another detector in the same room and no closer than 3 feet to a supply air diffuser.

The Addressable Manual Stations shall be Notifier LNG-1R with MMX-101.

The Intelligent Addressable Heat Detector shall be FDX-551 with BX-501 base. This device shall be both rate of rise and fixed temperature.

The intelligent addressable duct mounted smoke detectors shall be photoelectric smoke detector unit DHX-502/SDX-551/ST-3/CMX-2. Provide sampling tube, test station and all other required accessories. Provide remote alarm indicating unit flush mounted in acoustical tile ceiling, visible from floor below. If test stations are not readily accessible, provide remote test station.

The electronic horn/strobes shall be Notifier HS24-15/75WR with semi-flush mounting plates (with ADA compliant strobes), wall mounted at 6'8" as shown on plans.

The "visual only" alarms shall be ADA compliant strobe units wall mounted at 6'8" as shown on plans, Notifier #ST24-15/5WR.

Strobe units shall be synchronized wherever required by any prevailing code, regulation or authority having jurisdiction.

Install ISO-X isolation modules to protect the system from faults and or grounds. The ISO-X shall permit the entire system to operate independently of the area disconnected by the ISO-X due to wiring faults.

Provide MMX-101 monitor modules to interface "non-intelligent" devices into the system as shown on the drawings. (Sprinkler Flow and Tamper Switches).

Provide CMX-1/CMX-2 control modules for door closures and all supervised control functions such as air handler shut-downs.

Provide carbon monoxide sensor(s) where shown on drawings, with integral local A/V alarm annunciation and connect to the fire alarm system as a "trouble" address similar to sprinkler tamper switches.

DIGITAL COMMUNICATOR

Furnish and install a remote mounted digital communicator on the telephone equipment panel, programmed to report to the owners U.L. approved CENTRAL STATION monitoring agency.

Digital Communicator shall be U. L. listed for fire alarm use, Notifier 911AC or approved equal, mounted in single equipment housing containing battery charger and battery with coupler cable.

Furnish an RJ31X telephone company jack on equipment panel for connection to telephone system.

Digital Communicator shall be connected to operate from two sets of dry contacts on fire alarm control panel; one set for alarm and one set for trouble.

PART 3 - EXECUTION

Coordinate placement of duct detectors with the Heating Subcontractor. Provide auxiliary contact as required to shut down equipment and wire into the stop circuit of the associated air handler starter.

The water flow and tamper switches will be provided by the Sprinkler Contractor. The Sprinkler Contractor will install these devices but the Electrical Contractor shall wire and connect to the fire alarm system. Each of these shall be addressed and supervised with a MMX-101 module.

The equipment supplier shall make complete wiring diagrams locating all devices and terminal cabinets. The terminal cabinets shall have pressure terminals with markings as determined by the fire alarm equipment supplier.

The fire alarm system supplier shall provide to the electrical contractor a complete set of floor plan drawings showing conduit sizes and number of conductors required to all components plus detailed wiring connections required at each type of device.

The Electrical Contractor shall submit these drawings to the applicable authority having jurisdiction for approval. This action shall be taken during the Shop Drawing procedure.

Upon completion of the installation, the system shall be checked and tested by a certified fire alarm inspector and an Underwriters Laboratories Inc. Fire Alarm Certificate Corporation.

After making all tests and corrections, the system shall be demonstrated to the consulting engineers, the inspecting authority and the owners.

Provide the owner with a one year service contract. Indicate the cost of renewing this contract for an additional one, two and three year period at the owner's option.

END OF SECTION

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SECTION 16810

ELECTRICAL SPECIALTIES

PLUGSTRIPS AND SURFACE RACEWAY SYSTEMS

"Plugstrips" shall be equal to Wiremold #G3000 series for single service applications and #4000 series for dual-service applications. Provide factory fittings, etc. as required for a complete installation. Provide duplex receptacles on 12" centers, with a minimum of three duplex receptacles for the shortest shown length of surface raceway. Provide with receptacles as specified under Section 16210.

PHOTOCELLS

Photocells shall be Paragon #CW201 series, 2000W rated nipped to weatherproof outlet box plate (or equal by Tork, Precision). Determine exact mounting locations and adjustment requirements in field relative to structural and site conditions.

MULTI-PURPOSE TIME CLOCKS (7 DAY)

Multi-Purpose Time Clocks shall be equal to Tork #T930L-E (or equal by Paragon, Intermatic). Time clocks shall be photocell initiated, 7-day, 24 hour with external accessibility of override controls. Unit shall be 3 zone (1-timer control only, 1-photocell control only and 1-photocell control on/timer control off). Provide all required external contactors, relays, etc. to render the control system fully operational. Verify zone control requirements in field prior to rough-in. Provide power carryover.

END OF SECTION

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SECTION 16830
LIGHTNING PROTECTION SYSTEM

PART 1 - GENERAL

SUMMARY

Specific lightning protection system related work is not shown in plan view on drawings. Work shown on drawing details and defined in this section is intended to schematically describe all related work. All lightning protection related work shall be included by electrical contractor under base bid.

This Section includes lightning protection systems for buildings and associated structures and includes requirements for lightning protection systems components and work including, but not limited to, the following:

- Air terminals.
- Bonding plates.
- Conductors.
- Connectors.
- Counterpoise
- Fasteners
- Grounding plates.
- Grounding rods.
- Rod clamps.
- Splicers.
- Custom mounting modifications to roofing systems.

Raceways used for lightning protection system conductors are specified in Division 16 Section "Raceways."

QUALITY ASSURANCE

The Electrical Contractor shall provide a complete concealed Underwriter's Laboratory master labeled lightning protection system.

All equipment described herein shall be the product of a manufacturer of established reputation and experience who has been in operation of sufficient length of time to establish proof of high quality, acceptable to the Engineer.

All work shall be performed under the complete supervision of an accredited factory expert, furnished by the equipment manufacturer. This factory expert shall be locally available at all times during installation of the lightning protection system. It shall be the responsibility of this expert to supervise all unit locations and connections and he shall completely test the system after completion for strict conformance with U.L. master label requirements.

All equipment shall be furnished by the local vendor and supervision of installation shall be by same and installation may be by others.

The vendor shall provide all working drawings necessary for entire installation. Refer to contract documents of all trades for building roofing and structural system details.

SUBMITTALS

Product Data

Submit manufacturer's data on lightning protection systems and components, including adhesives where used.

Shop Drawings

Submit layout drawings of lightning protection system equipment and components including, but not limited to, air terminal locations, conductor routing, connections, bonding, custom modifications to roofing systems, grounding, counterpoise, etc. These drawings shall be complete working drawings.

UL Certification

Provide Owner with UL Master Label for overall system which is suitable for fastening to building for display purposes. Comply with UL 96A, "Master Labeled Lightning Protection Systems". Where additions or physical connections are to be made to existing structures under this contract, provide the above referenced UL Label for the resulting collective system.

PART 2 - PRODUCTS

MANUFACTURERS

Subject to compliance with requirements, provide products equal to those manufactured by the following:

- A-C Lightning Security Inc.
- Approved Lightning Protection Co., Inc.
- Carl Bajohr Co., Inc.
- East Coast Lightning Equipment.
- Heary Bros. Lightning Protection.
- Independent Protection Co., Inc.
- Robbins Lightning Protection Co.
- Sewell Manufacturing Co., Inc.
- Thompson Lightning Protection, Inc.
- West Dodd Lightning Conductor Corp.

LIGHTNING PROTECTION SYSTEM COMPONENTS

General

Provide lightning protection system materials and components, that comply with manufacturer's standard design, in accordance with published product information. Provide air terminals, bonding plates, conductors, connectors, conductor straps, fasteners, grounding plates, grounding rods, rod clamps, splicers and other components required for a complete system that meets LPI-175, UL 96A or NFPA 78 standards.

Cable

Lightning protection cable (for grounding, counterpoise, cross-runs, etc.) shall be minimum 28 strand (14AWG - each strand) bare copper.

Air Terminals

Metal for air terminals and cables shall be copper with solid air terminals.

Metal for air terminals and cables may be aluminum with solid air terminals only where required to avoid contact of dissimilar metals.

Provide air terminals with bases specially designed for the type of roofing system component on which they will be mounted.

Ground Electrodes

Provide 5/8-inch minimum diameter by 10-foot long, copper clad steel ground rods with minimum 27 percent of the rod weight in the copper cladding.

Provide equivalent copper ground plates where ground rods cannot be used.

PART 3 - EXECUTION

GENERAL INSTALLATION

General

Minimum requirements for the grounding system shall be Article 250 (and all related articles/sections) of the latest edition of N.E.C.

Coordinate with other work, including electrical wiring and roofing work, as necessary to interface installation of lightning protection system with other work.

Provide pitch pockets for all penetrations of the roofing material at each air terminal or other connection.

Bond all roof mounted fans, exhausters and other equipment, etc. to the lightning protection system/cables.

Bond and interface new system with all applicable rooftop and/or site equipment/structures (re-bars, parking lot lighting standards, condensing units, exhaust fans, plumbing stack vents, metal coping, flagpoles, towers, emergency generator system, utility transformer/services, etc.) requiring same and provide a resulting single UL master label.

All ground potentials associated with the structure and site shall be bonded and equalized.

Carefully coordinate all work with drawings of all other trades and with all other trades (including roofing contractor) in advance and during installation.

Except with special exceptions for special roofing materials, mounting of cross connector runs/devices on the roof (when away from parapets), no adhesives shall be used for mounting of devices, cables, etc. All mounting shall be mechanical. All other mounting shall be mechanical. Coordinate all work in advance with roofing contractor/manufacturer so as not to void any warranties.

Unless prior acceptance is granted by the owner's representative in field, use approved exothermic welded connections for all conductor splices and all connections between conductors and other components.

Cable

Install conductors with direct paths from air terminals to ground connections avoiding sharp bends and narrow loops.

Connect lightning protection cable to all terminals, ground rods, devices, structural members and equipment.

Provide cross connecting runs of cable at a maximum spacing of every 50 feet on roof. Where such cross connecting runs would occur on pitched roofing visible from below, contact engineer prior to completing working drawings.

All indoor cable shall be concealed from view. Conceal wiring from normal view from all exterior locations at grade within 200-feet of building.

Air Terminals

Air terminals shall be 12" projection above the parapet wall. These terminals shall be spaced a maximum of 20 feet on center around perimeter of each roof level. These air terminals shall be mechanically attached to the inside of the parapets.

Perimeter points shall be maximum 20' on center with 1/2" x 12" air terminals.

Counterpoise

Furnish and install a full cable counterpoise system around perimeter of building and, where applicable, bond to water service, building steel, emergency generator system, utility service entrance, service entrance pad-mount transformer, etc. per latest edition of NEC.

Ground electrodes shall be connected to every riser. Provide one connection between grid and water main and between counterpoise and electric service ground where it enters the building.

Provide cable risers at a maximum spacing of every 100 feet. Tie this cable to structural steel and floor mesh as well as to air terminals and ground rods. All metal objects on roof shall be bonded as required by UL & applicable codes.

Ground every 100' max. with 5/8" x 10' copperweld ground rod.

Risers shall be concealed within building chases and roof cable may be exposed.

Connect to each structural column, and to each driven electrode.

Work on Membrane or other Special Roofing Systems

The electrical contractor and/or the lightning protection system subcontractor shall provide all required special preparation of the new (and/or existing, if applicable) roofing systems as required by the roofing manufacturer for mounting air terminals, cables, etc.

It shall be the responsibility of the electrical contractor and/or the lightning protection system subcontractor to provide such preparation work under base bid and to sub-contract such work to the roofing contractor who is responsible for providing the roofing warranty.

Coordinate all such work in advance with the general contractor and the roofing contractor. Such work may include, but not be limited to, providing special fusion spliced (continuous heat welded) membrane caps and straps, special sealants, special solvents, special adhesives, etc.

Use mounting methods as recommended by manufacturer of air terminals and as approved by manufacturer of roofing material. Comply with air terminal and roofing manufacturers' installation instructions.

CORROSION PROTECTION

Use no combination of materials that may form an electrolytic couple of such nature that corrosion is accelerated in the presence of moisture, unless moisture is permanently excluded from the junction of such metals. Where unusual conditions exist that would cause deterioration or corrosion of conductors, use conductors with suitable protective coatings.

FIELD QUALITY CONTROL

Perform inspections of the lightning protection system installation in accordance with LPI-177, "Inspection Guide for LPI Certified Systems." Provide Owner's representative with one copy of LPI-177 and retain one copy at the project site throughout construction for reference.

Document the inspections on LPI forms LPI-C1-02 and LPI Form 1-R88. Provide one copy of each completed form to the Owner's representative.

Provide advance notice of at least 72 hours to the Owner's representative before concealing lightning protection system work.

Provide UL inspection and delivery of UL Master Label "C" to the Owner's representative (framed behind glass for mounting as directed in field by owner's representative).

Provide LPI Certification of the system, obtaining necessary certifications and signatures and preparing and handling necessary forms.

END OF SECTION

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SECTION 16880

COMMUNICATION TECHNOLOGY SPECIALTY WORK

WORK FURNISHED & INSTALLED BY DIVISION 16 ELECTRICAL CONTRACTOR

General

Provide general field coordination with Division 17 Contractor(s) and/or Owner's vendor(s) for same as required.

Refer to Section 16310 for service related work.

Provide outlet boxes (with 1" conduit stubs) for systems at each outlet indicated on drawings. Conduit stubs shall be turned out in joist space and, where located in areas with drywall ceilings, shall be extended to the nearest area with no ceiling or with acoustical tile ceiling.

Provide conduit, bridge rings and raceways as required.

Conduit stubs shall be 1" unless noted otherwise or directed otherwise in field.

Conduit stubs shall be installed in a manner which results in maintaining a minimum distance of 24 inches from motors, feeder/branch circuit wiring and from any ballasted lighting fixture.

All conduits shall be provided with sweep "L" 90's and insulated throat fittings (or bushings).

Refer to Section 16020 for raceway system identification requirements.

Outlets shall consist of a flush wall mounted 4" square box with a single gang plaster ring (verify with Div. 17 contractor). Maximum conduit fill for new work shall be 40%, based on manufacturer's published data of cable outside diameter.

Use caution not to exceed the allowed bending radius for respective cables (coordinate with respective vendor). Raceway/Cabling bending radii shall be minimum as directed by cable manufacturer.

Refer to drawings for schematic representation of this work. The exact mounting heights and locations of all electrical system outlets shall be determined in the field with relation to architectural detail and equipment being served. It shall be the responsibility of this contractor to coordinate all outlet locations in field with owner's representative and with respective system vendor.

Conduit stubs (and systems furniture whips where applicable) shall be provided as follows.

<u>Conduit Diameter</u>	<u>Application</u>
(1) 3/4"	All Wall Phones
(1) 1"	All Wall Technology Outlets at Individual Desks or tables.
(1) 1"	All Wall Technology Outlets at Individual Server, Copier, Fax, etc. locations.
(1) 1"	Lab Counters.

Provide additional wall outlet boxes and additional whips as/if required at systems furniture to achieve the above.

Bridle Rings

Cable distribution bridle rings shall be equal to Caddy #4BRT64 or Mono-Systems Inc. "The Hook" (minimum 4" diameter or 4" square usable internal area) constructed of aluminum or corrosion resistant steel with rolled edges or equivalent to prevent damage to cable jackets and insulation. Provide splits or openings so that cables can be laid in the rings rather than threaded through.

Provide rings at four foot intervals and at all offsets. Route rings through corridors and similar open areas wherever possible to minimize wall penetrations.

Securely anchor (mechanical - not adhesive) all rings directly to structural components of the building. Rings shall not be anchored to ductwork, conduit, piping, fixtures, equipment, ceiling supports, etc.

All rings shall be fully and readily accessible after installation.

Provide maximum 30% fill (in cross section), based on outside diameter of cables. Accordingly, provide multiple sets of rings along any routes as/if required.

Route all bridle ring paths and cables perpendicular and parallel to the building architectural lines, keeping offsets to a minimum. Install bridle rings in a uniform plane/elevation wherever possible, keeping vertical offsets to an absolute minimum. Prior to installation, submit scaled coordination drawings showing all proposed routing and ring locations for review by Owner. Keep offsets to an absolute minimum. Bridle ring paths shall be routed so that a minimum of 24" exists between any cables and any EMI source such as ballasts, motors, power wiring, etc.

Group cables by system type wherever possible. Provide color coded jackets, or other approved labelling/identification method, to identify runs of different systems.

Provide UL Listed plenum cables in all plenum ceiling areas where applicable.

Provide a minimum of three (3) 4 inch bushed conduit sleeves at all penetrations of: floors, masonry walls, fire rated walls, smoke-tight partitions, smoke-rated partitions, etc. Provide smoke/fire stopping at all such penetrations per Section 16020.

WORK FURNISHED & INSTALLED BY DIV. 17 COMMUNICATION TECHNOLOGY CONTRACTOR

Provide, cable, terminations, jacks, labelling, hardware, etc. as required for complete working systems.

Coordinate all work in advance with Division 16 Electrical Contractor, prior to Division 16 Electrical Contractor's installation of outlet boxes, conduit stubs, etc.

Determine exact locations of communication technology equipment, equipment outlets, etc. in field.

Use caution not to exceed the allowed bending radius for respective cables and not to compromise the integrity of the cables during installation by pulling tie-wraps too tightly, damaging cables, etc. Raceway/Cabling bending radii shall be minimum as directed by cable manufacturer. Use pulling compound or lubricant, where necessary; compound must not deteriorate conductor or insulation.

Neatly dress all cable work.

Electrical work shall be installed in a manner which results in maintaining a minimum distance of 24 inches from feeder/branch circuit raceways and from any ballasted lighting fixture.

Review all termination and labeling requirements with Owner in advance. All cable shall be provided with permanent adhesive labeling identification by this contractor. Provide transparent adhesive coverings over each label, wrapped around the labels at least two times. The long axis of the labels shall installed be parallel to the long axis of the respective cable assemblies. Labels shall be approximately 1-1/2" long by 3/8" high.

Communications technology systems cables may be installed outside of conduit above accessible ceilings.

All such "free-air" cables shall be supported/anchored at maximum 4 foot intervals and within 12" of box or outlet. All cables which are routed above accessible ceilings (or in areas with no ceilings) shall be neatly bundled and secured to bridle rings or cable tray at four foot intervals. Wherever possible, bundle cables of the same system together.

Provide color coded jackets (colors as directed by Owner) to identify runs of different systems.

Neatly route cables parallel and perpendicular to building architectural lines.

END OF SECTION

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SECTION 16910
ELECTRICAL ALTERNATES

GENERAL

All work performed under the alternate(s) shall conform to all requirements of the base bid contract documents. State cost addition or deduction to base bid for purchasing, receiving, furnishing and installing all labor, coordination, equipment and material required for the following.

ALTERNATE #E-1

State "no change", "addition" or "deduction" to base bid for providing equipment manufactured by Square D Company for electrical power equipment specified under Section 16470 and Section 16490.

NO-CHANGE ADD DEDUCT \$ _____
(Circle one of the above)

ALTERNATE #E-2

State "no change", "addition" or "deduction" to base bid for providing equipment manufactured by Simplex Company for fire alarm system equipment specified under Section 16720.

NO-CHANGE ADD DEDUCT \$ _____
(Circle one of the above)

ALTERNATE #E-3

State addition to base bid for providing all work associated with the Lightning Protection System as defined on drawing Sheet E-8 and Specification Section 16830.

ADD \$ _____

END OF SECTION

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SECTION 17010
GENERAL REQUIREMENTS

RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplemental Conditions and Division-1 Specification sections, apply to work of all Division-17 sections.

GENERAL

The base bid shall include furnishing all materials, labor, tools, equipment and installation of all work required to install complete communication systems as shown on the plans and outlined in all Division-17 sections.

Submittal of a bid indicates that the contractor has examined the drawings, specifications, and visited the site and has included all required allowances.

Contractor: shall be designated as the contractor for Division 17 work or, as applicable, sub-contractor for that section of work unless specifically stated otherwise.

SCOPE INCLUDED

Provide all communications technology work not specifically excluded. Work shall include, but is not limited to, the following.

Provide all communications technology work as required for complete operating systems.

Provide, cable, terminations, jacks, labeling, hardware, etc. as required for complete working systems.

Coordinate all work in advance with Division 16 Electrical Contractor, prior to Division 16 Electrical Contractor's installation of outlet boxes, conduit stubs, raceway systems, etc.

Determine exact locations of communications technology equipment, equipment outlets, etc. in field.

Use caution not to exceed the allowed bending radius for respective cables and not to compromise the integrity of the cables during installation by pulling tie-wraps too tightly, damaging cables, etc. Raceway/Cabling bending radii shall be minimum as directed by cable manufacturer. Use pulling compound or lubricant, where necessary; compound must not deteriorate conductor or insulation.

Neatly dress all cable work and provide bridle rings (or other approved method) for properly dressing all work at racks, control panels, etc.

Electrical work shall be installed in a manner which results in maintaining a minimum distance of 24 inches from feeder/branch circuit raceways and from any ballast type lighting fixture.

Review all termination and labeling requirements with Owner in advance. All cable shall be provided with permanent adhesive labeling identification by this contractor. Provide transparent adhesive coverings over each label, wrapped around the labels at least two times. The long axis of the labels shall installed be parallel to the long axis of the respective cable assemblies. Labels shall be approximately 1-1/2" long by 3/8" high. These labels shall appear within six (6) inches of each end of the finally terminated cable properly identifying each cable to assist in trouble shooting the system.

All cables shall be supported/anchored at maximum 4 foot intervals and within 12" of box or outlet. All cables shall be neatly bundled and secured to bridle rings or cable tray at four-foot intervals. Wherever possible, bundle cables of the same system together.

Provide color-coded jackets (colors as directed by Owner) to identify runs of different systems.

Neatly route cables parallel and perpendicular to building architectural lines.

SCOPE EXCLUDED

The following work is not included under this contract.

Field painting of any equipment, except as hereinafter mentioned in the specifications or shown on drawings.

120VAC power for equipment.

Providing wall outlet boxes.

Providing conduit.

Providing other raceways (cable tray, bridle rings, etc.)

SPECIAL CONDITIONS

Owner's representative or engineer shall be permitted to relocate any fixture, device or equipment outlet prior to installation within a 15 foot limit at no additional change in contract price.

The communication contractor shall complete his work or any part thereof at such time as may be designated by the owner's representative, so that it can be used for temporary or permanent use. Such use of the system shall not be construed as an acceptance of same by Owner.

MATERIALS AND EQUIPMENT

Materials installed shall be new, full weight, of the best quality. All similar materials shall be of the same type and manufacturer. All materials, apparatus and equipment shall bear the Underwriter's Laboratory, Inc. label where regularly supplied.

Contractor is responsible for the safety and good condition of the materials and equipment installed until final acceptance by the Owner. Materials shall be stored to prevent damage or weathering prior to installation.

When several materials, products or items of equipment are specified by name for one use, the contractor may select any one of those specified and shall include with his bid an Equipment List listing the equipment selected.

Bidders may bid on other materials, products or equipment. All material manufacturers listed in the contract documents, as an equal shall be equal in quality, performance, aesthetics, and product support to that specified. Other products, material, article, device, fixture or form of construction not mentioned as approved the Engineer must review equal. Request for approval must be made in writing and approved by the Architect ten (10) days prior to bid opening date, and issued by addendum.

The responsibility for costs incurred from deviation from the base equipment shall be the equipment supplier and this contractor. Use of any equipment will be considered as a statement that clearances and arrangements have been checked and found satisfactory.

STANDARDS

The applicable provisions of the following standards shall govern. All communication equipment must contain UL label and be manufactured and assembled in the USA.

All work shall be installed in strict accordance with the latest edition of all applicable codes including (but not limited to) the following codes and standards.

- National Electrical Code, NFPA 70.
- Ohio Basic Building Code.
- Kentucky Building Code.
- K.E.T.S. Building Wiring Standards.
- Life Safety Code, NFPA 101.
- City of Cincinnati Building Code.
- Local Electrical Codes.
- Local utility company requirements.
- A.D.A. requirements.

EXPLANATION AND PRECEDENCE OF DRAWINGS

For the purposes of clearness and legibility, drawings are essentially diagrammatic and although size and locations of equipment are drawn to scale wherever possible, Contractor shall make use of all data in all of the contract drawings and shall verify this information at building site.

The drawings indicate required size and points of termination of wiring and suggest proper routes to conform to the structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets, and it shall be the work of this section to coordinate the installation of wiring and equipment in such manner as to conform to structure, avoid obstructions, preserve headroom and keep openings and passageways clear without further instructions or cost to the Owner.

The communications contractor shall coordinate his work with all other trades and locate equipment accordingly. This contractor shall refer to coordination drawings of the other trades. Any communications work fabricated or installed before the above referenced coordination with all other trades will be done at the respective contractors' risk.

It is intended that all apparatus be located symmetrical with architectural elements and shall be installed at exact height and locations as shown on architectural drawings.

The contractor shall fully inform himself regarding all peculiarities and limitations of space available for installation of all work and materials furnished and installed under the contract. He shall exercise due and particular caution to determine that all parts of his work are made quickly and easily accessible. Although the locations of the equipment and conduit may be shown on the drawings in certain positions, the architectural details and conditions existing at the job site shall guide the Contractor, coordinating his work with that of others. Provide all offsets as required to provide a neat workmanlike arrangement.

Immediately upon award of contract and before any work is started, the contractor shall confer with the engineer or his representative concerning the work under these sections.

PERMITS AND REGULATIONS

All communication materials used in this work and all workmanship tests performed therein, unless otherwise specified shall conform to the latest rules, regulations and specifications of the National Electrical Code, the National Board of Fire Underwriters, local and state codes having jurisdiction and utility company.

Any discrepancy between these drawings and specifications and the codes, laws, ordinances, rules and regulations shall be immediately brought to the attention of the engineer, prior to any installation.

This contractor shall obtain and pay for all permits or certificates of inspection and approval required for this branch of the work.

Owner shall be furnished with certificates of final inspection and approval prior to final acceptance of this branch of the work.

SUPERINTENDENT

The contractor shall furnish the service of an experienced superintendent who shall be constantly in charge of the work, together with the qualified journeymen wireman and specialists as required to properly install, connect, adjust, start, operate and test the work involved.

The superintendent's qualifications shall be subject to the review and acceptance by the owner's representative. Unless the owner's representative grants prior special permission, the same communication superintendent shall be utilized throughout the duration of the project.

SUBMITTALS

All items of material and equipment shall be listed on an Equipment List prepared by the Contractor and shall be reviewed by the Engineer prior to the start of any work. Submittal shall be provided in a timely manner allowing for long lead items. No item of equipment will be permitted on the site until acceptance of that equipment has been given. Copies of drawings and manufacturer cuts and performance data will be required for approval. Submittals shall be organized in same order as listed in equipment list and include reference to page and paragraph numbers of the specifications and shall be bound in sets; all sets identical. The Contractor is not authorized to purchase any material until the Engineer reviews the shop drawings.

Submittals shall include a detail diagram of all mounting devices and method of rigging those devices to the structure.

Submittals shall clearly indicate sufficient definition so that they can be properly reviewed for compliance with contract documents.

See Division 1 Section "Submittals".

PRODUCT DELIVERY, STORAGE AND HANDLING

Deliver equipment and materials according to factory shipping requirements. Pack components in factory-fabricated protective containers. Units shall be delivered in sections of such size as will pass through available openings.

Store equipment and materials in clean dry place and protect from weather and construction traffic. When stored inside, do not exceed structural capacity of the floor.

Handling and rigging of equipment and products shall be as recommended by the manufacturer. Components and equipment damaged during shipment or handling shall not be installed. Replace and return damaged components to the manufacturer.

QUALITY ASSURANCE

Contractor if requested shall demonstrate his ability to perform all work to be included under the contract. Assurance if requested, shall be in the form of a list of past projects of similar size and complexity and a list of six (6) references pertaining to those projects. Failure to demonstrate these quality assurances shall be taken as a statement of the contractor's inability to perform.

Contractor shall have a minimum five (5) years experience in the installation of communication systems similar to the systems specified.

The quantity or quality level shown or specified shall be the minimum provided or performed. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for the context of the requirements. Should there be a conflict between the plans and specifications, the greater quantity or better quality shall be furnished.

Install all equipment and materials in strict accordance with manufacturer's written instructions.

Tighten communication connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals to comply with tightening torque specified by applicable UL Standards. Accomplish tightening by utilizing proper torque tools, including torque screwdriver, beam-type torque wrench, and ratchet wrench with adjustable torque settings. Ensure that sealing grommets expand to form watertight seal.

Upon completion of installation of equipment and communication circuitry, energize circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with re-testing.

Prior to energizing, check installed wires and cables to determine insulation resistance levels to assure requirements are fulfilled. Prior to energizing, test wires and cables for connections, for communication continuity and for short-circuits.

SPECIFICATIONS

Wherever the words "Contractor" or "This Contractor" "Subcontractor" appears in Division 17 specifications or on electrical drawings, it shall refer to the Division 17 Communications Contractor (or sub-contractor of the Communication Contractor where applicable).

Wherever the word "Provide" appears on plan drawings or in Division 17 specifications, it shall be interpreted to mean that the communication contractor shall "Furnish and Install", including all necessary accessories to render respective system fully operational.

Specifications shall be interpreted in connection with the drawings herein before described, and if anything is shown on drawings and not mentioned in the specifications, or vice versa, it is to be included in the work the same as though clearly set forth by both.

Furthermore, all materials or labor previously required to fully complete the work shall be included in the contractor's work even though each item necessarily involved be not specifically mentioned or shown. Such work and/or materials shall be of the same grade or quality as the parts actually specified and shown.

Should there be a conflict between the plans and specifications, the greater quantity or better quality shall be furnished.

CLEANING EQUIPMENT AND PREMISES

Clean all parts of the apparatus and equipment. Exposed parts, which are to be painted, shall be cleaned of cement, plaster and other materials and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all corners and cracks scraped out.

Exposed metal work shall be brushed down with steel brushes to remove rust and other spots and left smooth and clean. Remove trapped elements during cleaning and flushing period, after which they shall be replaced and adjusted.

During the progress of the work, the contractor shall clean up after his men and leave the premises and all portions of the building in which he is working in a clean and safe condition. This cleaning shall occur on a daily basis.

PROJECT CLOSEOUT

General

Final payment of contract will not be made until receipt, review and acceptance, by the owner's representative, of all documentation defined hereafter.

Refer to Division 1 Section 01700 "Contract Closeout".

Where applicable, refer to applicable General Conditions and similar sections of the project manual for details on record drawing submittals. In addition to the requirements specified in Division 1 or other applicable project manual sections, include the following as a minimum.

Owner shall be furnished with certificates of final inspection and approval prior to final acceptance of this branch of the work.

The owner's representative shall make arrangements for a meeting at such time as will be convenient to all parties concerned for the purpose of instructing the designated personnel on the correct operation and maintenance of each individual system furnished and/or installed by this contractor under this contract. These instructions shall be videotaped (VHS format) by the communication contractor with one tape submitted for each O & M manual.

The communication contractor shall be responsible for the proper instruction of each system to the satisfaction of the owner's representative.

Record Documents

In addition to the requirements specified in Division 1 or other applicable project manual sections, include the following for record documents.

Make arrangements for obtaining two complete sets of communication prints which shall be used to provide record drawings which shall be separate, clean, prints reserved for the purpose of showing a complete picture of the work as actually installed (including routing of all conduit and cables).

These drawings shall also serve as work progress report sheets and the communication contractor shall make any notations, neat and legible thereon daily as work proceeds. The drawings shall be available for inspection at all times and shall be kept at the job at a location designated by the owner's representative.

Maintain the clean, undamaged set of prints of Contract Drawings as well as a set of submittal drawings and coordination drawings where applicable. Mark the sets to show the actual installation where the installation varies from the Contract Documents as originally shown. Record drawings shall include locations of underground and concealed items if placed other than shown on the Contract Documents. Do not permanently conceal any construction until this required information is recorded. Mark which drawing is most capable of showing conditions fully and accurately. Where shop drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

Record documents shall show changes in: size, type, capacity, etc., of material device or piece of equipment, location of device or piece of equipment; location of outlet or source of building service systems; routing of piping, conduit, or other building services. These drawings shall also record location of concealed equipment, communication service work, conduits and other piping/work by indication of measured dimensions to each line from readily identifiable and accessible walls or corners of building. Indicate all approved substitutions, contract modifications, and actual equipment and materials installed.

For communication work installed below slabs, pavements, grade, etc., these drawings shall also record location of nearby concealed water piping, sewers, wastes, vents, ducts, conduit and other piping, etc. by indication of measured dimensions to each line from readily identifiable and accessible walls or corners of building and from adjacent communication work. Show invert elevation of underground communication work relative to work installed by other trades.

Upon substantial completion of the work, pay for and make arrangements for obtaining a complete set of erasable blackline reproducible drawings. All information from the print record drawings shall be neatly drafted onto the above referenced reproducible. Neatly erase and redraft work on the reproducible as required to reflect the work as actually installed. Perform drafting in a manner in which all work shall be shown in its actual locations, existing as well as new, by erasing inaccurate locations and redrawing proper routing/locations. This applies for all concealed work as well as work visible. Utilization of CAD for these drawings is preferred and related CAD files will be made available to the contractor.

Affix near the titleblock on each drawing of the set of record drawing prints and the set of reproducible the Contractors' Company Names, signature of Contractors' Representative and current date. Deliver one set of prints to the engineer. Deliver the second set of prints, the original reproducible and the marked-up field prints to the architect.

All prints and reproducible shall be signed and dated by the both the general contractor and the communication contractor.

In addition to the above, provide "as-built" record documentation for shop drawings (and coordination drawings where applicable).

Maintenance Manuals

In addition to the requirements specified in Division 1 or other applicable project manual sections, include the following.

Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.

Manufacturer's printed operating procedures shall include start-up, break-in, normal operating instructions, regulation, control, stopping, shutdown, and emergency instructions.

Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and re-assembly; aligning and adjusting instructions.

Provide a minimum of three neatly bound (3-ring binder) copies of maintenance and instruction (O & M) manuals, including a parts list pertaining to all equipment furnished and/or installed by the communication contractor. Submit to owner's representative for review.

Manuals shall be bound in hard cover, post type binders.

Manuals shall contain the following as a minimum:

- 1) Index, typed at front w/typed tabs for each section;
- 2) Lists of all materials and equipment furnished with name, address and telephone number of vendor;
- 3) Operating Instruction Manuals and Service Manuals for all equipment furnished by the Communication Contractor;
- 4) A complete set of final approved shop drawings as submitted during construction;
- 5) A complete spare parts schedule for all components of all equipment furnished and/or installed under this contract; the schedules shall not be factory generic information, but shall be complete and accurate for the equipment actually provided.
- 6) A complete set of detailed wiring diagram and schematic drawings for all components of all systems furnished and/or installed under this contract; the drawings shall not be factory generic information, but shall be complete and accurate for the equipment actually provided.

Guarantee

The contractor shall provide a guarantee in written form stating that all work, materials, equipment and parts shall be free of defect for a period of one year from the date of owner's final acceptance, and shall repair, revise or replace at no cost to the owner any such defects occurring within the guarantee period.

Contractor shall also state in written form that any items or occurrences arising during the guarantee period will be attended to in a timely manner and will in no case exceed four (4) working days from date of notification by owner.

Any defective items or work shall be removed and replaced at the contractor's expense and to the satisfaction of the owner's representative and the Engineer.

END OF SECTION

SECTION 17020

BASIC MATERIALS AND METHODS

EXPLOSIVES

Use of explosives shall not be permitted.

WELDING

Welding shall not be performed under Division 17.

HIGH VOLTAGE WIRING

All 120 VAC wiring and terminations shall not be performed under Division 17

COMMUNICATIONS INSTALLATIONS

All work installed in finished areas shall be concealed. All work installed in unfinished areas may be exposed at the discretion of the Owner's representative.

Sequence, coordinate, and integrate installations of communications materials and equipment with the Division 16 electrical contractor (any other applicable trade) as for efficient flow of the Work.

Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible.

Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and architectural/structural components.

Install equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations.

Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

Verify all dimensions by field measurements. Take measurements and be responsible for exact size and locations of all openings required for the installation of work. Figured dimensions are reasonably accurate and should govern in setting out work. Where detailed method of installation is not indicated or where variations exist between described work and approved practice, direction of the owner's representative on job shall be followed.

The symbols used to indicate the purpose of which the various outlets are intended are identified in the Legend.

The conductors terminating at each wired outlet shall be left not less than 8" long at their outlet fittings to facilitate installment of devices.

If during construction it becomes apparent that certain minor changes in layout will effect a neater job or better arrangement, such alterations shall be made a part of the contract. Engineer's review shall be obtained before making such changes.

Workmanship throughout shall conform to the standards of best practice. Marks, dents or finish scratches will not be permitted on any exposed materials, fixtures or fittings. Inside of panels and equipment boxes shall be left clean.

COORDINATION

Coordination shall commence immediately upon award of contract. Failure of this contractor in coordinating (including providing related information to other trades for review) in a timely manner, shall not result in any subsequent additional reimbursement, special allowances or additional construction time being made for any facet of the project. Any work fabricated or installed before properly coordinating with all other trades will be done at this contractor's risk.

Plans are diagrammatic indicating design intent and indicating required size, points of termination and, in some cases, suggested routes of raceways, etc. However, it is not intended that drawings indicate fully coordinated conduit routing, all necessary offsets, etc. All cable assemblies, etc. shall be run as straight as possible and symmetrical (perpendicular to or parallel with) with architectural items and in a consistent elevation. Work installed diagonal to building members shall not be permitted.

The contract document drawings are an outline to indicate the approximate location and arrangement of required work. The drawings shall be followed as closely as possible in coordination and in execution of the work.

The Division 17 contractor shall work in harmony with all building contractors and sub-contractors, so as not to cause any delays in pouring concrete, building masonry walls, etc. The communications contractor shall consult the Architectural, Plumbing, HVAC and Structural plans in all instances before installing his work so that his work will not interfere with those branches.

This contractor shall participate in coordination efforts and in preparation of coordination drawings prior to fabrication or installation of any equipment, materials, etc. Coordinate actual clearances of all installed equipment.

Conflicts in equipment and materials shall be corrected prior to installation. Should there be a conflict with drawings of other trades, this contractor shall work with the trades to correct the conflict while coordinating the project (prior to installation). If the conflict cannot be resolved, refer the matter to the owner's representative for a final decision as to method or material. This contractor shall refer to drawings of all other trades for details, dimensions and locations of other work and route their work so as not to conflict with any other branch. Any work installed or equipment placed in position by this contractor creating a conflict shall be readjusted to the satisfaction of the owner's representative at the expense of this contractor.

IDENTIFICATION

General

Submit manufacturer's data on identification materials and products. Submit detailed nameplate schedule indicating proposed nomenclature, colors, text heights, fastening methods, etc. If requested by Owner's representative, submit samples of each color, lettering style and other graphic representation required for each identification material or system.

Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.

Where identification is to be applied to surfaces, which require finish, install identification after completion of painting.

Comply with governing regulations and requests of governing authorities for identification of work.

Cable and Conductor Identification

Provide manufacturer's standard self-adhesive conductor markers of wrap-around type, write-on type with clear plastic self-adhesive cover flap; numbered to show cable identification. Provide on both ends of all conductors of all systems.

All conductors of all systems shall have color coded insulation. All cables of all systems shall have color coded jackets, with different colors used for the various systems (review with engineer and owner prior to ordering cables). Match color schemes with marking system used in existing systems (where applicable), shop drawings, contract documents, and similar previously established identification for project's work. Apply cable/conductor identification on each cable in each box/enclosure/cabinet for cables which are not available with color coded insulation or jackets.

END OF SECTION

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SECTION 17030

COMMUNICATION SYSTEMS SPECIAL REQUIREMENTS

GENERAL

The communication system equipment suppliers shall provide complete design and installation drawings. These drawings shall show layouts, conduit sizes, number and types of cables/conductors required to all components and detailed wiring connections required at each type of device. The final vendor designs shall be in full compliance with requirements of all authorities having jurisdiction. In addition to the one year warrantee required under Division 17 for all work, provide the following under base bid.

One year service contract (beginning after Owner's final acceptance of the work).

Cost of renewing each contract for an additional one, two and three year period at the Owner's option.

Unit prices (including Owner's discount) in "today's dollars" for all system components which could be affected by system expansions and by ongoing maintenance.

Provide all required design, accessories, devices, supplemental wiring, cable, programming etc. as required to render all systems fully operable. Each system shall be programmed, checked and tested by a certified factory technician. After making all tests and corrections, the systems shall be demonstrated to the Owner's Representatives and the authorities having jurisdiction.

CUSTOM PROGRAMMING, CONFIGURATION & IDENTIFICATION

All custom programming described below shall be provided for all programmable systems and all systems with any room number identifications which are required for successful system operation. Wherever the term "programming" is used below, it shall be taken to mean "programming, configuration and identification".

Custom programming shall be provided in full. Room names and numbers may change from architectural drawing names and numbers to actual Owner's room names and numbers. Provide all interim and permanent programming and configuration work under base bid.

All programming related services (including all required machine language, English language, etc.) associated with rendering all work fully operational shall be provided and neatly documented in detail by the respective vendors. Archive all intermediate and final programming work as required. Provide, replace and/or re-burn EPROM's and other integrated circuits as required.

All programming shall be custom and detailed to a level satisfactory to the Owner, including revised room numbers, revised room names, etc. Provide neatly typed orderly and logical submittal of proposed programming for review; prior to entering data, revise this submittal as much as required to satisfy the Owner. Determine specific requirements in field.

Provide programming for all auxiliary control and interface functions. Provide custom programming for all address labels. Provide detailed English language print statements for each system point/address and for each respective auxiliary control sequence. These print statements shall include as many characters, sentences, lines or paragraphs as required to provide extremely detailed descriptions of system status including any alarm or trouble condition and status of related auxiliary controls. The level of detail shall be at the discretion of the Owner. Remote enunciators shall also include clear specific English language descriptions.

EXISTING SYSTEMS

It shall be the collective responsibility of the successful communication technology contractor and the respective system manufacturer's representative, prior to bidding, to familiarize themselves with existing characteristics, devices, equipment, cabling, configuration, components, etc. of all affected systems so that all expansions/extensions/retrofits are fully compatible with the existing conditions and a complete fully operable system will be provided under Division 17 base bid. Any resulting modifications and/or supplements to Division 17 documents, which may be required accordingly, shall be considered to be included under base bid.

Programming services shall be provided for all new work, for all retrofit work and for all interfaces with new and existing systems. Provide schedule for cross reference of all new system labels to nomenclature used to enter same into the existing system.

Prior to beginning any work on any existing system, verify that the system is in proper working order; if not, bring defects to the attention of the Owner and the Construction Manager. If no notification occurs, it is assumed that the system was in working order and any subsequent system problems could become the responsibility of the Electrical Contractor.

PHASED CONSTRUCTION

Vendors submittal drawings shall account and indicate differentiation for all construction phasing and sub-phasing. All of the above custom programming (including all required machine language, English language, etc.), testing, certification, documentation, etc. related services shall be provided after each phase (and sub-phase) of the project (for projects with multi-phase construction) as required to render all systems fully operable after each construction phase. Room numbers shall change from architectural drawing names & numbers to actual Owner's room names & numbers, after each phase of construction. At the end of all construction phases, room names & numbers may change further.

Provide all interim and permanent programming and configuration work under base bid. Replace or re-burn EPROM's and other integrated circuits as required to accommodate multiple construction phases. Warrantee periods shall not begin until final acceptance of all work by the Owner after completion of the final construction phase.

SOFTWARE UPGRADES

Latest release of system software shall be provided (furnished, installed and adapted) at no additional cost to base bid under the following conditions.

Year 2000 upgrades.

Upgrades at final close-out of project, where system software originally installed has been upgraded.

END OF SECTION

SECTION 17710

TELEPHONE AND DATA CABLE PLANTS

PART 1 - GENERAL

SUMMARY

Unless noted otherwise on drawings or herein, furnish and install complete working telephone (voice) and data cable plants including all cables, wall-jacks, wall plates, labeling, blocks and terminations required for the telephone and data outlets shown on the drawings.

Coordinate with Division 16 electrical contractor including electrical boxes and fittings, and raceways, to properly interface installation of this work with other work.

All wiring terminations, and testing of this cable plant shall be performed by an experienced Data/Telephone installation organization having a minimum of 5 years experience.

The installation contractor shall provide documentation (with bid) proving at least five years company experience in successful cabling installations similar to the systems involved in this project.

All work associated with the Telephone and a Telephone and Data Cabling System Contractor shall provide Data Cabling System. This contractor shall provide documentation and references (with bid) as required to satisfy the Owner and Engineer as to the true qualifications of the installing contractor as an experienced, qualified Telephone and Data System Contractor.

Submit manufacturer's data on all system components and labeling. Submit layout drawings of ITS system-related components and accessories. Submit wiring diagrams for ITS system, including rack and terminal connections, patching, labeling and cable scheduling, etc.

Prior to time of substantial completion, the Installer shall submit 4 copies of an agreement for continued service and maintenance of the cable system related components and accessories, for Owner's possible acceptance. Offer terms and conditions for furnishing parts and providing continued testing and servicing, including replacement of materials and equipment, for one-year period (first year beyond the base bid one-year warranty) with option for renewal of Agreement by Owner.

The Owner reserves the right to reject any Subcontractor who does not satisfy the Owner as to their reliability and/or technical capability.

SCOPE

The installation of the data cable plant/computer cabling work shall be a "turnkey" system so that the Owner simply has to place microcomputer/terminal/printer equipment in place and plug in the respective cabling. All conduit, station cable assemblies, terminal connectors, terminations, raceway systems, labeling, etc. required for the data outlets shown on the drawings shall be furnished and installed by this Subcontractor. Wiring Scheme shall be T568B. All installation shall be in strict accordance with EIA/TIA 568 A&B, 569,606 & 607.

This contractor shall provide all devices and cable required to meet the requirements shown on the plan documents. All wall plate wiring shall have its wiring return to a wall mounted rack located on the West wall of Electrical Equipment Room 112.

Any symbols shown, as combination of telephone and data, shall have one of each type of cable terminated at that plate. Any symbols indicating a single application shall have only one of the type of cables indicated by the symbol.

Electrical boxes and fittings, raceways, cable trays, bridge rings, etc. which are required in connection with the installation of telephone and data systems, are specified in Division-16 sections and shall be provided by others.

The following equipment shall be furnished and installed by Owner:

- a) Telephone switch (existing).
- b) Regulated Line Telephone Cable Work.
- c) Telephone Handsets.
- d) Fax Machines and modems.
- e) Host Data Equipment/Hubs.
- f) Work Station Data Equipment (P.C.'s, Terminals, Printers, etc.).
- g) Whip Cords between work station equipment and voice/data jacks.
- h) Optical fiber related work.

PART 2 - EQUIPMENT

GENERAL

Provide color coded conductor insulation and gray outer jacket for all telephone cables.

Provide color coded conductor insulation and blue outer jacket for all data cables.

Provide separate home-run cable for each outlet jack shown ("star"/"radial" topology).

Duplex jacks shall be used where multiple outlets are shown immediately adjacent to each other or stacked on top of each other. Elsewhere, use single jacks.

Field install jack assemblies in wall outlets, floor outlets and systems furniture as required. All jacks (including those for system furniture installation) shall be provided by this contractor.

Data and Telephone cables shall be Category 5 - 4 Pr. #24 UTP, Type CMP/MPP, UL Subject 444. Belden #1585A or BerkTek, Com-Scope equal.

Data and Telephone Jack Receptacles shall be RJ45, Category 5 with lead frame design connector on the rear and mounted on single gang modular plates. Panduit Mini-Com Series Face Plates and receptacles. Plates shall be ivory. Provide red jacks for data and blue jacks for voice. Where jacks are to be installed in floor boxes, provide modular mounting straps configured for a duplex receptacle cover plate.

The Communication Technology Subcontractor shall install data and telephone cables to these station outlets of quantity and type as indicated by the symbol on the drawings.

All 4 pairs of all cables shall be punched down at both ends.

Wiring standard shall be EIA/TIA-568B.

Upon final installation and connections each cable shall be checked and tested for proper polarity, shorts and opens and a written report along with a cable identification schedule delivered to the Architect. All cable tests shall be performed in strict accordance with EIA/TIA 568B.

Furnish free standing self supporting data rack 84" high x 19" wide, DataTel #MK-19-45, with DataTel, HCM series cable management products as required or approved equal from CPI, Homaco, or Great Lakes. Include shelf and drawer accessories as detailed on the drawings. Provide shelves for Owner's hub equipment.

All data cross connect patch panels shall be Category 5 T568B Full Compliance. Panduit DataPatch patch panels or approved equal from AMP or Lucent Technologies.

VOICE (TELEPHONE) OUTLETS AND RELATED WORK

Provide Panduit Mini-Com Series CJ588BU or approved equal from Lucent or Ortronics

Quantity 1 per drop indicated on plan

Provide snap-in (or equivalent) identification at each jack (i.e. "VOICE", or graphic equivalent).

Telephone pin configuration wiring shall be as determined in field to match Owner's existing conditions.

Wall phones shall be mounted at 48" above finished floor to the center of the outlet box. They shall be provided with one cable drop each and with single-gang plaster rings. Provide hanger type wall jack for wall mounted handset.

DATA OUTLETS

Provide Panduit Mini-Com Series CJ588RD or approved equal from Lucent or Ortronics

Quantity 1 per drop indicated on plans

Provide snap-in (or equivalent) identification at each jack (i.e. "DATA", or graphic equivalent).

All data station cable home-runs shall terminate to Owner's rack mounted equipment, as directed by Owner in field.

DATA AND VOICE PATCH PANELS

Panduit DP24588110B data / voice patch panel or approved equal from Lucent Technologies or AMP
Quantity as needed

DATA RACKS

DataTel SGR-20-18, with DataTel HCM series cable management products as required or approved equal from CPI. Include shelf and drawer accessories as required. Provide shelves for Owner's hub equipment.
Quantity as needed

Provide Distribution Rack Grounding Kit installed in the rack. Provide one #6 AWG (3/4" conduit) from Room rack to the electric service ground.
Quantity as needed

Rack shall be provided with vertically mounted Middle Atlantic PD series, Wiremold #G-3000 series plug-strip assemblies with NEMA 5-20R duplex receptacles.
Quantity as needed

Terminate all station cabling to rack-mounted RJ-45, Cat. 5 compatible, patch panels. Provide cross connect patch cords from same to Owner's Concentrator Hubs.

CABLE

Provide Belden CM-00424 CAL - 5B Category 5 Data Cable or approved equal from BerkTek, Prestolite or Lucent Technologies

Provide Belden CM-00424 CAG - 5B Category 5 Voice Cable or approved equal from BerkTek, Prestolite or Lucent Technologies

PART 3 - EXECUTION

INSTALLATION

Use caution not to exceed the allowed bending radius for Cat. 5 cables and not to compromise the integrity of the cables during installation by pulling tie-wraps too tightly, damaging cables, etc. Raceway/Cabling bending radii shall be minimum as directed by cable manufacturer. Use pulling compound or lubricant, where necessary; compound must not deteriorate conductor or insulation.

Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors.

Review all termination and labelling requirements with Owner in advance.

Neatly dress all cable assembly work at all terminal locations and provide secure cable guides as required.

Refer to drawings for schematic representation of this work. The exact mounting heights and locations of all electrical system outlets shall be determined in the field with relation to architectural detail and equipment being served. It shall be the responsibility of this contractor to coordinate all outlet locations in field with owner's representative.

All station cable assemblies shall be terminated and identified by this Subcontractor.

All cables from overhead cable trays shall be neatly dressed behind distribution panels in a manner which provides adequate working space in back of the panels/racks.

Neatly dress all cable assembly work at all racks and at all termination points and provide cable management guides as required.

Work shall be installed in a manner which results in maintaining a minimum distance of 24 inches from feeder/branch circuit raceways and from any ballasted lighting fixture.

CABLE PLANT IDENTIFICATION/LABELLING

Refer to Electrical Identification Section for labelling material/methods.

Specific nomenclature of labels shall be as directed by owner's representative in field. Provide all necessary coordination.

All station cable assemblies shall be provided with permanent adhesive labeling identification by this contractor. Provide transparent adhesive coverings over each label, wrapped around the labels at least two times. The long axis of the labels shall installed be parallel to the long axis of the respective cable assemblies. Labels shall be approximately 1-1/2" long by 3/8" high. Labels and transparent coverings shall not be sensitive to light, heat or moisture. Allow for a minimum of two lines ("to" & "from") per label with a minimum of 12 characters per line.

At Owner's option, provide IBM #GX21-9345 labels in lieu of those described above.

Typical labeling logic shall be as follows. Verify logic in field prior to fabricating labels, etc. Provide all necessary coordination.

Telephone: CFRRRNNT (where C indicates "Student Center", F indicates Floor (1 or 2), RRR is the respective Room Number, NN is the Device Number within the respective room and T indicates Telephone Cable).

Data: CFRRRNN (where C indicates "Student Center", F indicates Floor (1 or 2), RRR is the respective Room Number and NN is the Device Number within the respective room).

As a minimum, provide such labeling identification at the following locations:

- a) on each faceplate at each connector outlet.
- b) on each cable within outlet box at each connector outlet (on sheath after stripping).
- c) on each cable at exit from conduits in closets.
- d) on each cable at exit from conduits to cable tray.
- e) on each cable within each pullbox.
- f) on each cable at each telephone punchdown block and data rack port (on sheath after stripping).
- g) at each data port on the Cable Distribution Panel.
- h) on each cable at each host/hub equipment port.
- i) as otherwise directed in field by Owner.

Provide separately framed (behind glass) label logic legend, securely mounted at within Wiring Closet 226. Similarly provide separately framed (behind glass) reduced floor plan and riser drawings ("as-builts"). Framed legends/drawings shall be clearly legible and shall not be sensitive to light, heat or moisture.

TESTING

This Subcontractor shall perform all necessary acceptance testing insuring that operational parameters at selected points throughout the cable plant facility operate in accordance with manufacturer's hardware

specifications. Upon completion of testing, submit a bound set of printed test results consisting of a separate sheet for each cable tested.

This Subcontractor shall perform all necessary acceptance testing insuring that operational parameters at selected points throughout the cable plant facility operate in accordance with manufacturer's cable assembly and hardware specifications.

All testing shall be tabulated, documented, scheduled and witnessed by Owner's representative. Electrical Subcontractor shall provide all labor, materials, and documentation as required for all testing. Testing shall include, but not necessarily limited to, the following (including all conductors & connectors):

- a) Open circuit/Continuity testing.
- b) Short circuits between conductors of the same cable assembly.
- c) Reversed polarities.
- d) Grounds on individual conductors, either between a conductor and a shield or between a conductor and a grounded object.
- e) Attenuation testing. Submit printed test report for each cable. Include loop resistance, Attenuation, Capacitance, ACR and cable length.
- f) If any cable assembly or conductor or connector is found defective or not per specifications of manufacturer, it shall be immediately replaced with no additional compensation to the Subcontractor.

END OF SECTION

INDEX FOR CASE: 99-065
NORTHERN KENTUCKY WATER SERVICE DISTRICT
Construct Deviation
WATER QUALITY LABORATORY BUILDING

IN THE MATTER OF THE APPLICATION OF NORTHERN KENTUCKY WATER
SERVICE DISTRICT FOR A CERTIFICATE TO CONSTRUCT A NEW AND
LARGER WATER QUALITY LABORATORY BUILDING TO REPLACE OBSOLETE
FACILITIES

SEQ NBR	ENTRY DATE	REMARKS
0001	02/24/99	Application.
0002	02/25/99	Acknowledgement letter.
0003	03/04/99	Filing deficiencies letter, response due 3/19/99.
M0001	03/11/99	RONALD BARROW NORTHERN KY WATER SERV-RESPONSE TO LETTER OF MARCH 4,99 FOR DEFICIENCIES
M0002	04/08/99	RONALD BARROW NORTHERN KY WATER-RESPONSE TO FILING DEFICIENCIES
0004	04/12/99	FINAL ORDER GRANTING CONSTRUCTION



COMMONWEALTH OF KENTUCKY
PUBLIC SERVICE COMMISSION
730 SCHENKEL LANE
POST OFFICE BOX 615
FRANKFORT, KY. 40602
(502) 564-3940

CERTIFICATE OF SERVICE

RE: Case No. 99-065
NORTHERN KENTUCKY WATER SERVICE DISTRICT

I, Stephanie Bell, Secretary of the Public Service Commission, hereby certify that the enclosed attested copy of the Commission's Order in the above case was served upon the following by U.S. Mail on April 12, 1999.

See attached parties of record.

Stephanie J. Bell

Secretary of the Commission

SB/sa
Enclosure

Honorable James M. Honaker
Attorney at Law
Sower Building
219 St. Clair Street
Frankfort, KY. 40601

Honorable John N. Hughes
Attorney at Law
124 West Todd Street
Frankfort, KY. 40601

Charles H. Pangburn
Northern Kentucky Water Service
404 Long Meadow Lane
Covington, KY. 41017

Mr. Dennis L. Willaman
General Manager
Northern KY Water Service District
100 Aqua Drive
P. O. Box 220
Cold Spring, KY. 41076

COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE APPLICATION OF NORTHERN KENTUCKY)
WATER SERVICE DISTRICT FOR A CERTIFICATE)
TO CONSTRUCT A NEW AND LARGER WATER) CASE NO. 99-065
QUALITY LABORATORY BUILDING TO REPLACE)
OBSOLETE FACILITIES)

O R D E R

By application filed March 11, 1999, Northern Kentucky Water Service District ("Northern Kentucky District") has applied for a Certificate of Public Convenience and Necessity to construct a \$1,176,860 waterworks improvement project. The Commission has previously determined that this project, which Northern Kentucky District has designated as Project TT, requires a Certificate of Convenience and Necessity.¹ Having reviewed the application and being otherwise sufficiently advised, the Commission finds that:

1. The proposed waterworks improvement project involves the construction of a water quality testing facility.
2. The proposed waterworks improvement project will replace the existing facility located at Northern Kentucky District's Fort Thomas Treatment Plant.

¹ Case No. 98-079, The Application of Northern Kentucky Water Service District To Construct Various Water Distribution Facilities Under Its Capital Budgets Programs (June 9, 1998).

3. Northern Kentucky District's existing water quality testing facilities are no longer large enough to meet Northern Kentucky District's testing requirements and fail to comply with local and state safety codes.

4. The proposed waterworks improvement project will not compete with any other water utility.

5. Construction of the proposed waterworks improvement project will not result in the wasteful duplication of any existing utility facilities.

6. Humpert Wolnitzek Architects, PSC, of Covington, Kentucky prepared the drawings and specifications for the proposed waterworks improvement project.

7. The Division of Water of the Kentucky Natural Resources and Environmental Protection Cabinet has approved the drawings and specifications for the proposed waterworks improvement project.

8. Estimated total cost of the proposed waterworks improvement project is \$1,176,860.

9. Northern Kentucky District proposes to finance the proposed waterworks project with internal funds.

10. Public convenience and necessity require construction of the proposed waterworks improvement project.

IT IS THEREFORE ORDERED that:

1. Northern Kentucky District is granted a Certificate of Public Convenience and Necessity to construct the proposed waterworks improvement project as set forth in the drawings and specifications contained in its application.

2. Northern Kentucky District shall obtain approval from the Commission prior to performing any additional construction not expressly authorized by this Order.

3. Any deviation from the construction approved shall be undertaken only with the prior approval of the Commission.

4. Northern Kentucky District shall furnish documentation of the total costs of this project including the cost of construction and all other capitalized costs (engineering, legal, administrative, etc.) within 60 days of the date that construction is substantially completed. Construction costs shall be classified into appropriate plant accounts in accordance with the Uniform System of Accounts for water utilities prescribed by the Commission.


5. Northern Kentucky District shall require construction to be inspected under the general supervision of a professional engineer with a Kentucky registration in civil or mechanical engineering, to ensure that the construction work is done in accordance with the contract drawings and specifications and in conformance with the best practices of the construction trades involved in the project.

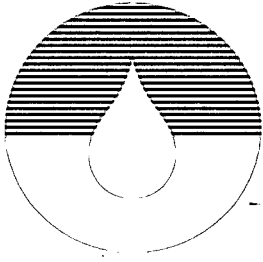
6. Northern Kentucky District shall file a copy of the "as-built" drawings and a certified statement that the construction has been satisfactorily completed in accordance with the contract plans and specifications within 60 days of the substantial completion of the construction certificated herein.

Done at Frankfort, Kentucky, this 12th day of April, 1999.

By the Commission

ATTEST:


Executive Director



Northern Kentucky
Water Service District

March 8, 1999

RECEIVED

MAR 11 1999

PUBLIC SERVICE
COMMISSION

Ms. Stephanie Bell
Secretary of commission
Public Service Commission
730 Schenkel Lane
P.O. Box 615
Frankfort, KY 40602

RE: Case No. 99-065
Deficiencies, if any

Dear Ms. Bell

In response to your letter of March 4, 1999, we believe the information sought is already apparent from Northern's filing:

- C-1. The proposed location of the new construction is merely the replacement of a laboratory building "at the Fort Thomas Treatment Plant" (Please see Application, Paragraph 8). Exhibit F is a map of the area.
- C-2. Plans and specs are shown on Exhibit B.
- C-2. The building does not compete.
- F. The exchange of new for the old will not materially affect cost of operation. Northern's accounts are not maintained by separate building units.

As stated in the Application at Paragraph 6, the Bid term expires April 15, 1999. Northern requests an Order by April 12, 1999. Hopefully no time has been lost.

Very truly yours,

N. Kentucky Water Service District

Ronald J. Barrow
Asst. General Manager

RJB/ak



COMMONWEALTH OF KENTUCKY
PUBLIC SERVICE COMMISSION
730 SCHENKEL LANE
POST OFFICE BOX 615
FRANKFORT, KENTUCKY 40602
www.psc.state.ky.us
(502) 564-3940
Fax (502) 564-3460
March 4, 1999

Paul E. Patton
Governor

Laura Douglas, Secretary
Public Protection and
Regulation Cabinet

Honorable James M. Honaker
Attorney at Law
Sower Building
219 St. Clair Street
Frankfort, Kentucky 40601

Re: Case No. 99-065
Filing Deficiencies

Dear Mr. Honaker:

The Commission staff has reviewed your application in the above case. This filing is rejected pursuant to 807 KAR 5:001, Section 2, for the reasons set forth below. These items are either required to be filed with the application or to be referenced in the application if they are already on file in another case or will be filed at a later date.

Filing deficiency pursuant to 807 KAR 5:001, Section 9(2):

(c) A full description of the proposed location, route, or routes of the new construction or extension, including a description of the manner in which same will be constructed, and also the names of all public utilities, corporations, or persons with whom the proposed new construction or extension is likely to compete.

(f) An estimated cost of operation after the proposed facilities are completed.

The statutory time period in which the Commission must process this case will not commence until the above-mentioned information is filed with the Commission. You are requested to file six copies of this information within 15 days of this letter. If you need further information, please contact James Rice of my staff at 502-564-3940, extension 411.

Sincerely,

Stephanie Bell
Secretary of the Commission

hv
cc: John N. Hughes
Charles H. Pangburn
Dennis L. Willaman



AN EQUAL OPPORTUNITY EMPLOYER M/F/D



COMMONWEALTH OF KENTUCKY
PUBLIC SERVICE COMMISSION

730 SCHENKEL LANE
POST OFFICE BOX 615
FRANKFORT, KY. 40602
(502) 564-3940

February 25, 1999

Honorable James M. Honaker
Attorney at Law
James M. Honaker
Sower Building
219 St. Clair Street
Frankfort, KY. 40601

Honorable John N. Hughes
Attorney at Law
124 West Todd Street
Frankfort, KY. 40601

Charles H. Pangburn
Northern Kentucky Water Service
404 Long Meadow Lane
Covington, KY. 41017

RE: Case No. 99-065
NORTHERN KENTUCKY WATER SERVICE DISTRICT
(Construct) (Deviation) WATER QUALITY LABORATORY BUILDING

This letter is to acknowledge receipt of initial application in the above case. The application was date-stamped received February 24, 1999 and has been assigned Case No. 99-065. In all future correspondence or filings in connection with this case, please reference the above case number.

If you need further assistance, please contact my staff at 502/564-3940.

Sincerely,

A handwritten signature in cursive script that reads "Stephanie Bell".

Stephanie Bell
Secretary of the Commission

SB/jc

JAMES M. HONAKER
SOWER BUILDING
219 ST. CLAIR STREET
FRANKFORT, KENTUCKY 40601

February 13, 1999

Honorable Helen Helton
Executive Director
Public Service Commission of Kentucky
P. O. Box 615
Frankfort, Kentucky 40602

RECEIVED
FEB 24 1999
PUBLIC SERVICE
COMMISSION

Re: Case No. 99- *case 99-065*
Application of Northern to Construct
Water Quality Laboratory Building

Dear Executive Director Helton:

Tendered herewith is an original and ten (10) copies of Northern Kentucky Water Service District's Application for a Certificate authorizing the construction of a Water Quality Laboratory Building. The Application contains a Table of the 10 Exhibits, A thru J. Exhibits B and C are in only three copies. Staff has advised that three copies will be acceptable. They are bulky documents.

Please advise the undersigned and Mr. Dennis L. Willaman, General Manager, Northern Kentucky Water Service District, 100 Aqua Drive, P. O. Box 220, Cold Spring, Kentucky 41076, if any further information is needed.

Respectfully,



James M. Honaker
Counsel for Northern
Kentucky Water Service
District

JMH:anb

attachments

COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

RECEIVED

FEB 24 1999

PUBLIC SERVICE
COMMISSION

In the Matter of:

APPLICATION OF NORTHERN KENTUCKY WATER SERVICE)
DISTRICT FOR A CERTIFICATE TO CONSTRUCT A NEW) CASE NO.
AND LARGER WATER QUALITY LABORATORY BUILDING) 99-065
TO REPLACE OBSOLETE FACILITIES. FUNDS ARE ON)
HAND.

APPLICATION

1. The full name and address of the Applicant is Northern Kentucky Water Service District, c/o Dennis Willaman, P.E., General Manager, 100 Aqua Drive, P. O. Box 220, Cold Spring, Kentucky 41076.

2. Northern Kentucky Water Service District (Northern, or District), is the lawful successor to the former Campbell County Kentucky Water District (originally established in 1953) and former Kenton County Water District No. 1 (originally established in 1926).

Northern serves some 60,000 retail customers in the northern Kentucky area, plus several cities and water districts at wholesale

for resale. It has the authority and duty to plan, design, finance, construct, install, operate, replace and maintain a water treatment system and water distribution system within its service area approved by the PSC.

3. Northern operates under the provisions of KRS Chapter 74 which constitutes its Articles of Incorporation. It is subject to the jurisdiction of the Public Service Commission, under KRS Chapter 278. Particular reference is made to 807 KAR 5:001, Section 9, and Section 14.

4. Northern, in this Application, seeks a deviation as provided in Section 14 of the Regulations, for any occasion that may arise where strict compliance with a Rule is impracticable or unduly burdensome.

5. Its gross plant is approaching \$150,000,000. Reference is made to Northern's 1997 Annual Report to the Commission on file, for a full description of the existing plant by accounts, and other operations data.

6. There is a demand and need for the proposed Water Quality Laboratory Building replacement. It is in the public interest. Funding will be from accumulated funds on hand. The pending construction bid is \$1,176,860. The bid term expires April 15, 1999. No rate changes are proposed.

7. The subject construction project may be identified as Project TT, being the same Project TT that the PSC classified as requiring a Certificate of Convenience and Necessity in its Order dated June 9, 1998 in Case No. 98-079. Reference is made to Case No. 98-079 for any essential background.

New, and larger, state of the art water quality testing facilities are needed to replace the existing facilities which are old (building circa 1930), inefficient, inadequate; and, provision for growth and potable water have been recognized.

8. Ten Exhibits are herewith submitted as an integral part of the instant Application. They contain the technical data required by the Commission's Rules and Regulations. See Table of Exhibits attached to Application. Northern proposes to construct the replacement facilities in the same general locale as the old plant, at the Fort Thomas Treatment Plant.

9. The proposed construction comports with the District's Master Improvements Plan. Northern's Board of Commissioners has approved this construction.

WHEREFORE, Northern requests the Commission to issue an order approving the District's proposed construction; to issue a Certificate of Public Convenience and Necessity; and to grant Northern all other remedies and relief to which it may be entitled in the public interest.

RESPECTFULLY SUBMITTED,

Charles H. Pangburn III
404 Long Meadow Lane
Covington, KY 41017

James M. Honaker
Sower Building
219 St. Clair Street
Frankfort, KY 40601
(502) 223-0376

John N. Hughes
124 West Todd Street
Frankfort, KY 40601
(502) 227-7270


by 
COUNSEL FOR APPLICANT

TABLE OF EXHIBITS

- A Letter to Staff regarding the Exhibits.
- B Plans and Specifications per Contract. (Three copies).
- C Maps. (Three copies).
- D Division of Water (DOW) Approval.
- E Plumbing Approval.
- F Map of General Area Location.
- G Safety Audit Survey (Black & Veatch).
- H Inspection of Fort Thomas Facility.
- I City of Fort Thomas Fire Inspection.
- J Bid Tabs.


**COMMONWEALTH OF KENTUCKY
COUNTY OF CAMPBELL**

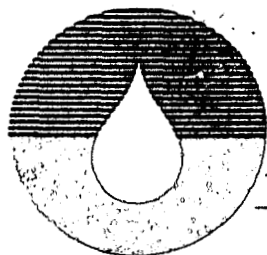
Affiant, Ronald J. Barrow, being first duly sworn, deposes and says that he is Assistant General Manager of Northern Kentucky Water Service District, which is the Applicant in the proceeding styled above; that he has read the foregoing Application and knows the contents thereof, and that the same is true of his own knowledge, except as to matters which are therein stated on information or belief, and that as to those matters he believes them to be true.


RONALD J. BARROW
Assistant General Manager
Northern Kentucky Water Service District

Subscribed and sworn to before me in said County to be his act and deed by Ronald J. Barrow,
Assistant General Manager of Northern Kentucky Water Service District, this 19th day of

January 1999.


NOTARY PUBLIC
Campbell County, Kentucky
My commission expires: 7-26-01



Northern Kentucky
Water Service District

February 23, 1999

Mr. James Rice
Public Service Commission
730 Schenkel Lane
PO Box 615
Frankfort, KY 40602

RE: New Water Quality Laboratory Building

Dear Mr. Rice:

We are submitting with this letter the subject Northern Kentucky Water Service District (District) New Water Quality Laboratory Building design documents for your review. In addition, the following is included:

- 11 copies Kentucky Division of Water letter
- 11 copies plumbing permit
- 11 copies facilities map
- 11 copies Black & Veatch safety audit
- 11 copies Jane Schwarting (OccNet Safety) letter
- 11 copies letter from Captain Gerald Sandfoss, Fire Prevention Officer, City of Fort Thomas

The New Water Quality Laboratory Building will replace the present Laboratory which is located in the Fort Thomas Treatment Plant. When the plant was constructed in 1936, a small area was set aside for laboratory facilities. In 1980, the adjoining tool room was converted into additional laboratory space. Over the years, the District has taken many short term steps to try to keep the old Laboratory in compliance with safety and regulatory requirements. Despite our short term corrections, safety and insurance specialists have documented that the old Laboratory reached its capacity years ago and is now a serious concern.

The Laboratory is essential for day-to-day operations of the water plant. It is also essential for emergency response and customer service. The Laboratory is currently certified by the Kentucky Division of Water to perform bacteriological, inorganic, and organic analysis of approximately 130 parameters.

The New Water Quality Laboratory Building will be built adjoining the Fort Thomas treatment plant on property already owned by the District. It will be approximately 1.5 times the size of the present Laboratory, with the capability of being expanded to twice the original size as new regulations dictate. All current OSHA and ADA regulations have been incorporated into the design, making the New Water Quality Laboratory Building a safe and efficient work space for the District staff.

If you have any questions, please feel free to call me at 606-441-0482 or Mr. Larry Humpert of Humpert Wolnitzek Architects at 606-283-2211.

Thank you very much for your consideration of this project.

Sincerely,

Bob Gabbard, Project Manager

JAMES E. BICKFORD
SECRETARY



PAUL E. PATTON
GOVERNOR

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION

FRANKFORT OFFICE PARK
14 REILLY RD
FRANKFORT KY 40601

January 6, 1999

N. Kentucky Water Service District
3049 Dixie Highway
Covington, Kentucky 41017

RE: DW #0590220-98-059
Water Line Extension
New Water Quality Lab
Campbell County, Kentucky

Dear Sirs:

This is to advise that plans for the above referenced project are APPROVED with respect to sanitary features of design as of this date. This approval is in accordance with the standard N. Kentucky Water Service District specifications and Division of Water stipulations as outlined in our letter of approval dated January 8, 1998.

This approval has been issued under the provisions of KRS Chapter 224 and regulations promulgated pursuant thereto. Issuance of this approval does not relieve the applicant from the responsibility of obtaining any other approvals, permits or licenses required by this Cabinet and other state, federal, and local agencies.

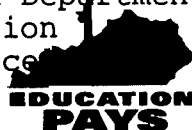
Unless construction of this project is begun within one year from the date of approval, the approval shall expire. If you have any questions concerning this project, please contact Bob Arnett, PE at 502/564-2225, extension 578.

Sincerely,

Vicki L. Ray, Branch Manager
Drinking Water Branch
Division of Water

VLR:RNA:lm

C: Maxfield, Schwartz, Lonnemann & Kohrs, PSC
Campbell County Health Department
Public Service Commission
Florence Regional Office
Drinking Water Files





COMMONWEALTH OF KENTUCKY
DEPARTMENT OF HOUSING, BUILDINGS AND CONSTRUCTION
DIVISION OF PLUMBING

1017 U.S. Highway 127 S. Bay 1
FRANKFORT, KENTUCKY 40601-4322
TEL. (502) 564-3580
FAX (502) 564-0690

THOMAS C. BARNES, JR.
DIRECTOR

December 28, 1998

Campbell County Health Department
N KY DISTRICT HEALTH DEPT
610 MEDICAL VLG DR
EDGEWOOD KY 41017

LP 54061
097754-000-0
OP 41

RE: Northern Kentucky Water Service Water Quality Lab, 700 Alexandria, Fort Thomas

Dear Sir:

This is to advise you that plans covering the above captioned project are approved for the plumbing system only by the Division of Plumbing as of this date with corrections and notes.

It should be understood that this approval is limited to the proposed plumbing installation only.

Inspections must be requested before any part of this plumbing is covered under the floor or concealed in the walls. A final inspection and air test must be requested after all plumbing fixtures have been set. If a private sewage disposal system or water system is used they also must be inspected.

We are returning two sets of plans to you. One set is for your file, the other must be returned to the person who submitted them along with the enclosed copy of this letter.

This approval is valid only if construction is begun within one year from this date.

Very truly yours,

Thomas C. Barnes, Jr.
Thomas C. Barnes, Jr.
Director

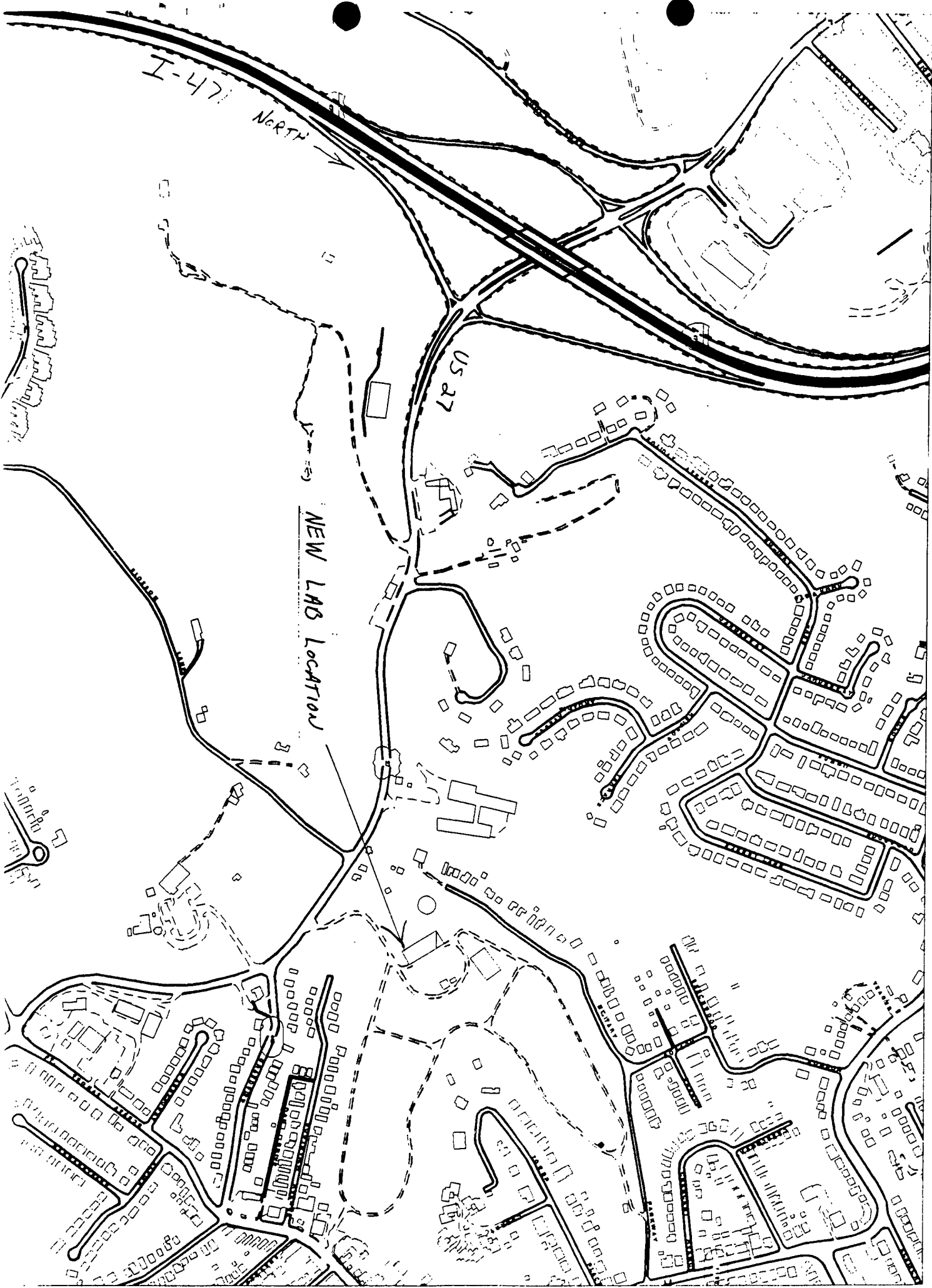
TCB/dgs

cc: Perkins, Plb. Insp.
Humpert-Wolnitze Architects
MSLK Engineers (Plans)

RF
FF RECEIVED FS
HUMPERT WOLNITZEK HOWARD FB

DEC 30 1998

PROJ _____ SUBJ. _____
PC _____ RC _____



**SAFETY AUDIT SUMMARY
BLACK & VEATCH, 1997**

Bob Gabbard

Life Safety

Gas Cylinder Safety

Roof Exit

Chemical and Flammable Material Storage

General Storage Areas

Table 1 Indoor Air Quality	
<u>Location</u>	<u>CO₂ Level</u>
Conference Room	900 PPM
Lab Manager's Office	1,300 PPM
Southwest Office	1,200 PPM
Lab Technician's Desk Facing Window	1,300 PPM
Organic Chemistry Workstation	1,500 PPM
Microbiology Lab	1,500 PPM
Atomic Adsorption Lab	1,600 PPM
Gas Chromatography Preparation Area	2,000 PPM
Gas Chromatography Lab	1,600 PPM
Cryptobiology Lab	1,500 PPM

Table 2
Light Levels

<u>Location</u>	<u>Foot Candles</u>	<u>Glare</u>
Conference Room	78	Yes
Laboratory Manager's Office	150 - 250 (varies)	Yes
Southwest Office	67	Yes
Laboratory Technician's Desk Facing Window	62	Yes
Part-Time Employee's Desk	33	Yes
Organic Chemistry Workstation	75	No
Microbiology Laboratory	150	No
Atomic Adsorption Laboratory	50	No
Gas Chromatography Prep Area	38	No
Gas Chromatography Laboratory	48	No
Cryptobiology Laboratory	126	Yes

Table 3
Office Ergonomic Evaluations

<u>Employee Workstation</u>	<u>Floor to Seat Height</u>	<u>Floor to Keyboard Height</u>	<u>Floor to Eye Height</u>
Mary Carol			
Actual	19.5 in.	31.5 in.	49 in.
Recommended	19.75 in.	29.75 in.	49.75 in.
Difference	0.25 in. low	1.75 in. high	0.75 in. low
Susan			
Recommended	17.5 in.	26.5 in.	45.5 in.
Dave			
Actual	20.5 in.	31.25 in.	42.75 in.
Recommended	19 in.	28 in.	48 in.
Difference	1.5 in. high	3.25 in. high	5.25 in. low
Becky			
Actual	18 in.	30.75 in.	49.75 in.
Recommended	18.75 in.	30.25 in.	43.75 in.
Difference	0.75 in. low	0.5 in. low	6 in. low

Table 4
Ventilation Survey

<u>Ventilation Hood Location</u>	<u>Average Face Velocity</u>	<u>Opening Size</u>	<u>Average Volume</u>	<u>Recommended Volume*</u>
Wet Chemistry Lab	66 fpm	51" x 25"	584	708
Atomic Adsorption	296 fpm (12" from top of opening)	12" x 6"	148	420
Gas Chromatography	<20 fpm	N/A	<20	>50

* = Based on ACGIH ventilation guidelines.

Table A-1
Noise Level Survey

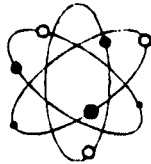
Location	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	16 kHz
Recommended (dBA)		64	56	50	45	41	38	38	37	
Conference Room, Door to Storage Room Closed	53	54	68	52	43	41	40	34	33	29
Conference Room, Door to Storage Room Open	53	54	58	52	43	41	40	34	33	29
Research Chemist's Office	47	49	41	49	45	44	42	39	39	32
Lab Technician's Desk	50	49	50	51	51	52	46	38	31	29
Organic Prep. Area, Vacuum Compressor On	54	56	52	59	58	58	56	52	46	38
Organic Prep. Area, Vacuum Compressor Off	50	51	52	58	61	58	54	48	41	31
Organic Prep. Area, Exhaust Hood On	58	61	58	60	58	56	54	49	40	31
Wet Chemistry Lab, Exhaust Hood and Vacuum Compressor On	64	67	68	66	64	70	61	53	48	40
Wet Chemistry Lab, Exhaust Hood Off, Vacuum Compressor On	55	71	63	65	66	67	65	55	51	44
Microbiology Lab, Vacuum Compressor Off	48	55	55	53	55	53	53	47	42	33
Microbiology Lab, Vacuum Compressor On	50	64	67	55	58	59	56	50	48	40

Table 5
Probable Costs of Recommended Improvements

<u>Item</u>	<u>Estimated Probable Cost</u>
Overall Laboratory Ventilation System	\$100,000 - \$125,000
Lighting Improvements, Entire Lab	\$10,000 - \$20,000
New Lab Workbenches	\$25,000 - \$30,000
New Computer Workstations	\$8,500 - \$10,000
Noise Reduction Options	
A. Relocating Noisy Equipment	\$10,000 - \$20,000
B. Enclosing Noisy Equipment	\$6,000 - \$8,000
C. Replacing Noisy Equipment	\$15,000 - \$25,000
New Eyewash / Safety Shower	\$3,500 - \$5,000
Safety Shower Modesty Curtain	\$100
Repair Wet Chemistry Hood	\$200
Replace GC Hood	\$3,500 - \$5,000
Replace AA Hood	\$4,000 - \$6,000
Install Makeup Air System	\$15,000 - \$20,000
Reconfigure / Remodel Corridors and Workspaces	\$40,000 - \$50,000
Prepare Revised Evacuation Plan; Install New Signs and Exit Lighting	\$500 - \$1,000
Label Gas Storage Rooms and Piping	\$500
Replace Flexible Tubing With Hard Piping	\$1,500 - \$3,000
Install Excess Flow Control Valves	\$1,500 - \$3,000
Separate Gas Cylinder Storage	\$500 - \$1,000

Table 5
Probable Costs of Recommended Improvements

<u>Item</u>	<u>Estimated Probable Cost</u>
Gas Cylinder Handling Options	
A. Motorized Cylinder Handling Cart	\$2,500 - \$3,000
B. Reinstallation of Abandoned Elevator	\$25,000 - \$30,000
C. New Cylinder Lift Elevator	\$20,000 - \$25,000
D. Exterior Gas Storage Facility	\$15,000 - \$20,000
Roof Exit Modifications	\$8,500 - \$10,000
Flammable/Hazardous Material Storage Cabinets	\$4,000 - \$5,000
General Chemical Storage Cabinets	\$2,000 - \$2,500
Modifying Lighting and Electrical Items in Storage Areas	\$2,000 - \$3,000
Upgraded Storage System	\$2,000 - \$3,000
Glassware Storage Cabinets	\$2,000 - \$2,500
Carbon Monoxide Monitor	\$700
TOTAL, Range of Costs	\$249,000 - \$366,500



NEEDS ASSESSMENT OUTLINE BLACK & VEATCH, 1993

Rebecca McCormick

Laboratory Goal: The continuing goal of the District staff is to perform as much of the required analytical work in-house as possible. This capability is important in providing timely response in the event of emergency situations, such as spills on the Rivers.

Basic Laboratory Function: The Water Quality Laboratory's basic function is to operate in collaboration with the other District facilities and operations in order to provide a safe and reliable source water to the citizens of Kenton and Campbell Counties. In addition to performing analyses necessary to support and monitor the District's operations, the laboratory also does contract analyses for outside regulatory agencies and other smaller water utilities.

Compliance with Current Regulations and Guidelines:

Floor Space (in square feet):

existing: 157 needed: 150 - 200 best: 200

Bench Space (in linear feet):

existing: 30 needed: 125 best: 200

Storage (in square feet):

existing: 440 needed: 1,200 best: 1,400

Sinks (number of):

existing: 4 needed: 6 best: 8

Electrical Outlets: It appears that a sufficient number of electrical outlets are currently available in most of the lab areas. The microbiology lab appears to be the only area lacking in that department.

Sample Delivery: Delivery personnel from outside NKWSD have access to all areas of the lab and frequently walk through the various areas. This has the potential to create several problems, including contamination of ongoing or prepped tests or samples; sample accounting and logging errors; and potentially creates liability and safety issues for the District in the event non NKWSD personnel were injured in a laboratory accident. It is recommended a receiving area and counter is provided near the laboratory entrance where all samples are received and logged and passed to lab personnel.

Security: This is of particular concern. Theft of valuable equipment and sabotage of water quality testing and results is a primary concern. The

District may want to consider some form of coded or card entry system. This could also be used to record access to the area when unmanned.

Additional Considerations: If the District decides to remodel the existing facility significant modifications would be required to conform to the Americans with Disabilities Act (ADA),

INSTRUMENTS CURRENTLY IN THE LAB

Atomic Absorption Spectrophotometer
Autoclave (2)
Balance
Centrifuge
Deionized Water Supply (2)
Dishwasher
Drying Ovens 93)
Fluorescent Microscope
Fluoride Meter
GC/Mass Spectrometer
Hot Air Oven
Incubator
Microscope
Muffle Furnace
pH Meter
Refrigerator
Total Organic Carbon Analyzer
Turbidimeter
Spectrometer
Vacuum Pump
Water Bath

New instruments coming year of 1998:

IC Instrument – analysis of Chlorite, Chlorate, Orthophosphate, Nitrate, Nitrite etc.

TO: Christina Verst, Human Resources Manager
Bari Joslyn, Director of W Q & P

FROM: Jane Schwarting, OccNet Safety Consultant

DATE: June 5, 1997

SUBJ: Inspection of the Ft. Thomas Facility

On May 15, 1997, an inspection of the Ft. Thomas facility was conducted. Bill Wulfeck and Mike Casebolt were the contacts and guides during the inspection.

The inspection was conducted in accordance with the state, federal, and local regulations and ordinances.

The following deficiencies were noted during the inspection followed by the reference standard when possible:

1. Fire Safety

- a. In the laboratory, three compressed gas cylinders (1 - Acetylene - highly flammable and; 2 - Nitrous Oxide - supports and intensifies fire), are being stored in a closet which was once the elevator shaft. The closet has walls partially covered with sheets of wood, contains combustible materials and is not equipped with a sprinkler system.

Recommendations -

- 1.) Move cylinders to a closet designed and equipped for their safe storage following NFPA 55, *Standard for the Storage, Use, and Handling of Compressed and Liquefied Gases in Portable Cylinders*.
 - 2.) Clear the closet of combustible materials, cover the walls with dry wall material, and install a limited area sprinkler system. This could possible consist of just one sprinkler head supplied from a nearby water line.
- b. The evacuation plans posted throughout the facility do not distinctly identify (by name) the different rooms. This could cause confusion to visitors or individuals who are unfamiliar with the facility.

Recommendation - Identify the rooms with the name or number posted so that visitors can quickly identify their location on the map.

Example - See the attached evacuation plan of the Edgewood facility.

FIRE DEPARTMENT
WILLIAM E. DIECKMAN, CHIEF
PHONE 606-441-8393
FAX 606-441-5104



130 N. FT. THOMAS AVE.
FT. THOMAS, KY 41075

"The City of Beautiful Homes"

August 11, 1997

Mr. Bob Stark
Kenton County Water
700 Alexandria Pike
Fort Thomas, Ky 41075

Bob:

Listed below are some recommendations from SFM Krebs and myself from our inspection on August 6, 1997:

1. Remove compressed gas cylinders that are presently being stored inside the elevator shaft, and place cylinders in a storage area with a more substantial floor, and in an area where impinging flames would be less likely.
2. All rooms with compressed gas cylinders should be marked to provide emergency personnel with immediate identification.
3. Install a limited sprinkler head at the top of the elevator shaft to prevent vertical travel of fire. In lieu of a sprinkler head, a smoke detector installed at the top of the elevator shaft, connected to a detection system throughout the building to provide easy notification of any fire in this area.
4. Replace existing battery operated smoke detectors with ac powered smoke alarms, with battery back up.

page 2, Report for Kenton County Water District, continued;

5. Identify all gas lines, mark lines as such, and provide location of cylinder supplying the gas for quick access during an emergency.
6. On second floor remove all unnecessary combustible material.
7. All fire extinguishers should be checked, inspected and tagged with the date of work annually.
8. It is recommended that Halon extinguishers be replaced for CO2 or an all purpose extinguisher.
9. Emergency lighting should be checked monthly.

If we can be of any further assistance, please do not hesitate to call.

Sincerely,



Captain Gerald Sandfoss
Fire Prevention Officer

J**NORTHERN KENTUCKY WATER SERVICE DISTRICT****Bid Tabulation Sheet****for****New Water Quality Laboratory Building****Bid Opening: January 15, 1999 2:00 pm**

<u>BIDDER</u>	<u>BID PRICE</u>
Hanson Millay, Inc.	\$1,176,060
Carrerra Construction	\$1,185,000
Hemmer Industries	\$1,206,000
Century Construction Inc.	\$1,246,900
Ashley Development Inc.	\$1,274,500
Toebben Companies	\$1,334,000

Staff recommends Hanson Millay, Inc. as lowest and best bidder.

PROJECT MANUAL

NEW WATER QUALITY LABORATORY BUILDING

FOR THE

NORTHERN KENTUCKY

WATER SERVICE DISTRICT

FORT THOMAS WATER TREATMENT PLANT

700 ALEXANDRIA PIKE, FORT THOMAS, KENTUCKY

RECEIVED
FEB 24 1999
PUBLIC SERVICE
COMMISSION

HUMPERT WOLNITZEK ARCHITECTS, PSC
ARCHITECT

MAXFIELD, SCHWAWRTZ, LONNEMANN & KOHRS, PSC
MECHANICAL/ELECTRICAL ENGINEER

TRUMAN P. YOUNG & ASSOCIATES
STRUCTURAL ENGINEER

DECEMBER 14, 1998

SET NO. _____

8

PROJECT MANUAL

NEW WATER QUALITY LABORATORY BUILDING
FOR THE
NORTHERN KENTUCKY
WATER SERVICE DISTRICT
FORT THOMAS WATER TREATMENT PLANT
700 ALEXANDRIA PIKE, FORT THOMAS, KENTUCKY

HUMPERT WOLNITZEK ARCHITECTS, PSC
ARCHITECT

MAXFIELD, SCHWAWRTZ, LONNEMANN & KOHRS, PSC
MECHANICAL/ELECTRICAL ENGINEER

TRUMAN P. YOUNG & ASSOCIATES
STRUCTURAL ENGINEER

DECEMBER 14, 1998

SET NO. _____

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SECTION 00150
INVITATION TO BID

THE PROJECT

1.01 PROJECT NAME AND LOCATION

- A. Water Quality Laboratory Building.
- B. 700 Alexandria Pike, Fort Thomas, Kentucky.

1.02 OWNER

- A. NORTHERN KENTUCKY WATER SERVICE DISTRICT.
- B. 700 Alexandria Pike.
- C. Fort Thomas, Kentucky 41075.

1.03 ARCHITECT

- A. HUMPERT WOLNITZEK ARCHITECTS
- B. 501 Main Street, Suite 250
- C. Covington, Kentucky 41011-1329 (606-491-2255)
- D. Direct inquiries to: Bud Blackwell.

1.04 STRUCTURAL ENGINEER

- A. Truman P. Young & Associates, 1216 East McMillan St., Cincinnati, OH 45206 (513-861-5655)

1.05 MECHANICAL / ELECTRICAL ENGINEER

- A. MSLK, 5 West 5th St., Covington, KY 41011 (606-491-8511)

1.06 CONTRACT

- A. A Single Contract for all work will be awarded.

BIDDING DOCUMENTS

2.01 LOCATION AND REQUIREMENTS FOR OBTAINING BIDDING DOCUMENTS

- A. Copies of the Bidding Documents may be obtained after 1:00 PM, December 15, 1998 at the office of the Architect.
- B. Prime Bidders (General Contractors) may obtain Bidding Documents with deposit. There is a 2 set limit per Bidder.
- C. All other sub-bidders, major subcontractors and prime bidders desiring additional copies of the bidding

documents must purchase them at cost, plus shipping (if any), from Ohio Blue Print Co., 2348 Gilbert Avenue, Cincinnati, OH 45206 (513-281-9933).

- D. The charge for mailing Bidding Documents is \$25.00 per set, and will be a 3-day delivery. For mailing charge make check payable to "Humpert Wolnitzek Architects".

2.02 TYPE AND AMOUNT OF DOCUMENT DEPOSIT

- A. The Deposit for each set of Bidding Documents is \$50.00. Make checks payable to "Humpert Wolnitzek Architects".
- B. The deposit will be returned to unsuccessful Bidders if the Bidding Documents are returned in good condition within 10 days after receipt of bids. Bid deposits will be returned to non-bidders if Bidding Documents are returned prior to Bid due date.

2.03 LOCATIONS WHERE BIDDING DOCUMENTS ARE AVAILABLE FOR INSPECTION

- A. Bidding Documents may be viewed at the following locations:
 - 1. The Architect's Office.
 - 2. The Plan Room of:
 - a. F.W. Dodge Corporation
 - b. Allied Construction Services

BIDDING PROCEDURES

3.01 DATE, TIME AND PLACE FOR RECEIVING BIDS

- A. Bids are due on January 15, 1999 at 2:00 PM prevailing time.
- B. Deliver Bids to: The Owner's Office, Fort Thomas Water Treatment Plant, Northern Kentucky Water Service District, 700 Alexandria Pike, Fort Thomas, KY, 41075.

3.02 CONDITIONS FOR SUBMITTING BIDS

- A. Submit bids in duplicate, one original and one exact photocopy.
- B. Bids received by fax or email will not be considered.
- C. Bidders may not withdraw their Bids within sixty (60) days of the actual bid opening.

CONSIDERATION OF BIDS

4.01 BID OPENING

- A. Bids will be opened publicly and read aloud immediately after the deadline for receipt of Bids.

4.02 OWNER'S RIGHTS

- A. The Owner reserves the right to waive any informality, irregularity or defect in any Bids.
- B. The Owner reserves the right to reject any or all Bids.
- C. It is the Owner's intent to award a contract on the basis of the lowest and/or best Bid as determined by the

Owner to be in his best interests.

BONDS

5.01 BID BOND

- A. Bid Security in the amount of 5% of the amount of the Base Bid plus any Alternates is required in the form of a Surety Bond.

5.02 PERFORMANCE BOND AND PAYMENT BOND

- A. The successful bidder will be required to post Performance and Payment Bonds in the amount of 100% of the Construction Cost.

END OF INVITATION

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SECTION 00200

INSTRUCTIONS TO BIDDERS

FORM OF INSTRUCTIONS TO BIDDERS

1.01 SEE AIA DOCUMENT A701 (1987 EDITION), INSTRUCTIONS TO BIDDERS FOLLOWING THIS DOCUMENT.

END OF INSTRUCTIONS TO BIDDERS

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AIA DOCUMENT A701-1997*Instructions to Bidders*

TABLE OF ARTICLES

1. DEFINITIONS
2. BIDDER'S REPRESENTATIONS
3. BIDDING DOCUMENTS
4. BIDDING PROCEDURES
5. CONSIDERATION OF BIDS
6. POST-BID INFORMATION
7. PERFORMANCE BOND AND PAYMENT BOND
8. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

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



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AIA DOCUMENT A701-1997
 INSTRUCTIONS TO BIDDERS

The American Institute
 of Architects
 1735 New York Avenue, N.W.
 Washington, D.C. 20006-5292

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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INSTRUCTIONS TO BIDDERS

The American Institute
of Architects
1735 New York Avenue, N.W.
Washington, D.C. 20006-5292

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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INSTRUCTIONS TO BIDDERS

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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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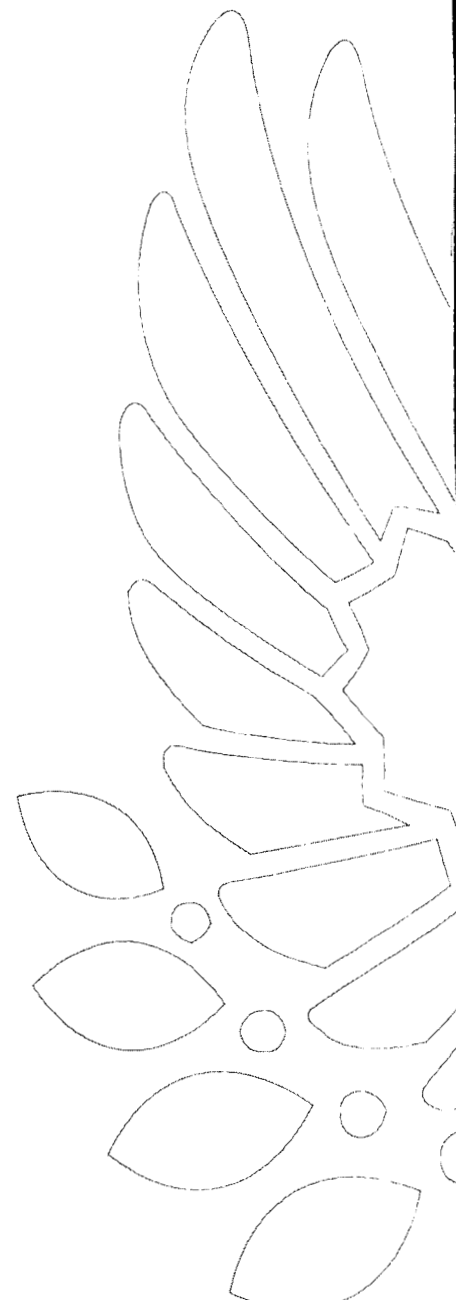


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9/97



SECTION 00410

BID FORM

BID FORM

TO: (THE NORTHERN KENTUCKY WATER SERVICE DISTRICT)

2.01 ADDRESS

- A. 700 Alexandria Pike
- B. Fort Thomas, KY 41075

2.02 PROJECT IDENTIFICATION:

- A. WATER QUALITY LABORATORY BUILDING

2.03 CONTRACT NUMBER:

2.04 DATE: _____ (BIDDER TO ENTER DATE)

2.05 SUBMITTED BY: (BIDDER TO ENTER NAME AND ADDRESS)

- A. Bidder's Full Name _____
 - 1. Address _____
 - 2. City, State, Zip _____

2.06 OFFER

- A. Having examined the Place of The Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by Humpert Wolnitzek Architects for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of:
- B. _____ dollars
(\$ _____), in lawful money of the United States of America.
- C. We have included the required security deposit as required by the Instruction to Bidders.
- D. All applicable federal taxes are included and State of Kentucky taxes are included in the Bid Sum.
- E. All Cash and Contingency Allowances described in Section 01210 are included in the Bid Sum.

2.07 PREVAILING WAGE

- A. Not less than the prevailing hourly wage as determined by the Commissioner of Labor shall be paid to all laborers, workmen, and mechanics performing Work under the Agreement.

2.08 ACCEPTANCE

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

- B. If this bid is accepted by the Northern Kentucky Water Service District within the time period stated above, we will:
 - 1. Execute the Agreement within seven days of receipt of Notice of Award.
 - 2. Furnish the required bonds within seven days of receipt of Notice of Award.
 - 3. Commence work within seven days after written Notice to Proceed of this bid.

- C. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to the Northern Kentucky Water Service District 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.

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

2.09 CONTRACT TIME

- A. If this Bid is accepted, we agree that the Work will be substantially completed by December 15, 1999 and completed and ready for final payment in accordance with will the Contract Documents.

2.10 ADDENDA

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

2.11 BID FORM SIGNATURE(S)

- A. The Corporate Seal of
- B.
- C. (Bidder - print the full name of your firm)
- D. was hereunto affixed in the presence of:
- E.
- F. (Authorized signing officer, Title)
- G. (Seal)
- H.
- I. (Authorized signing officer, Title)
- J. 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 BID FORM

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AIA Document A310

Bid Bond

KNOW ALL MEN BY THESE PRESENTS, that we

(Here insert full name and address or legal title of Contractor)

as Principal, hereinafter called the Principal, and

(Here insert full name and address or legal title of Surety)

a corporation duly organized under the laws of the State of
as Surety, hereinafter called the Surety, are held and firmly bound unto

(Here insert full name and address or legal title of Owner)

as Obligee, hereinafter called the Obligee, in the sum of

Dollars (\$ _____),

for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for

(Here insert full name, address and description of project)

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this _____

day of _____

19 _____

_____	}	_____	(Seal)
(Witness)		(Principal)	
_____	}	_____	(Seal)
(Witness)		(Surety)	
		_____	(Title)
		_____	(Title)

INSTRUCTION SHEET

FOR AIA DOCUMENT A310, BID BOND—1970 EDITION

A. GENERAL INFORMATION

1. Purpose

AIA Document A310 establishes the maximum penal amount that may be due the Owner if the Bidder fails to execute the contract and to provide the required performance and payment bonds, if any. It provides assurance that, if a bidder is offered a contract based on its tendered proposal but fails to enter into the contract, then the Owner will be paid the difference in cost to award the contract to the next qualified bidder, so long as the difference does not exceed the maximum penal amount of the bond.

2. Related Documents

The A310 is not incorporated by reference into other AIA documents. For further reference on bonding procedures, see Construction Bonds and Insurance Guide, 2nd Edition, by Bernard B. Rothschild, FAIA, published by the AIA. See also AIA Document A501, Recommended Guide for Competitive Bidding Procedures; AIA Document 701, Instructions to Bidders; AIA Document A771, Instructions to Interiors Bidders; and AIA Document G612, Owner's Instructions Regarding Construction Contract, Insurance and Bonds, and Bidding Procedures.

3. Use of Non-AIA Forms

AIA Document A310 may be used with any appropriate AIA or non-AIA document. CAUTION SHOULD BE EXERCISED BEFORE ITS USE TO VERIFY ITS COMPLIANCE WITH CURRENT LAWS AND REGULATIONS BY CONSULTING WITH AN ATTORNEY OR A BOND SPECIALIST.

B. COMPLETING THE A310 FORM

1. Modifications

Users are encouraged to consult with an attorney or a bond specialist before completing the A310, particularly concerning the effect of federal, state, and local laws on the terms of this document.

2. Identification of the Parties

The Contractor, the Surety, and the Owner should be identified using their respective full names and addresses or legal titles under which the bond is to be executed. The state in which the Surety is incorporated also should be identified in the space provided.

3. Bond Amount

The dollar amount of the bond should be provided in both written and numerical form.

4. Project Description

The proposed project should be described in sufficient detail to identify (1) the official name or title of the facility, (2) the location of the site, and (3) the proposed building type, size, scope, or usage.

C. EXECUTION OF THE BOND

The bond must be signed by both the Contractor and the Surety. The parties executing (signing) the bond should print their title and impress their corporate seal, if any. Where appropriate, attach a copy of the resolution or bylaw authorizing the individual to act on behalf of the firm or entity. As to the Surety, this usually takes the form of a power of attorney issued by the Surety company to the bond producer (agent) who signs on its behalf.

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AIA Document A311

Performance Bond

KNOW ALL MEN BY THESE PRESENTS: that

(Here insert full name and address or legal title of Contractor)

as Principal, hereinafter called Contractor, and,

(Here insert full name and address or legal title of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto

(Here insert full name and address or legal title of Owner)

as Obligee, hereinafter called Owner, in the amount of

Dollars (\$ _____),

for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS,

Contractor has by written agreement dated

19____, entered into a contract with Owner for

(Here insert full name, address and description of project)

in accordance with Drawings and Specifications prepared by

(Here insert full name and address or legal title of Architect)

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

PERFORMANCE BOND

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the Owner.

Whenever Contractor shall be, and declared by Owner to be in default under the Contract, the Owner having performed Owner's obligations thereunder, the Surety may promptly remedy the default, or shall promptly

- 1) Complete the Contract in accordance with its terms and conditions, or
- 2) Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, or, if the Owner elects, upon determination by the Owner and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and Owner, and make available as Work progresses (even though there should be a default or a succession of

defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the contract price," as used in this paragraph, shall mean the total amount payable by Owner to Contractor under the Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.

Any suit under this bond must be instituted before the expiration of two (2) years from the date on which final payment under the Contract falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators or successors of the Owner.

Signed and sealed this

day of

19

		<i>(Principal)</i>	<i>(Seal)</i>
<i>(Witness)</i>	}		<i>(Title)</i>
		<i>(Surety)</i>	<i>(Seal)</i>
<i>(Witness)</i>	}		<i>(Title)</i>

THE AMERICAN INSTITUTE OF ARCHITECTS



AIA Document A311

Labor and Material Payment Bond

THIS BOND IS ISSUED SIMULTANEOUSLY WITH PERFORMANCE BOND IN FAVOR OF THE OWNER CONDITIONED ON THE FULL AND FAITHFUL PERFORMANCE OF THE CONTRACT

KNOW ALL MEN BY THESE PRESENTS: that

(Here insert full name and address or legal title of Contractor)

as Principal, hereinafter called Principal, and,

(Here insert full name and address or legal title of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto

(Here insert full name and address or legal title of Owner)

as Oblige, hereinafter called Owner, for the use and benefit of claimants as hereinbelow defined, in the

amount of

(Here insert a sum equal to at least one-half of the contract price)

Dollars (\$ _____),

for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS,

Principal has by written agreement dated

19 _____, entered into a contract with Owner for

(Here insert full name, address and description of project)

in accordance with Drawings and Specifications prepared by

(Here insert full name and address or legal title of Architect)

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

LABOR AND MATERIAL PAYMENT BOND

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

1. A claimant is defined as one having a direct contract with the Principal or with a Subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.

2. The above named Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expenses of any such suit.

3. No suit or action shall be commenced hereunder by any claimant:

a) Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to any two of the following: the Principal, the Owner, or the Surety above named, within ninety (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial

accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Principal, Owner or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.

b) After the expiration of one (1) year following the date on which Principal ceased Work on said Contract, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

c) Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the Project, or any part thereof, is situated, or in the United States District Court for the district in which the Project, or any part thereof, is situated, and not elsewhere.

4. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

Signed and sealed this

day of

19

_____	}	(Principal)	(Seal)
(Witness)		_____	(Title)
_____	}	(Surety)	(Seal)
(Witness)		_____	(Title)

SECTION 00500

AGREEMENT

FORM OF AGREEMENT

1.01 AIA DOCUMENT A101, OWNER-CONTRACTOR AGREEMENT FORM - STIPULATED SUM 1987 EDITION, FORMS THE BASIS OF CONTRACT BETWEEN THE OWNER AND CONTRACTOR.

AMENDMENTS TO AGREEMENT FORM

2.01 THE OWNER'S STANDARD ADDENDUM TO THE OWNER-CONTRACTOR AGREEMENT FORM IS ATTACHED FOLLOWING THIS PAGE.

END OF AGREEMENT

AIA DOCUMENT A101-1997

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a STIPULATED SUM

AGREEMENT made as of the _____ day of _____
in the year _____
(In words, indicate day, month and year)

day of

BETWEEN the Owner:
(Name, address and other information)

and the Contractor:
(Name, address and other information)

The Project is:
(Name and location)

The Architect is:
(Name, address and other information)

The Owner and Contractor agree as follows.

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

AIA Document A201-1997, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

This document has been approved and endorsed by The Associated General Contractors of America.



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OWNER-CONTRACTOR
AGREEMENT

The American Institute
of Architects
1735 New York Avenue, N.W.
Washington, D.C. 20006-5292

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement and Modifications issued after execution of this Agreement; these form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. An enumeration of the Contract Documents, other than Modifications, appears in Article 8.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except to the extent specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

3.1 The date of commencement of the Work shall be the date of this Agreement unless a different date is stated below or provision is made for the date to be fixed in a notice to proceed issued by the Owner.

(Insert the date of commencement if it differs from the date of this Agreement or, if applicable, state that the date will be fixed in a notice to proceed.)

If, prior to the commencement of the Work, the Owner requires time to file mortgages, mechanic's liens and other security interests, the Owner's time requirement shall be as follows:

3.2 The Contract Time shall be measured from the date of commencement.

3.3 The Contractor shall achieve Substantial Completion of the entire Work not later than _____ days from the date of commencement, or as follows:

(Insert number of calendar days. Alternatively, a calendar date may be used when coordinated with the date of commencement. Unless stated elsewhere in the Contract Documents, insert any requirements for earlier Substantial Completion of certain portions of the Work.)

, subject to adjustments of this Contract Time as provided in the Contract Documents.

(Insert provisions, if any, for liquidated damages relating to failure to complete on time or for bonus payments for early completion of the Work.)



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OWNER-CONTRACTOR
AGREEMENT

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ARTICLE 4 CONTRACT SUM

4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be _____ Dollars (\$ _____), subject to additions and deductions as provided in the Contract Documents.

4.2 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:
(State the numbers or other identification of accepted alternates. If decisions on other alternates are to be made by the Owner subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

4.3 Unit prices, if any, are as follows:

ARTICLE 5 PAYMENTS

5.1 PROGRESS PAYMENTS

5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

5.1.3 Provided that an Application for Payment is received by the Architect not later than the _____ day of a month, the Owner shall make payment to the Contractor not later than the _____ day of the _____ month. If an Application for Payment is received by the Architect after the application date fixed above, payment shall be made by the Owner not later than _____ days after the Architect receives the Application for Payment.

5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be 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.



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5.1.5 Applications for Payment shall indicate the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

5.1.6 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

- .1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of _____ percent (_____ %). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Subparagraph 7.3.8 of AIA Document A201-1997;
- .2 Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), less retainage of _____ percent (_____ %);
- .3 Subtract the aggregate of previous payments made by the Owner; and
- .4 Subtract amounts, if any, for which the Architect has withheld or nullified a Certificate for Payment as provided in Paragraph 9.5 of AIA Document A201-1997.

5.1.7 The progress payment amount determined in accordance with Subparagraph 5.1.6 shall be further modified under the following circumstances:

- .1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work, retainage applicable to such work and unsettled claims; and (*Subparagraph 9.8.5 of AIA Document A201-1997 requires release of applicable retainage upon Substantial Completion of Work with consent of surety, if any.*)
- .2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Subparagraph 9.10.3 of AIA Document A201-1997.

5.1.8 Reduction or limitation of retainage, if any, shall be as follows:

(If it is intended, prior to Substantial Completion of the entire Work, to reduce or limit the retainage resulting from the percentages inserted in Clauses 5.1.6.1 and 5.1.6.2 above, and this is not explained elsewhere in the Contract Documents, insert here provisions for such reduction or limitation.)

5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

5.2 FINAL PAYMENT

5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when:

- .1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Subparagraph 12.2.2 of AIA Document A201-1997, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.



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5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

ARTICLE 6 TERMINATION OR SUSPENSION

6.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201-1997.

6.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201-1997.

ARTICLE 7 MISCELLANEOUS PROVISIONS

7.1 Where reference is made in this Agreement to a provision of AIA Document A201-1997 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

7.2 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

(Usury laws and requirements under the Federal Truth in Lending Act, similar state and local consumer credit laws and other regulations at the Owner's and Contractor's principal places of business, the location of the Project and elsewhere may affect the validity of this provision. Legal advice should be obtained with respect to deletions or modifications, and also regarding requirements such as written disclosures or waivers.)

7.3 The Owner's representative is:
(Name, address and other information)

7.4 The Contractor's representative is:
(Name, address and other information)

7.5 Neither the Owner's nor the Contractor's representative shall be changed without ten days' written notice to the other party.

7.6 Other provisions:



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ARTICLE 8 ENUMERATION OF CONTRACT DOCUMENTS

8.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated as follows:

8.1.1 The Agreement is this executed 1997 edition of the Standard Form of Agreement Between Owner and Contractor, AIA Document A101-1997.

8.1.2 The General Conditions are the 1997 edition of the General Conditions of the Contract for Construction, AIA Document A201-1997.

8.1.3 The Supplementary and other Conditions of the Contract are those contained in the Project Manual dated _____, and are as follows:

Document	Title	Pages
----------	-------	-------

8.1.4 The Specifications are those contained in the Project Manual dated as in Subparagraph 8.1.3, and are as follows:
(Either list the Specifications here or refer to an exhibit attached to this Agreement.)

Section	Title	Pages
---------	-------	-------

8.1.5 The Drawings are as follows, and are dated _____ unless a different date is shown below:
(Either list the Drawings here or refer to an exhibit attached to this Agreement.)

Number	Title	Date
--------	-------	------



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8.1.6 The Addenda, if any, are as follows:

Number	Date	Pages
--------	------	-------

Portions of Addenda relating to bidding requirements are not part of the Contract Documents unless the bidding requirements are also enumerated in this Article 8.

8.1.7 Other documents, if any, forming part of the Contract Documents are as follows:

(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201-1997 provides that bidding requirements such as advertisement or invitation to bid, Instructions to Bidders, sample forms and the Contractor's bid are not part of the Contract Documents unless enumerated in this Agreement. They should be listed here only if intended to be part of the Contract Documents.)

This Agreement is entered into as of the day and year first written above and is executed in at least three original copies, of which one is to be delivered to the Contractor, one to the Architect for use in the administration of the Contract, and the remainder to the Owner.

OWNER *(Signature)*

CONTRACTOR *(Signature)*

(Printed name and title)

(Printed name and title)

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SECTION 00700

GENERAL CONDITIONS

FORM OF GENERAL CONDITIONS

- 1.01 AIA DOCUMENT A201, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, 1987 EDITION, ATTACHED, IS THE GENERAL CONDITIONS BETWEEN THE OWNER AND CONTRACTOR.

SUPPLEMENTARY CONDITIONS

- 2.01 REFER TO DOCUMENT 00800 FOR AMENDMENTS TO THESE GENERAL CONDITIONS.

END OF DOCUMENT 00700

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AIA DOCUMENT A201-1997*General Conditions of the Contract for Construction*

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11. INSURANCE AND BONDS
12. UNCOVERING AND CORRECTION OF WORK
13. MISCELLANEOUS PROVISIONS
14. TERMINATION OR SUSPENSION OF THE CONTRACT

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

This document has been approved and endorsed by The Associated General Contractors of America.



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ARTICLE 1 GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents consist of the Agreement between Owner and Contractor (hereinafter the Agreement), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, 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 other documents such as bidding requirements (advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or portions of Addenda relating to bidding requirements).

1.1.2 THE CONTRACT

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

The Project Manual is a volume assembled for the Work which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications.

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



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complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

1.2.2 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 which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

1.3 CAPITALIZATION

1.3.1 Terms capitalized in these General Conditions include those which are (1) specifically defined, (2) the titles of numbered articles and identified references to Paragraphs, Subparagraphs and Clauses in the document or (3) the titles of other documents published by the American Institute of Architects.

1.4 INTERPRETATION

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

1.5 EXECUTION OF CONTRACT DOCUMENTS

1.5.1 The Contract Documents shall be signed by the Owner and Contractor. If either the Owner or Contractor or both do not sign all the Contract Documents, the Architect shall identify such unsigned Documents upon request.

1.5.2 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.

1.6 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

1.6.1 The Drawings, Specifications and other documents, including those in electronic form, prepared by the Architect and the Architect's consultants are Instruments of Service through which the Work to be executed by the Contractor is described. The Contractor may retain one record set. Neither the Contractor nor any Subcontractor, Sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect or the Architect's consultants, and unless otherwise indicated the Architect and the Architect's consultants shall be deemed the authors of them and will retain all common law, statutory and other reserved rights, in addition to the copyrights. All copies of Instruments of Service, except the Contractor's record set, shall be returned or suitably accounted for to the Architect, on request, upon completion of the Work. The Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants. The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants appropriate to and for use in



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the execution of their Work under the Contract Documents. All copies made under this authorization shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants. 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' copyrights or other reserved rights.

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 Subparagraph 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 The Owner shall, at the written request of the Contractor, prior to commencement of the Work and thereafter, furnish to the Contractor reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. Furnishing of such evidence shall be a condition precedent to commencement or continuation of the Work. After such evidence has been furnished, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

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

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 Information or services required of the Owner by the Contract Documents shall be furnished by the Owner with reasonable promptness. Any other information or services relevant to the Contractor's performance of the Work under the Owner's control shall be furnished by the Owner after receipt from the Contractor of a written request for such information or services.

2.2.5 Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, such copies of Drawings and Project Manuals as are reasonably necessary for execution of the Work.

2.3 OWNER'S RIGHT TO STOP THE WORK

2.3.1 If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Paragraph 12.2 or persistently fails to carry out Work in



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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 Subparagraph 6.1.3.

2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

2.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-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 after such seven-day period give the Contractor a second written notice to correct such deficiencies within a three-day period. If the Contractor within such three-day period after receipt of such second notice fails to commence and continue to correct any deficiencies, 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 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 other than the Contractor.

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.1 Since the Contract Documents are complementary, before starting each portion of the Work, the Contractor shall carefully study and compare the various Drawings and other Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Subparagraph 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 construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, any errors, inconsistencies or omissions discovered by the Contractor shall be reported promptly to the Architect as a request for information in such form as the Architect may require.

3.2.2 Any design errors or omissions noted by the Contractor during this review shall be reported promptly to the Architect, but 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. The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations, but any nonconformity discovered by or made known to the Contractor shall be reported promptly to the Architect.



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3.2.3 If the Contractor believes that additional cost or time is involved because of clarifications or instructions issued by the Architect in response to the Contractor's notices or requests for information pursuant to Subparagraphs 3.2.1 and 3.2.2, the Contractor shall make Claims as provided in Subparagraphs 4.3.6 and 4.3.7. If the Contractor fails to perform the obligations of Subparagraphs 3.2.1 and 3.2.2, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. The Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents or for differences between field measurements or conditions and the Contract Documents unless the Contractor recognized such error, inconsistency, omission or difference and knowingly failed to report it to the Architect.

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 resulting loss or damage.

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 The Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order.

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

3.5 WARRANTY

3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract



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Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear 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

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

3.7 PERMITS, FEES AND NOTICES

3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit and other permits and governmental fees, licenses and inspections necessary for proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required when bids are received or negotiations concluded.

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

3.7.3 It is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations. However, if the Contractor observes that portions of the Contract Documents are at variance therewith, the Contractor shall promptly notify the Architect and Owner in writing, and necessary changes shall be accomplished by appropriate Modification.

3.7.4 If the Contractor performs Work knowing it to be contrary to laws, statutes, ordinances, building codes, and rules and regulations without such notice to the Architect and Owner, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

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;
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 Clause 3.8.2.1 and
 - (2) changes in Contractor's costs under Clause 3.8.2.2.

3.8.3 Materials and equipment under an allowance shall be selected by the Owner in sufficient time to avoid delay in the Work.



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3.9 SUPERINTENDENT

3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

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 and keep current, for the Architect's approval, a schedule of submittals which is coordinated with the Contractor's construction schedule and allows the Architect reasonable time to review 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

3.11.1 The Contractor shall maintain at the site for the Owner one record copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record field changes and selections made during construction, and one record 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.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

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

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

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

3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required by the Contract Documents the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review by the Architect is subject to the limitations of Subparagraph 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals which 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



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the Contract Documents 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. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Architect without action.

3.12.6 By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

3.12.7 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 which 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 to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed 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 Subparagraph 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 or design criteria required by the Contract Documents.



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3.13 USE OF SITE

3.13.1 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

3.14 CUTTING AND PATCHING

3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner 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 from and about the Project waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials.

3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor.

3.16 ACCESS TO WORK

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

3.17 ROYALTIES, PATENTS AND COPYRIGHTS

3.17.1 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 and to the extent claims, damages, losses or expenses are not covered by Project Management Protective Liability insurance purchased by the Contractor in accordance with Paragraph 11.3, 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



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construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Paragraph 3.18.

3.18.2 In claims against any person or entity indemnified under this Paragraph 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Subparagraph 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 ADMINISTRATION OF THE CONTRACT

4.1 ARCHITECT

4.1.1 The Architect is the person lawfully licensed to practice architecture or an entity lawfully practicing architecture identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Architect" means the Architect or the Architect's authorized representative.

4.1.2 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 new Architect against whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the former Architect.

4.2 ARCHITECT'S 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 (1) during construction, (2) until final payment is due and (3) with the Owner's concurrence, from time to time during the one-year period for correction of Work described in Paragraph 12.2. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with other provisions of the Contract.

4.2.2 The Architect, as a representative of the Owner, will visit the site at intervals appropriate to the stage of the Contractor's operations (1) to become generally familiar with and to keep the Owner informed about the progress and quality of the portion of the Work completed, (2) to endeavor to guard the Owner against defects and deficiencies in the Work, and (3) to determine in general if the Work 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 neither have control over or charge of, nor be responsible 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 Subparagraph 3.3.1.

4.2.3 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.



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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 will have 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 Work in accordance with Subparagraphs 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 with such reasonable promptness as to cause no delay in the Work or in the activities of the Owner, Contractor or separate contractors, while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Paragraphs 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Paragraph 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, will 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, and will issue a final Certificate for Payment upon compliance with the requirements of the Contract Documents.

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.



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The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If no agreement is made concerning the time within which interpretations required of the Architect shall be furnished in compliance with this Paragraph 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretations until 15 days after written request is made for them.

4.2.12 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 initial decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions so rendered in good faith.

4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

4.3 CLAIMS AND DISPUTES

4.3.1 **Definition.** A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims must be initiated by written notice. The responsibility to substantiate Claims shall rest with the party making the Claim.

4.3.2 **Time Limits on Claims.** 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. Claims must be initiated by written notice to the Architect and the other party.

4.3.3 **Continuing Contract Performance.** Pending final resolution of a Claim except as otherwise agreed in writing or as provided in Subparagraph 9.7.1 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.

4.3.4 **Claims for Concealed or Unknown Conditions.** If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then notice by the observing party shall be given to the other party promptly before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall so notify the Owner and Contractor in writing, stating the reasons. Claims by either party in opposition to such determination must be made within 21 days after the Architect has given notice of the decision. If the conditions encountered are materially different, the Contract Sum and Contract Time shall be equitably adjusted, but if the Owner and Contractor cannot agree on an adjustment in the Contract Sum or Contract Time, the adjustment shall be referred to the Architect for initial determination, subject to further proceedings pursuant to Paragraph 4.4.



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4.3.5 Claims for Additional Cost. If the Contractor wishes to make Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Paragraph 10.6.

4.3.6 If the Contractor believes additional cost is involved for reasons including but not limited to (1) a written interpretation from the Architect, (2) an order by the Owner to stop the Work where the Contractor was not at fault, (3) a written order for a minor change in the Work issued by the Architect, (4) failure of payment by the Owner, (5) termination of the Contract by the Owner, (6) Owner's suspension or (7) other reasonable grounds, Claim shall be filed in accordance with this Paragraph 4.3.

4.3.7 CLAIMS FOR ADDITIONAL TIME

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

4.3.7.2 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.

4.3.8 Injury or Damage to Person or Property. If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, 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.

4.3.9 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.

4.3.10 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 Subparagraph 4.3.10 shall be deemed to preclude an award of liquidated direct damages, when applicable, in accordance with the requirements of the Contract Documents.

4.4 RESOLUTION OF CLAIMS AND DISPUTES

4.4.1 Decision of Architect. Claims, including those alleging an error or omission by the Architect but excluding those arising under Paragraphs 10.3 through 10.5, shall be referred initially to the Architect for decision. An initial decision by the Architect shall be required as a



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condition precedent to mediation, arbitration or litigation of all Claims between the Contractor and Owner arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Architect with no decision having been rendered by the Architect. The Architect will not decide disputes between the Contractor and persons or entities other than the Owner.

4.4.2 The Architect will review Claims and within ten days of the receipt of the 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 Architect is unable to resolve the Claim if the Architect lacks sufficient information to evaluate the merits of the Claim or if the Architect concludes that, in the Architect's sole discretion, it would be inappropriate for the Architect to resolve the Claim.

4.4.3 In evaluating Claims, the Architect 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 Architect in rendering a decision. The Architect may request the Owner to authorize retention of such persons at the Owner's expense.

4.4.4 If the Architect 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 provide a response on the requested supporting data, advise the Architect when the response or supporting data will be furnished or advise the Architect that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Architect will either reject or approve the Claim in whole or in part.

4.4.5 The Architect will approve or reject Claims by written decision, which shall state the reasons therefor and which shall notify the parties of any change in the Contract Sum or Contract Time or both. The approval or rejection of a Claim by the Architect shall be final and binding on the parties but subject to mediation and arbitration.

4.4.6 When a written decision of the Architect states that (1) the decision is final but subject to mediation and arbitration and (2) a demand for arbitration of a Claim covered by such decision must be made within 30 days after the date on which the party making the demand receives the final written decision, then failure to demand arbitration within said 30 days' period shall result in the Architect's decision becoming final and binding upon the Owner and Contractor. If the Architect renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence, but shall not supersede arbitration proceedings unless the decision is acceptable to all parties concerned.

4.4.7 Upon receipt of a Claim against the Contractor or at any time thereafter, the Architect or 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 Architect or the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

4.4.8 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 prior to resolution of the Claim by the Architect, by mediation or by arbitration.

4.5 MEDIATION

4.5.1 Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Subparagraphs 4.3.10, 9.10.4 and 9.10.5 shall, after initial decision by the Architect or 30 days after submission of the Claim to the Architect, be



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subject to mediation as a condition precedent to arbitration or the institution of legal or equitable proceedings by either party.

4.5.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect. Request for mediation shall be filed in writing with the other party to the Contract and with the American Arbitration Association. The request may be made concurrently with the filing of a demand for arbitration but, in such event, mediation shall proceed in advance of arbitration or legal or equitable 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.

4.5.3 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.

4.6 ARBITRATION

4.6.1 Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Subparagraphs 4.3.10, 9.10.4 and 9.10.5, shall, after decision by the Architect or 30 days after submission of the Claim to the Architect, be subject to arbitration. Prior to arbitration, the parties shall endeavor to resolve disputes by mediation in accordance with the provisions of Paragraph 4.5.

4.6.2 Claims not resolved by mediation shall be decided by arbitration which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association currently in effect. The demand for arbitration shall be filed in writing with the other party to the Contract and with the American Arbitration Association, and a copy shall be filed with the Architect.

4.6.3 A demand for arbitration shall be made within the time limits specified in Subparagraphs 4.4.6 and 4.6.1 as applicable, and in other cases within a reasonable time after the Claim has arisen, and in no event shall it be made after the date when institution of legal or equitable proceedings based on such Claim would be barred by the applicable statute of limitations as determined pursuant to Paragraph 13.7.

4.6.4 Limitation on Consolidation or Joinder. No arbitration arising out of or relating to the Contract shall include, by consolidation or joinder or in any other manner, the Architect, the Architect's employees or consultants, except by written consent containing specific reference to the Agreement and signed by the Architect, Owner, Contractor and any other person or entity sought to be joined. No arbitration shall include, by consolidation or joinder or in any other manner, parties other than the Owner, Contractor, a separate contractor as described in Article 6 and other persons substantially involved in a common question of fact or law whose presence is required if complete relief is to be accorded in arbitration. No person or entity other than the Owner, Contractor or a separate contractor as described in Article 6 shall be included as an original third party or additional third party to an arbitration whose interest or responsibility is insubstantial. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of a Claim not described therein or with a person or entity not named or described therein. The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.



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4.6.5 Claims and Timely Assertion of Claims. 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.

4.6.6 Judgment on Final Award. 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.

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.

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 will promptly reply to the Contractor in writing stating whether or not the Owner or the Architect, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the Owner or Architect to reply promptly shall constitute notice of no reasonable objection.

5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner 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 change a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitute.

5.3 SUBCONTRACTUAL RELATIONS

5.3.1 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



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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 which 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 Paragraph 14.2 and only for those subcontract agreements which 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.

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.

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 Paragraph 4.3.

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 when directed to do so. 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 which apply to the



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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 Owner shall be reimbursed by the Contractor for costs incurred by the Owner which are payable to a separate contractor because of delays, improperly timed activities or defective construction of the Contractor. The Owner shall be responsible to the Contractor for costs incurred by the Contractor because of delays, improperly timed activities, damage to the Work or defective construction of a separate contractor.

6.2.4 The Contractor shall promptly remedy damage wrongfully caused by the Contractor to completed or partially completed construction or to property of the Owner or separate contractors as provided in Subparagraph 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 Subparagraph 3.14.

6.3 OWNER'S RIGHT TO CLEAN UP

6.3.1 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.



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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 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.

7.2.2 Methods used in determining adjustments to the Contract Sum may include those listed in Subparagraph 7.3.3.

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 Subparagraph 7.3.6.

7.3.4 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.

7.3.5 A Construction Change Directive signed by the Contractor indicates the agreement of the Contractor therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

7.3.6 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the method and the adjustment shall be determined by the Architect on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, a reasonable allowance for overhead and profit. In such case, and also under Clause 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Subparagraph 7.3.6 shall be limited to the following:

- 1 costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
- 2 costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
- 3 rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;



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- 4 costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
- 5 additional costs of supervision and field office personnel directly attributable to the change.

7.3.7. The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the 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.

7.3.8 Pending final determination of the total cost of a Construction Change Directive to the Owner, amounts not in dispute for such changes in the Work shall be included in Applications for Payment accompanied by a Change Order indicating the parties' agreement with part or all of such costs. For any portion of such cost that remains in dispute, the Architect will make an interim determination for purposes of monthly certification for payment for those costs. That 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 4.

7.3.9 When the Owner and Contractor agree with the 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 shall be recorded by preparation and execution of an appropriate Change Order.

7.4 MINOR CHANGES IN THE WORK

7.4.1 The Architect will have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly.

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 Paragraph 9.8.

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

8.2 PROGRESS AND COMPLETION

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

8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance. Unless the date of commencement is established by the Contract Documents or a notice to proceed given



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by the Owner, the Contractor shall notify the Owner in writing not less than five days or other agreed period before commencing the Work to permit the timely filing of mortgages, mechanic's liens and other security interests.

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

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 which 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 Paragraph 4.3.

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

ARTICLE 9 PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

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

9.2 SCHEDULE OF VALUES

9.2.1 Before the first Application for Payment, the Contractor shall submit to the Architect a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the 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 for operations completed in accordance with the schedule of values. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and reflecting retainage if provided for in the Contract Documents.

9.3.1.1 As provided in Subparagraph 7.3.8, such applications may include requests for payment on account of changes in the Work which 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 Such applications may not include requests for payment for portions of the Work for which the Contractor does not intend to pay to a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.



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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 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 Subparagraph 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 the Work has progressed to the point indicated and that, to the best of the Architect's knowledge, information and belief, 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 Subparagraph 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 Subparagraph 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



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opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Subparagraph 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 another contractor;
- 6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- 7 persistent failure to carry out the Work in accordance with the Contract Documents.

9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

9.6 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.

9.6.2 The Contractor shall promptly pay each Subcontractor, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of such Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in 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 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 Payment to material suppliers shall be treated in a manner similar to that provided in Subparagraphs 9.6.2, 9.6.3 and 9.6.4.

9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

9.6.7 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.



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9.7 FAILURE OF PAYMENT

9.7.1 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 arbitration, 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.

9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

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 Clause 11.4.1.5 and authorized by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and



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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 Subparagraph 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

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 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 Subparagraph 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.

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



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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

10.1.1 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 give notices and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable 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 Clauses 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 Clauses 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 Paragraph 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 load or permit any part of the construction or site to be loaded so as to endanger its safety.

10.3 HAZARDOUS MATERIALS

10.3.1 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 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 verify that it has been 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. 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, which adjustments shall be accomplished as provided in Article 7.

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 Subparagraph 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) and provided that such damage, loss or expense is not due to the sole negligence of a party seeking indemnity.

10.4 The Owner shall not be responsible under Paragraph 10.3 for materials and substances brought to the site by the Contractor unless such materials or substances were required by the Contract Documents.

10.5 If, without negligence on the part of the Contractor, the Contractor is held liable 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.

10.6 EMERGENCIES

10.6.1 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



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extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Paragraph 4.3 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

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

- .1 claims under workers' compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;
- .2 claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- .3 claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 claims for damages insured by usual personal injury liability coverage;
- .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 Paragraph 3.18.

11.1.2 The insurance required by Subparagraph 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the Work until date of final payment and termination of any coverage required to be maintained after final payment.

11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These certificates and the insurance policies required by this Paragraph 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. If any of the foregoing insurance coverages are required to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the final Application for Payment as required by Subparagraph 9.10.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor's information and belief.



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11.2 OWNER'S LIABILITY INSURANCE

11.2.1 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

11.3 PROJECT MANAGEMENT PROTECTIVE LIABILITY INSURANCE

11.3.1 Optionally, the Owner may require the Contractor to purchase and maintain Project Management Protective Liability insurance from the Contractor's usual sources as primary coverage for the Owner's, Contractor's and Architect's vicarious liability for construction operations under the Contract. Unless otherwise required by the Contract Documents, the Owner

shall reimburse the Contractor by increasing the Contract Sum to pay the cost of purchasing and maintaining such optional insurance coverage, and the Contractor shall not be responsible for purchasing any other liability insurance on behalf of the Owner. The minimum limits of liability purchased with such coverage shall be equal to the aggregate of the limits required for Contractor's Liability Insurance under Clauses 11.1.1.2 through 11.1.1.5.

11.3.2 To the extent damages are covered by Project Management Protective Liability insurance, the Owner, Contractor and Architect waive all rights against each other for damages, except such rights as they may have to the proceeds of such insurance. The policy shall provide for such waivers of subrogation by endorsement or otherwise.

11.3.3 The Owner shall not require the Contractor to include the Owner, Architect or other persons or entities as additional insureds on the Contractor's Liability Insurance coverage under Paragraph 11.1.

11.4 PROPERTY INSURANCE

11.4.1 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 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 Paragraph 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Paragraph 11.4 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

11.4.1.1 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.

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

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

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

11.4.1.5 Partial occupancy or use in accordance with Paragraph 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial



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occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

11.4.2 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.

11.4.3 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.

11.4.4 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.

11.4.5 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 Subparagraph 11.4.7 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.

11.4.6 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 Paragraph 11.4. 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.

11.4.7 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 Paragraph 11.4 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.



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11.4.8 A loss insured under 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 Subparagraph 11.4.10. 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.

11.4.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or in accordance with an arbitration award in which case the procedure shall be as provided in Paragraph 4.6. 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.

11.4.10 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 as provided in Paragraphs 4.5 and 4.6. The Owner as fiduciary shall, in the case of arbitration, make settlement with insurers in accordance with directions of the arbitrators. If distribution of insurance proceeds by arbitration is required, the arbitrators will direct such distribution.

11.5 PERFORMANCE BOND AND PAYMENT BOND

11.5.1 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.

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

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 required in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

12.1.2 If a portion of the Work has been covered which 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, 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.



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12.2 CORRECTION OF WORK

12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

12.2.1.1 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 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 Paragraph 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 Subparagraph 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner 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 Paragraph 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 performance 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 Paragraph 12.2.

12.2.3 The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

12.2.4 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 which is not in accordance with the requirements of the Contract Documents.

12.2.5 Nothing contained in this Paragraph 12.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the one-year period for correction of Work as described in Subparagraph 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

12.3 ACCEPTANCE OF NONCONFORMING WORK

12.3.1 If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.



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ARTICLE 13 MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

13.1.1 The Contract shall be governed by the law of the place where the Project is located.

13.2 SUCCESSORS AND ASSIGNS

13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Subparagraph 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 an institutional lender providing construction financing for the Project. In such event, the lender shall assume 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

13.3.1 Written notice shall be deemed to have been duly served if delivered in person to the individual or 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 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 thereunder, except as may be specifically agreed in writing.

13.5 TESTS AND INSPECTIONS

13.5.1 Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the 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 tests, inspections or approvals which do not become requirements until after bids are received or negotiations concluded.

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 Subparagraph 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 Subparagraph 13.5.3, shall be at the Owner's expense.



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13.5.3 If such procedures for testing, inspection or approval under Subparagraphs 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, 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.

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

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

13.7 COMMENCEMENT OF STATUTORY LIMITATION PERIOD

13.7.1 As between the Owner and Contractor:

- 1 Before Substantial Completion.** As to acts or failures to act occurring prior to the relevant date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than such date of Substantial Completion;
- 2 Between Substantial Completion and Final Certificate for Payment.** As to acts or failures to act occurring subsequent to the relevant date of Substantial Completion and prior to issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of the final Certificate for Payment; and
- 3 After Final Certificate for Payment.** As to acts or failures to act occurring after the relevant date of issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of any act or failure to act by the Contractor pursuant to any Warranty provided under Paragraph 3.5, the date of any correction of the Work or failure to correct the Work by the Contractor under Paragraph 12.2, or the date of actual commission of any other act or failure to perform any duty or obligation by the Contractor or Owner, whichever occurs last.



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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 which requires all Work to be stopped;
- 2** an act of government, such as a declaration of national emergency which 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 Subparagraph 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 Subparagraph 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 Paragraph 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

14.1.3 If one of the reasons described in Subparagraph 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 and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead, profit 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 persistently failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Subparagraph 14.1.3.

14.2 TERMINATION BY THE OWNER FOR CAUSE

14.2.1 The Owner may terminate the Contract if the Contractor:

- 1 persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- 2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- 3 persistently disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction; or
- 4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

14.2.2 When any of the above reasons exist, the Owner, upon certification by the Architect that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- 1 take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- 2 accept assignment of subcontracts pursuant to Paragraph 5.4; and
- 3 finish the Work by whatever reasonable method the Owner may deem expedient. Upon 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 Subparagraph 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.



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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 Architect, 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 Subparagraph 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.



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SECTION 00800

SUPPLEMENTARY CONDITIONS

INTENT

- 1.01 THESE SUPPLEMENTARY CONDITIONS AMEND AND SUPPLEMENT THE GENERAL CONDITIONS DEFINED IN DOCUMENT 00700 AND OTHER PROVISIONS OF THE CONTRACT DOCUMENTS AS INDICATED BELOW. ALL PROVISIONS WHICH ARE NOT SO AMENDED OR SUPPLEMENTED REMAIN IN FULL FORCE AND EFFECT.**
- 1.02 THE TERMS USED IN THESE SUPPLEMENTARY CONDITIONS WHICH ARE DEFINED IN THE GENERAL CONDITIONS HAVE THE MEANINGS ASSIGNED TO THEM IN THE GENERAL CONDITIONS.**

MODIFICATIONS TO AIA A201

2.01 ARTICLE 3.6 - TAXES

A. Add the following subparagraph:

- 1. 3.6.2: The Owner will obtain rebate on taxes and duties paid by the Contractor on certain Products or items. Provide administrative assistance and cooperation to the Owner in this regard.**

ADDITIONAL ARTICLE _____ - DEFINITIONS

- 3.01 PRODUCTS: MEANS NEW MATERIAL, MACHINERY, COMPONENTS, EQUIPMENT, FIXTURES, AND SYSTEMS FORMING THE WORK, BUT DOES NOT INCLUDE MACHINERY AND EQUIPMENT USED FOR PREPARATION, FABRICATION, CONVEYING AND ERECTION OF THE WORK. PRODUCTS MAY ALSO INCLUDE EXISTING MATERIALS OR COMPONENTS REQUIRED FOR REUSE.**
- 3.02 FURNISH OR SUPPLY: TO SUPPLY AND DELIVER, UNLOAD, INSPECT FOR DAMAGE.**
- 3.03 INSTALL: TO UNPACK, ASSEMBLE, ERECT, APPLY, PLACE, FINISH, CURE, PROTECT, CLEAN, AND READY FOR USE.**
- 3.04 PROVIDE: TO FURNISH OR SUPPLY, PLUS INSTALL.**
- 3.05 PROJECT MANUAL: THE PROJECT MANUAL IS THE VOLUME USUALLY ASSEMBLED FOR THE WORK WHICH INCLUDES THE BID DOCUMENTS, CONTRACT DOCUMENTS, AND SPECIFICATIONS.**

END OF DOCUMENT 00800

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SECTION 01100

SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Water Quality Laboratory Building.
- B. Owner's Name: Northern Kentucky Water Service District.
- C. Architect's Name: Humpert Wolnitzek Architects
- D. The Project consists of the construction of a two story laboratory building and site improvements.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00500 - Agreement.

1.03 WORK BY OWNER

- A. Items noted NIC (Not in Contract) will be supplied and installed by Northern Kentucky Water Service District after Substantial Completion. Some items include:
 - 1. Movable cabinets.
 - 2. Furnishings.
 - 3. Small equipment.
 - 4. Window blinds.

1.04 OWNER OCCUPANCY

- A. The Northern Kentucky Water Service District intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Northern Kentucky Water Service District to minimize conflict and to facilitate Northern Kentucky Water Service District's operations.
- C. Schedule the Work to accommodate Northern Kentucky Water Service District occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: as to be determined during preconstruction meeting.
- B. Arrange use of site and premises to allow:
 - 1. Northern Kentucky Water Service District occupancy.
 - 2. Work by Others.
- C. Restoration of Site:
 - 1. Restore all areas of the Site disturbed by the Work of the Project to the condition existing prior to commencement of the Work or replace with new construction.

1.06 WORK SEQUENCE

- A. Coordinate construction schedule and operations with Northern Kentucky Water Service District.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01200

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Change procedures.

1.02 RELATED SECTIONS

- A. Document 00500 - Agreement: Contract Sum, retainages, payment period, monetary values of unit prices.
- B. Document 00700 - General Conditions: Additional requirements for progress payments, final payment, changes in the Work.
- C. Document 00800 - Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.
- D. Section 01210 - Allowances: Payment procedures relating to allowances.

1.03 SCHEDULE OF VALUES

- A. 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.
- B. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- C. 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.
- D. Include in each line item, the amount of Allowances specified in this Division.
- E. Include within each line item, a direct proportional amount of Contractor's overhead and profit.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Present required information on electronic media printout.
- C. Form: Contractor's electronic media driven form including continuation sheets when required.
- D. 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 under this Application.
 - 6. Total Completed to Date of Application.
 - 7. Percentage of Completion.
 - 8. Balance to Finish.

9. Retainage.
- E. Execute certification by signature of authorized officer.
- F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed.
- G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.
- H. Submit three copies of each Application for Payment.
- I. Include the following with the application:
 1. Transmittal letter as specified for Submittals in Section 01300.
 2. Construction progress schedule, revised and current as specified in Section 01300.
 3. Partial release of liens from major Subcontractors and vendors.

1.05 MODIFICATION PROCEDURES

- A. The Architect/Engineer 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 Architect's Supplemental Instructions form.
- B. Construction Change Directive: Architect/Engineer may issue a document, signed by the Owner, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. The document will describe changes in the Work, and will designate method of determining any change in Contract Sum or Contract Time.
 2. Promptly execute the change in Work.
- C. Proposal Request: The Architect/Engineer may issue a document which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 10 days.
- D. Execution of Change Orders: Architect/Engineer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract on AIA G701.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01210

ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cash allowances.
- B. Contingency allowance.

1.02 RELATED SECTIONS

- A. Section 01200 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CASH ALLOWANCES

- A. Costs Included in Cash Allowances: Cost of Product to Contractor or Subcontractor, less applicable trade discounts delivery to site.
- B. Costs Not Included in Cash Allowances: Product handling at the site, including unloading, uncrating, and storage; protection of Products from elements and from damage; and labor for installation and finishing. Overhead, profit and other anticipated costs are not included in Cash Allowances; they are part of the Contract Sum.
- C. Architect/Engineer Responsibilities:
 - 1. Consult with Contractor for consideration and selection of Products, suppliers.
 - 2. Select Products in consultation with Owner and transmit decision to Contractor.
 - 3. Prepare Change Order.
- D. Contractor Responsibilities:
 - 1. Assist Architect/Engineer in selection of Products, suppliers.
 - 2. Obtain proposals from suppliers and offer recommendations.
 - 3. On notification of selection by Architect/Engineer execute purchase agreement with designated supplier.
 - 4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
 - 5. Promptly inspect Products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
- E. Differences in costs will be adjusted by Change Order.

1.04 CONTINGENCY ALLOWANCE

- A. Contractor's costs for Products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.
- B. Funds will be drawn from the Contingency Allowance only by Change Order.
- C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.05 ALLOWANCES SCHEDULE

- A. Section 08710 - DOOR HARDWARE: Include the stipulated sum of \$7,750 for purchase and delivery of hardware material.
- B. Section 09680 - CARPET: Include the stipulated sum of \$1,500 for purchase and delivery of carpet, (include other materials in Contract Sum).
- C. Contingency Allowance: Include the stipulated sum/price of \$5,000 for use upon Owner's instructions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01300

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preconstruction meeting.
- B. Site mobilization meeting.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Submittals for review, information, and project closeout.
- F. Number of copies of submittals.
- G. Submittal procedures.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

- A. Humpert Wolnitzek Architects will schedule a meeting after Notice of Award.
- B. Attendance Required:
 - 1. Northern Kentucky Water Service District.
 - 2. Humpert Wolnitzek Architects.
 - 3. General Contractor.
- C. Agenda:
 - 1. Execution of Northern Kentucky Water Service District - 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 in Contract, Owner, Contractor, and the Humpert Wolnitzek Architects.
 - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 7. Scheduling.
 - 8. Scheduling activities of a Geotechnical Engineer.
- D. Record minutes and distribute copies within two days after meeting to participants, with as requested copies to Humpert Wolnitzek Architects, Northern Kentucky Water Service District, participants, and those affected by decisions made.

3.02 SITE MOBILIZATION MEETING

- A. Humpert Wolnitzek Architects will schedule a meeting at the Project site prior to beginning of construction.
- B. Attendance Required:
 - 1. Northern Kentucky Water Service District.
 - 2. Humpert Wolnitzek Architects.
 - 3. General Contractor's Superintendent.
 - 4. Major Subcontractors.
- C. Agenda:
 - 1. Use of premises by Northern Kentucky Water Service District.
 - 2. Northern Kentucky Water Service District 's requirements.
 - 3. Construction facilities and controls provided by Northern Kentucky Water Service District.
 - 4. Temporary utilities provided by Northern Kentucky Water Service District.
 - 5. Survey and building layout.
 - 6. Security and housekeeping procedures.
 - 7. Schedules.
 - 8. Application for payment procedures.
 - 9. Procedures for testing.
 - 10. Procedures for maintaining record documents.
 - 11. Requirements for start-up of equipment.
 - 12. Inspection and acceptance of equipment put into service during construction period.
- D. Record minutes and distribute copies within two days after meeting to participants, with as requested copies to Humpert Wolnitzek Architects, Northern Kentucky Water Service District, participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum two week intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Northern Kentucky Water Service District, Humpert Wolnitzek Architects, 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 which 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 as requested copies to Humpert Wolnitzek Architects, Northern Kentucky Water Service District, participants, and those affected by decisions made.

3.04 CONSTRUCTION PROGRESS SCHEDULE

- A. Within 10 days after date established in Notice to Proceed, submit preliminary schedule.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 10 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

3.05 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 Humpert Wolnitzek Architects for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed only for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01780 - CLOSEOUT SUBMITTALS.

3.06 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 the Humpert Wolnitzek Architects 's knowledge as contract administrator or for the Northern Kentucky Water Service District. No action will be taken.

3.07 SUBMITTALS FOR PROJECT CLOSEOUT

- A. When the following are specified in individual sections, submit them at project closeout:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Other types as indicated.
- B. Submit for the Northern Kentucky Water Service District 's benefit during and after project completion.

3.08 NUMBER OF COPIES OF SUBMITTALS

- A. Documents for Review:
 - 1. Small size sheets, not larger than 8-1/2 x 11 inches: Submit the number of copies which the requires, plus two copies which will be retained by the Humpert Wolnitzek Architects.
 - 2. Larger sheets, not larger than 36 x 48 inches: Submit one reproducible transparency and one opaque reproduction.
- 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 Humpert Wolnitzek Architects.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to unless specifically so stated.

3.09 SUBMITTAL PROCEDURES

- A. Transmit each submittal with standard transmittal form.
- B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- C. Identify Project,, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- D. Apply '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.
- E. Deliver submittals to Humpert Wolnitzek Architects at business address.
- F. Schedule submittals to expedite the Project, and coordinate submission of related items.
- G. For each submittal for review, allow 15 days excluding delivery time to and from the.
- H. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- I. Provide space for and Humpert Wolnitzek Architects review stamps.
- J. When revised for resubmission, identify all changes made since previous submission.
- K. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- L. Submittals not requested will not be recognized or processed.

END OF SECTION

SECTION 01400

QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Control of installation.
- B. Testing and inspection services.
- C. Manufacturers' field services.

1.02 RELATED SECTIONS

- A. Section 01300 - Administrative Requirements: Submittal procedures.
- B. Section 01425 - Reference Standards.
- C. Section 01600 - Product Requirements: Requirements for material and product quality.

1.03 SUBMITTALS

- A. Design Data: Submit for the Humpert Wolnitzek Architects 's knowledge as contract administrator or for the Northern Kentucky Water Service District, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- B. Test Reports: After each test/inspection, promptly submit two copies of report to Humpert Wolnitzek Architects and to.
 - 1. Test reports are submitted for the Humpert Wolnitzek Architects 's knowledge as contract administrator or for the Northern Kentucky Water Service District, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and or installation/application subcontractor to Humpert Wolnitzek Architects, in quantities specified for Product Data.
 - 1. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Northern Kentucky Water Service District 's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.04 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

- C. Obtain copies of standards where required by product specification sections.
- D. Should specified reference standards conflict with Contract Documents, request clarification from the Humpert Wolnitzek Architects before proceeding.
- E. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Humpert Wolnitzek Architects shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.05 TESTING AND INSPECTION AGENCIES

- A. Northern Kentucky Water Service District will employ and pay for services of an independent testing agency to perform specified testing.
- B. Employment of agency in no way relieves of obligation to perform Work in accordance with requirements of Contract Documents.

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 Humpert Wolnitzek 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 TESTING AND INSPECTION

- A. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Humpert Wolnitzek Architects and 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 Humpert Wolnitzek Architects and of observed irregularities or non-conformance of Work or Products.
 - 5. Perform additional tests and inspections required by Humpert Wolnitzek Architects.
 - 6. Submit reports of all tests/inspections specified.

- B. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency may not approve or accept any portion of the Work.
 3. Agency may not assume any duties of.
 4. Agency has no authority to stop the Work.
- C. Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used which 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 Humpert Wolnitzek Architects and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by beyond specified requirements.
 6. Arrange with Northern Kentucky Water Service District 's agency and pay for additional samples, tests, and inspections required by beyond specified requirements.
- D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by the Humpert Wolnitzek Architects. Payment for re-testing will be charged to the by deducting testing charges from the Contract Sum/Price.

3.03 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 workmanship, start-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.

3.04 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not conforming to specified requirements.
- B. If, in the opinion of the Humpert Wolnitzek Architects, it is not practical to remove and replace the Work, the Humpert Wolnitzek Architects will direct an appropriate remedy or adjust payment.

END OF SECTION

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SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary telephone service.
- 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 SECTIONS

- A. Section 01510 - Temporary Utilities.

1.03 TEMPORARY UTILITIES - SEE SECTION 01510

1.04 TELEPHONE SERVICE

- A. Provide, maintain, and pay for telephone service to field office at time of project mobilization.
- B. Provide, maintain and pay for facsimile service to field office at time of project mobilization.

1.05 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Use of existing facilities is not permitted.
- C. Maintain work site daily in clean and sanitary condition.

1.06 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Provide protection for plants designated to remain. Replace damaged plants.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.07 FENCING

- A. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.08 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and Northern Kentucky Water Service District's operations from unauthorized entry, vandalism, or theft.

1.09 VEHICULAR ACCESS AND PARKING

- A. Coordinate access and haul routes with governing authorities and Northern Kentucky Water Service District.
- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide means of removing mud from vehicle wheels before entering streets.
- D. The Designated existing on-site roads may be used for construction traffic.
- E. Provide temporary parking areas to accommodate construction personnel. If site space is not adequate, the Owner shall designate additional off-site parking.
- F. Existing parking areas may not be used for construction parking.
- G. Do not allow vehicle parking on existing pavement or driveways.
- H. Designate one parking space for Northern Kentucky Water Service District and Humpert Wolnitzek Architects use.

1.10 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. Dispose of waste off-site twice each month.
- C. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 PROJECT IDENTIFICATION

- A. Provide project identification sign of design and construction indicated on Drawings.
- B. Erect on site at location established by Humpert Wolnitzek Architects.
- C. No other signs are allowed without Northern Kentucky Water Service District permission except those required by law.

1.12 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 8 persons.
- C. Locate offices a minimum distance of 15 feet from existing and new structures.

1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Final Application for Payment inspection.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01510
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary Utilities: Electricity, lighting, heat, ventilation, and water.

1.02 RELATED SECTIONS

- A. Section 01500 - Temporary Facilities and Controls: Telephone service for administrative purposes.

1.03 TEMPORARY ELECTRICITY

- A. Connect to Northern Kentucky Water Service District 's existing power service.
 - 1. Do not disrupt Northern Kentucky Water Service District 's need for continuous service.
 - 2. Exercise measures to conserve energy.
 - 3. Provide separate metering and reimburse Northern Kentucky Water Service District for cost of energy used.
- B. Provide temporary electric feeder from existing building electrical service at location as directed.
- C. Complement existing power service capacity and characteristics as required.
- D. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. 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. Provide and maintain lighting for construction operations to achieve a minimum lighting level of 1 watt/sq ft.
- 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. Provide heating devices and heat as needed to maintain specified conditions for construction operations.
- B. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.06 TEMPORARY WATER SERVICE

- A. Cost of Water Used: By Northern Kentucky Water Service District.
- B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.
- C. Connect to existing water source.
 - 1. Exercise measures to conserve water.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01600
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 and procedures.
- E. Spare parts and maintenance materials.

1.02 RELATED SECTIONS

- A. Document 00200 - Instructions to Bidders: Product options and substitution procedures prior to bid date.

1.03 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.
- 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 PRODUCTS

- A. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- B. Motors: Refer to Section 15170, NEMA MG 1 Type. Specific motor type is specified in individual specification sections.
- C. 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.
- D. 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 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Provide spare parts, maintenance, and extra products 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 PROCEDURES

- A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- C. A request for substitution constitutes a representation that the 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 which may be required for the Work to be complete with no additional cost to Northern Kentucky Water Service District.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
- D. 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 Humpert Wolnitzek Architects will notify in writing of decision to accept or reject request.

3.02 TRANSPORTATION AND HANDLING

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

3.03 STORAGE AND PROTECTION

- A. Store and protect products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.
- C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- D. For exterior storage of fabricated products, place on sloped supports above ground.
- E. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- G. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

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SECTION 01700
EXECUTION 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 Northern Kentucky Water Service District personnel.
- H. Closeout procedures, except payment procedures.

1.02 RELATED SECTIONS

- A. Section 01300 - Administrative Requirements: Submittals procedures.
- B. Section 01400 - Quality Requirements: Testing and inspection procedures.
- C. Section 01500 - Temporary Facilities and Controls: .
- D. Section 01780 - Closeout Submittals: Project record documents, operation and maintenance data, warranties.

1.03 QUALIFICATIONS

- A. For survey work employ a land surveyor registered in Fort Thomas, Kentucky and acceptable to Humpert Wolnitzek Architects. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.04 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.
- C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

- E. Erosion and Sediment Control: Plan and execute construction 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. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- F. Noise Control: Provide methods, means, and facilities to minimize noise from equipment and noise produced by construction operations.
- G. Pest Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- I. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

1.05 COORDINATION

- A. Coordinate work of alterations and renovations to expedite completion sequentially and to accommodate occupancy requirements.
- B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- C. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown 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, 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.
- G. After Northern Kentucky Water Service District occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Northern Kentucky Water Service District's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary,

referring to existing work as a standard.

- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01600.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Beginning new work means acceptance of existing conditions.
- B. Verify that demolition is complete in alterations areas and areas are ready for installation of new work.
- C. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- D. Examine and verify specific conditions described in individual specification sections.
- 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. Remove debris and abandoned items from area and from concealed spaces.
- B. Prepare surfaces and remove surface finishes to provide for proper installation of new work and finishes.
- C. Clean substrate surfaces prior to applying next material or substance.
- D. Seal cracks or openings of substrate prior to applying next material or substance.
- E. 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 Humpert Wolnitzek Architects four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of installation, 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 Humpert Wolnitzek Architects, Northern Kentucky Water Service District, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Humpert Wolnitzek Architects of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- E. Promptly report to Humpert Wolnitzek Architects the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Humpert Wolnitzek Architects.
- G. Utilize recognized engineering survey practices.
- H. 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.
- I. Periodically verify layouts by same means.
- J. 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.
- B. Make neat transitions. Patch work to match adjacent work in texture and appearance.

3.06 CUTTING AND PATCHING

- A. Execute cutting and patching including excavation and fill to complete the work, to uncover work 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.
- B. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing.
- C. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- E. Restore work with new Products in accordance with requirements of Contract Documents.
- F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

- G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07840, to full thickness of the penetrated element.
- H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

3.07 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 rubbish from site periodically and dispose off-site.

3.08 PROTECTION OF INSTALLED WORK

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

3.09 STARTING SYSTEMS

- 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 which 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 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.

3.10 DEMONSTRATION AND INSTRUCTION

- A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

3.11 ADJUSTING

- A. Adjust operating Products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See Section 15990 and 01400.

3.12 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
 - 1. Clean areas to be occupied by Northern Kentucky Water Service District prior to final completion before Northern Kentucky Water Service District occupancy.
- B. 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.
- C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- D. Replace filters of operating equipment.
- E. Clean debris from roofs, gutters, downspouts, and drainage systems.
- F. Clean site; sweep paved areas, rake clean landscaped surfaces.
- G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

3.13 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Humpert Wolnitzek Architects and Northern Kentucky Water Service District.
- B. Accompany Architect on preliminary inspection to determine items to be listed for completion or correction in's Notice of Substantial Completion.
- C. Notify Humpert Wolnitzek Architects when work is considered ready for Substantial Completion.
- D. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Humpert Wolnitzek Architects's review.
- E. Northern Kentucky Water Service District will occupy portions of the building as specified in Section 01100.
- F. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Northern Kentucky Water Service District-occupied areas.

- G. Notify Humpert Wolnitzek Architects when work is considered finally complete.
- H. Complete items of work determined by Humpert Wolnitzek Architects's final inspection.

END OF SECTION

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SECTION 01780
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 SECTIONS

- A. Section 01300 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Section 01700 - Execution 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 Humpert Wolnitzek Architects with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Humpert Wolnitzek 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 Northern Kentucky Water Service District, submit completed documents within ten days after acceptance.
 - 3. Submit 1 copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Humpert Wolnitzek 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 Northern Kentucky Water Service District 's permission, submit documents within ten days after acceptance.
 - 2. Make other submittals within ten 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 ten 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 Northern Kentucky Water Service District.
- 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. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 3. Field changes of dimension and detail.
 - 4. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. 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 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. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

- 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 charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- K. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- L. Include test and balancing reports.
- M. Additional Requirements: As specified in individual product specification sections.

3.04 OPERATION AND MAINTENANCE MANUALS

- A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- B. Prepare data in the form of an instructional manual.
- C. 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 Humpert Wolnitzek Architects,, 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.
 - 3. Part 3: Project documents and certificates, including the following:
 - a. Shop drawings and product data.
 - b. Air and water balance reports.
 - c. Certificates.

3.05 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work. Except for items put into use with Northern Kentucky Water Service District 's permission, leave date of beginning of time of warranty until the 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 x 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 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 02230

SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Removal of surface debris.
- B. Removal of trees, shrubs, and other plants indicated.
- C. Removal of sod.
- D. Removal of paving, curbs, and other site improvements.

1.02 RELATED SECTIONS

- A. Section 02310 - Grading: Topsoil removal.

1.03 PROJECT CONDITIONS

- A. Conform to applicable regulations relating to environmental requirements and disposal of debris.
- B. Coordinate clearing work with utility companies.
- C. Protect utilities to remain from damage.
- D. Protect trees, plants, and other features designated to remain as final landscaping.
- E. Protect bench marks, survey control points, and existing structures from damage or displacement.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PREPARATION

- A. Locate and identify utilities to remain.
 - 1. Take precautions to not interrupt continuous utility service to all buildings.
- B. Tag existing plants designated to remain.

3.02 CLEARING

- A. Clear areas required for access to site and execution of Work.
- B. Remove trees, shrubs, and stumps within marked areas.
- C. Remove existing sod without disturbing topsoil.

3.03 REMOVAL

- A. Remove portions of paving; as indicated. Neatly saw cut edges at right angle to surface.
- B. Remove debris from site.

END OF SECTION

SECTION 02310

GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Removal and storage of topsoil.
- B. Rough grading the site.
- C. Replacement of topsoil and finish grading.
- D. Restoration of all areas disturbed by construction.

1.02 RELATED SECTIONS

- A. Section 02230 - Site Clearing.
- B. Section 02315 - Excavation.
- C. Section 02316 - Fill and Backfill: Filling and compaction.
- D. Section 02921 - Seeding: Finish ground cover.

1.03 PROJECT CONDITIONS

- A. Protect above- and below-grade utilities that remain.
- B. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.
- C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil: See Section 02316.
- B. Other Fill Materials: See Section 02316.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.

- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect utilities that remain, from damage.

3.03 ROUGH GRADING

- A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
- B. Do not remove topsoil when wet.
- C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
- D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.
- E. When excavating through roots, perform work by hand and cut roots with sharp axe.
- F. See Section 02316 for filling procedures.
- G. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.04 SOIL REMOVAL AND STOCKPILING

- A. Stockpile excavated topsoil on site.
- B. Stockpile subsoil to be re-used on site; remove remainder from site.
- C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

3.05 FINISH GRADING

- A. Before Finish Grading:
 - 1. Verify building and trench backfilling have been inspected.
 - 2. Verify subgrade has been contoured and compacted.
- B. Remove debris, roots, branches, stones, in excess of 1 inch in size. Remove soil contaminated with petroleum products.
- C. Where topsoil is to be placed, scarify surface to depth of 3 inches.
- D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 6 inches.
- E. Place topsoil in areas where seeding, sodding, and planting are indicated.
- F. Place topsoil where required to level finish grade.
- G. Place topsoil to nominal depth of 4 inches.
- H. Place topsoil during dry weather.
- I. Remove roots, weeds, rocks, and foreign material while spreading.
- J. Near plants and buildings spread topsoil manually to prevent damage.

- K. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- L. Lightly compact placed topsoil.

3.06 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.
- B. Top Surface of Finish Grade: Plus or minus 1/2 inch.

3.07 CLEANING AND PROTECTION

- A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.
- B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

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SECTION 02315

EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Excavating for building volume below grade, footings, slabs-on-grade, paving, site structures, and utilities within the building.
- B. Trenching for utilities outside the building to utility main connections.

1.02 RELATED SECTIONS

- A. Section 02310 - Grading: Soil removal from surface of site.
- B. Section 02316 - 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.
- B. Protect plants, lawns, rock outcroppings, and other features to remain.
- C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Locate, identify, and protect utilities that remain and protect from damage.

3.02 EXCAVATING

- A. Excavate to accommodate new structures and construction operations.
- B. Notify Humpert Wolnitzek Architects of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- C. Slope banks of excavations deeper than 3 feet to angle of repose or less until shored.
- D. Do not interfere with 30 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. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 02316.
- H. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- I. Remove excavated material that is unsuitable for re-use from site.
- J. Stockpile excavated material to be re-used in area designated on site in accordance with Section 02310.
- K. Remove excess excavated material from site.

3.03 FIELD QUALITY CONTROL

- A. See Section 01400 - 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 02316
FILL AND BACKFILL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Filling, backfilling, and compacting for building volume below grade, footings, slabs-on-grade, paving, site structures, and utilities within the building.
- B. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 RELATED SECTIONS

- A. Section 02310 - Grading: Site grading.
- B. Section 02315 - Excavation: Removal and handling of soil to be re-used.

1.03 REFERENCES

- A. ASTM D 698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 1991.
- B. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 1990 (Reapproved 1996).
- C. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 1994.
- D. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 1991.
- E. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 1988 (Reapproved 1993).

1.04 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Subgrade Elevations: 4 inches below finish grade elevations indicated on drawings, unless otherwise indicated.

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Compaction Density Test Reports.

1.06 PROJECT CONDITIONS

- A. Provide sufficient quantities of fill to meet project schedule and requirements. When necessary, store materials on site in advance of need.

- B. Verify that survey bench marks and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. General Fill: Subsoil excavated on-site.
 - 1. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
- B. Granular Fill: Pit run washed stone; free of shale, clay, friable material and debris.
 - 1. Evenly graded mixture of gravel, with 95 to 100 percent passing a 1-1/2" sieve and not more than 5 percent passing a No. 4 sieve. No. 467 washed river gravel complies.
- C. Sand: Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.
- D. Topsoil: See Section 02310.

2.02 ACCESSORIES

- A. Geotextile Fabric: Non-biodegradable, non-woven.
- B. Vapor Retarder: 10 mil thick, polyethylene.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 02310 for additional requirements.

3.02 PREPARATION

- A. Scarify subgrade surface to a depth of 4 inch 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. Employ a placement method that does not disturb or damage other work.
- C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- D. Maintain optimum moisture content of fill materials to attain required compaction density.

- E. Granular Fill: Place and compact materials in equal continuous layers not exceeding 4 inches compacted depth.
- F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.
- G. Slope grade away from building minimum 12 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- H. Correct areas that are over-excavated.
 - 1. Load-bearing foundation surfaces: Fill with concrete.
 - 2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.
- I. Compaction Density Unless Otherwise Specified or Indicated:
 - 1. Under paving, slabs-on-grade, footings, and similar construction: 97 percent of maximum dry density.
 - 2. At other locations: 90 percent of maximum dry density.
- J. Reshape and re-compact fills subjected to vehicular traffic.

3.04 FILL AT SPECIFIC LOCATIONS

- A. Use general fill unless otherwise specified or indicated.
- B. Under Interior Slabs-On-Grade:
 - 1. Use granular fill.
 - 2. Depth: varies 4 to 7 inches deep.
 - 3. Compact to 95 percent of maximum dry density.
- C. At Foundation Walls, Footings, and Elevator Pit (interior conditions):
 - 1. Use concrete fill.
 - 2. Fill up to subgrade elevation.
 - 3. Do not backfill against unsupported foundation walls.
- D. Over Subdrainage Piping at Foundation Perimeter:
 - 1. Cover pipe with geotextile fabric and use granular fill.
 - 2. Fill up to subgrade elevation.
 - 3. Compact to 95 percent of maximum dry density.
- E. Over Buried Utility Piping and Conduits in Trenches:
 - 1. Fill up to subgrade level under slabs and for 15' outside building walls with concrete fill.
 - 2. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.
- F. At Lawn Areas:
 - 1. Use general fill.
 - 2. Fill up to 4 inches below finish grade elevations.
 - 3. Compact to 90 percent of maximum dry density.
 - 4. See Section 02310 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 1/2 inch from required elevations.

3.06 FIELD QUALITY CONTROL

- A. See Section 01400 - Quality Requirements, for general requirements for field inspection and testing.
- B. Compaction density testing will be performed on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.
- C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor").
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- E. Frequency of Tests: As needed to assure specified results.

3.07 CLEAN-UP

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 02361

SOIL TREATMENT FOR TERMITE CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Chemical soil treatment.

1.02 REFERENCES

- A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; United States Code; 1947 (Revised 1988).

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.
- C. Warranty: Submit warranty and ensure that forms have been completed in Northern Kentucky Water Service District 's name.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing this type of work and:
 1. Having minimum of 2 years documented experience.
 2. Approved by manufacturer of treatment materials.
 3. Licensed in Fort Thomas, Kentucky.

1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable code for requirements for application, application licensing, and authority to use toxicant chemicals, and comply with EPA regulations.
- B. Provide certificate of compliance from authority having jurisdiction indicating approval of toxicants.

1.06 SEQUENCING

- A. Apply toxicant immediately prior to installation of vapor barrier under slabs-on-grade.

1.07 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year installer's warranty against damage to building caused to termites.
 1. Include coverage for repairs to building and to contents damaged due to building damage. Repair damage and, if required, re-treat.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Toxicant Chemical: EPA approved; synthetically color dyed to permit visual identification of treated soil.
- B. Diluent: Recommended by toxicant manufacturer.

2.02 MIXES

- A. Mix toxicant to manufacturer's instructions.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.
- B. Verify final grading is complete.

3.02 APPLICATION

- A. Spray apply toxicant in accordance with manufacturer's instructions.
- B. Apply toxicant at following locations:
 - 1. Under Slabs-on-Grade.
 - 2. At Both Sides of Foundation Surface.
 - 3. Soil Within 5 feet of Building Perimeter For a Depth of 3 feet.
- C. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.
- D. Re-treat disturbed treated soil with same toxicant as original treatment.
- E. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

END OF SECTION

SECTION 02741

BITUMINOUS CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aggregate base course.
- B. Double course bituminous concrete paving.
- C. Surface sealer.

1.02 RELATED SECTIONS

- A. Section 02310 - Grading: Preparation of site for paving and base.
- B. Section 02316 - Fill and Backfill: Compacted subgrade for paving.
- C. Section 03300-Cast-in-place Concrete: Concrete curbs.

1.03 REFERENCES

- A. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types; The Asphalt Institute; 1994, Sixth Edition.
- B. AI MS-19 - A Basic Asphalt Emulsion Manual; The Asphalt Institute; Third Edition.
- C. ASTM D 946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction; 1982 (Reapproved 1993).

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Kentucky Highways standard.
- B. Mixing Plant: Conform to State of Kentucky Highways standard.
- C. Obtain materials from same source throughout.

1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable code for paving work on public property.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Asphalt Cement: ASTM D 946.
- B. Aggregate for Base Course: In accordance with State of Kentucky Highways standards.
- C. Aggregate for Binder Course: In accordance with State of Kentucky Highways standards.
- D. Aggregate for Wearing Course: In accordance with State of Kentucky Highways standards.
- E. Fine Aggregate: In accordance with State of Kentucky Highways standards.
- F. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.
- G. Primer: In accordance with State of Kentucky Highways standards.
- H. Tack Coat: Homogeneous, medium curing, liquid asphalt.
- I. Seal Coat: AI MS-19, sand type.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

- A. Base Course: State of Kentucky Highways standards.
- B. Binder Course: State of Kentucky Highways standards.
- C. Wearing Course: State of Kentucky Highways standards.
- D. Submit proposed mix design of each class of mix for review prior to beginning of work.

2.03 SOURCE QUALITY CONTROL

- A. Test mix design and samples in accordance with AI MS-2.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.02 BASE COURSE

- A. Place and compact base course.

3.03 PREPARATION - PRIMER

- A. Apply primer in accordance with manufacturer's instructions.
- B. Apply primer on aggregate base or subbase at uniform rate of 1/3 gal/sq yd.

- C. Use clean sand to blot excess primer.

3.04 PREPARATION - TACK COAT

- A. Apply tack coat in accordance with manufacturer's instructions.
- B. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 1/3 gal/sq yd.

3.05 PLACING ASPHALT PAVEMENT - DOUBLE COURSE

- A. Place asphalt binder course within 24 hours of applying primer or tack coat.
- B. Place binder course to 4 inch compacted thickness.
- C. Place wearing course within two hours of placing and compacting binder course.
- D. Place wearing course to 2 inch compacted thickness.
- E. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
- F. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.06 SEAL COAT

- A. Apply seal coat to surface course in accordance with AI MS-19.

3.07 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
- B. Compacted Thickness: Within 1/4 inch of specified or indicated thickness.
- C. Variation from True Elevation: Within 1/2 inch.

3.08 FIELD QUALITY CONTROL

- A. See Section 01400 - Quality Requirements, for general requirements for quality control.
- B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.

3.09 PROTECTION

- A. Immediately after placement, protect pavement from mechanical injury for 3 days or until surface temperature is less than 140 degrees F.

END OF SECTION

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SECTION 02751

PORTLAND CEMENT CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete sidewalks, integral curbs, and isolated curbs.

1.02 RELATED SECTIONS

- A. Section 02310 - Grading: Preparation of site for paving and base and preparation of subsoil at pavement perimeter for planting.
- B. Section 02316 - Fill and Backfill: Compacted subbase for paving.
- C. Section 03300 - Cast-In-Place Concrete.
- D. Section 07900 - Joint Sealers: Sealant for joints.

1.03 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 1996.
- B. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 1989.
- C. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 1988.
- D. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 1996a.
- E. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 1996.
- F. ASTM C 94 - Standard Specification for Ready-Mixed Concrete; 1996.
- G. ASTM C 173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 1994a.
- H. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 1997.
- I. ASTM D 1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction; 1984 (Reapproved 1996).

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Obtain cementitious materials from same source throughout.
- C. Follow recommendations of ACI 306R when concreting during cold weather.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.01 FORM MATERIALS

- A. Wood form material, profiled to suit conditions.
- B. Joint Filler: Preformed; sponge rubber or cork (ASTM D 1752).
 - 1. Thickness: 1/2 inch.

2.02 REINFORCEMENT

- A. Reinforcing Steel and Wire Fabric: Types specified in Section 03300.
- B. Dowels: ASTM A 615/A 615M Grade 40 (300); deformed billet steel bars; unfinished finish.

2.03 CONCRETE MATERIALS

- A. Concrete Materials: As specified in Section 03300.

2.04 ACCESSORIES

- A. Curing Compound: ASTM C 309, Type 1, Class A.
- B. Joint Sealer: Type R as specified in Section 07900.

2.05 CONCRETE MIX DESIGN

- A. Concrete Properties:
 - 1. Compressive Strength, per ASTM C 39 at 28 days: 4,000 psi.
 - 2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
 - 3. Total Air Content: 7 percent, per ASTM C 173.
 - 4. Maximum Slump: 4 inches.

2.06 MIXING

- A. Transit Mixers: Comply with ASTM C 94.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.02 SUBBASE

- A. See Section 02316 - Fill and Backfill for preparation of subbase and placement of granular fill.

3.03 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Coat surfaces of catch basin and other frames with oil to prevent bond with concrete pavement.
- C. Notify Humpert Wolnitzek Architects minimum 24 hours prior to commencement of concreting operations.

3.04 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.05 REINFORCEMENT

- A. Place reinforcement at midheight of slabs-on-grade.
- B. Interrupt reinforcement at expansion joints.

3.06 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Ensure reinforcement, inserts, embedded parts, formed joints and joint fillers are not disturbed during concrete placement.
- C. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

3.07 JOINTS

- A. Align curb, gutter, and sidewalk joints.
- B. Place 1/2 inch wide expansion joints at 25 foot intervals and to separate paving from vertical surfaces and other components and in pattern indicated.
 - 1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.
 - 2. Secure to resist movement by wet concrete.
- C. Provide scored joints:
 - 1. At 5 feet intervals.
 - 2. Between sidewalks and curbs.
 - 3. Between curbs and pavement.

3.08 FINISHING

- A. Sidewalk Paving: Light broom, radius to 3/4 inch radius, and trowel joint edges.
- B. Curbs and Gutters: Light broom.
- C. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.09 JOINT SEALING

- A. See Section 07900 for joint sealer requirements.

3.10 TOLERANCES

- A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.
- B. Maximum Variation From True Position: 1/4 inch.

3.11 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01400.
 - 1. Provide free access to concrete operations at project site and cooperate with appointed firm.
- B. Compressive Strength Tests: ASTM C 39. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 25 cu yd or less of concrete placed.
 - 1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
 - 2. Perform one slump test for each set of test cylinders taken.
- C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.12 PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.
- B. Do not permit pedestrian traffic over pavement for 7 days minimum after finishing.

END OF SECTION

SECTION 02834

MODULAR CONCRETE RETAINING WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete modular block retaining wall units installed to the lines and grades shown on the construction drawings and as specified herein, including preparing foundation soil, furnishing and installing leveling pad, unit fill, geogrid reinforcement, and backfill.

1.02 RELATED SECTIONS

- A. Section 02316 - Excavation.
- B. Section 02316 - Fill and Backfill.

1.03 REFERENCES

- A. AASHTO HB-16 - Standard Specifications for Highway Bridges; American Association of State Highway and Transportation Officials; 1996, 16th Edition.
- B. ASTM C 331 - Standard Specification for Lightweight Aggregates for Concrete Masonry Units; 1994.
- C. ASTM D 698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 1991.
- D. ASTM D 1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 1991.
- E. NCMA TR-127A - Design Manual for Segmental Retaining Walls; National Concrete Masonry Association; 1996, Second Edition; including Test Method SWRU-1.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's product data for proposed materials and method of installation.
- C. Samples: Submit samples of each product used in the work of this section.
- D. Certifications: Submit a manufacturer's certification, prior to start of work, that the retaining wall system components meet the requirements of this specification.
- E. Submit engineering plans prepared by a professional engineer experienced with Mechanically Stabilized Earth retaining wall systems and registered in Fort Thomas, Kentucky. Perform engineering designs, techniques, and material evaluations in accordance with the KEYSTONE Design Manual, 1995, NCMA Design Manual For Segmental Retaining Walls, 1997, or AASHTO Standard Specifications for Highway Bridges, Section 5.8, whichever is applicable.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Check the materials upon delivery to assure that proper materials have been received.

- B. Prevent excessive mud, wet cement, epoxy, and similar materials (which may affix themselves) from coming in contact with the materials.
- C. Protect the materials from damage. Do not incorporate damaged materials into the retaining wall structure.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Provide modular concrete retaining wall units and accessory materials fabricated by authorized licensed manufacturers of Keystone Retaining Wall Systems, 4444 West 78th Street, Minneapolis, MN 55435. ASD. Telephone 612-897-1040; FAX 612-897-3858.
- B. Substitutions: See Section 01600 - Product Requirements.

2.02 MODULAR CONCRETE RETAINING WALL UNITS

- A. Modular Concrete Units -- Architectural Requirements:
 - 1. Unit color: Manufacturer's standard color.
 - 2. Face finish: Sculptured rock face in angular multiplanar configuration. Other face finishes will not be allowed without written approval.
 - 3. Bond configuration: Running, with bonds nominally located at midpoint vertically adjacent units, in both straight and curved alignments.
 - 4. Exposed surfaces of units shall be free of chips, cracks or other imperfections when viewed from a distance of 20 feet under diffused lighting.
 - 5. Corners: Provide 90 degree corners, finished two sides, where indicated.
 - 6. Cap units: Provide solid cap units with parallel sides for straight walls and convex walls, angular sides for concave walls.
- B. Modular Concrete Units -- Structural and Geometric Requirements:
 - 1. Compressive strength: 3000 psi, minimum.
 - 2. Absorption: 8 percent maximum for standard weight aggregates.
 - 3. Unit width to height ratio: 2.25 to 1.
 - 4. Unit depth: 20 inches, minimum.
 - 5. Unit weight: 90 lb per unit, minimum, for standard weight aggregates.
 - 6. Inter-unit shear strength: 1500 lb/lf, minimum, at 2 psi normal pressure.
- C. Modular Concrete Units -- Constructibility Requirements:
 - 1. Vertical setback: 1/8 inch plus/minus per course (near vertical) or 1-1/4 inch plus/minus per course per the design drawings.
 - 2. Alignment and grid positioning mechanism: Fiberglass pins, two per unit minimum.

2.03 ACCESSORIES

- A. Shear Connectors: 1/2 inch diameter thermoset isophthalic polyester resin-pultruded fiberglass reinforcement rods.
 - 1. Minimum flexural strength of 128,000 psi and short beam shear of 6,400 psi.
 - 2. Strength of shear connectors between vertical adjacent units shall be applicable over a design temperature range of minus 10 degrees F to plus 100 degrees F.
- B. Construction Adhesive: Keystone Kapseal as supplied by manufacturer of modular concrete units.

2.04 FILL MATERIALS

- A. Base Leveling Pad Material: Compacted crushed stone base, non-reinforced concrete, or subsoil as shown on the drawings.
- B. Unit Fill: Clean 1-inch minus crushed stone or crushed gravel meeting the gradation listed below.
 - 1. 1 inch sieve, 100 percent passing.
 - 2. 3/4 inch sieve, 75 to 100 percent passing.
 - 3. No. 4 sieve, 0 to 10 percent passing.
 - 4. No. 50 sieve, 0 to 5 percent passing.
- C. Pea rock (3/8 to 1/2 inch round stone) is not acceptable for unit fill.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that layout dimensions are correct and substrate is in proper condition for installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 EXCAVATION

- A. Excavate to the lines and grades shown on the construction drawings. Obtain the Humpert Wolnitzek Architects 's approval of excavation prior to placement of leveling material or fill soils.
- B. Be careful not to disturb embankment and foundation materials beyond lines shown.

3.03 BASE LEVELING PAD

- A. Compact granular leveling pad material to a minimum of 95 percent of the maximum density as determined by ASTM D 698 or 90 percent of the maximum density as determined by ASTM D 1557 (Modified Proctor).
- B. Prepare leveling pad to ensure full contact to the base surface of the concrete units.

3.04 MODULAR UNIT INSTALLATION

- A. Place first course of units on the leveling pad, and alignment and level checked. Use pins or molded surfaces of modular concrete units for alignment control; do not attempt alignment from rockface split surface.
- B. Ensure that all units are in full contact with base and properly seated.
- C. Install fiberglass connecting pins and fill all voids in and around the modular units with unit fill material. Tamp or rod unit fill to ensure that all voids are completely filled.
- D. Sweep excess material from top of units and install the next course. Ensure that each course is completely unit filled, backfilled and compacted prior to proceeding to next course.
- E. Place each subsequent course ensuring that pins protrude into adjoining courses a minimum of 1 inch. Two pins are required per unit. Push next course unit forward, away from the fill zone, locking against the pins in the previous course and backfill as the course is completed. Repeat procedure to the extent of wall height.
- F. Follow wall erection and unit fill placement closely with any other backfilling required.

- G. Position vertically adjacent modular concrete units as recommended by the manufacturer (in running bond pattern).
- H. Do not install units more than two courses high before wall unit fill, backfill placement and compaction.
- I. Use 1 cubic foot, minimum, of unit fill for each square foot of wall face. Place unit fill within cores of, between, and behind units to meet this requirement.
- J. Erect whole, or cut, units on curves and corners with running bond approximately centered on units above and below.
- K. Cap Installation: Apply adhesive to top surface of unit below and place cap unit into position over projecting pins from units below.

3.05 UNREINFORCED BACKFILL PLACEMENT

- A. Place and compact backfill in lifts not to exceed 8 inches.
- B. Compact backfill to 95 percent of the maximum density as determined by ASTM D 698.
- C. Place the top 8 inches of the structure fill using low permeability soil.
- D. Use only lightweight hand-operated equipment within 3 ft from the tail of the modular concrete units.
- E. At the end of each day's operation, slope the last lift of reinforced backfill away from the wall units to direct runoff away from wall face. Do not allow surface runoff from adjacent areas to enter the wall construction site.

END OF SECTION

SECTION 02921

SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Seeding, mulching and fertilizer.
- B. Maintenance.

1.02 RELATED SECTIONS

- A. Section 02316 - Fill and Backfill: Topsoil material.

1.03 DEFINITIONS

- A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Proposed seed mixture.

1.05 REGULATORY REQUIREMENTS

- A. Comply with regulatory agencies for fertilizer and herbicide composition.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.
- B. Deliver fertilized in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.07 MAINTENANCE SERVICE

- A. Furnish maintenance of seeded areas for 1-1/2 months from Date of Substantial Completion.
- B. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

PART 2 PRODUCTS

2.01 SEED MIXTURE

- A. Seed Mixture:

1. Mixture as recommended by Installer, but containing primarily Kentucky Blue Grass and Creeping Red Fescue.

2.02 ACCESSORIES

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.
- B. Fertilizer: Commercial brand; recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated by analysis.
- C. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.
- D. Erosion Fabric: Jute matting, open weave.
- E. Herbicide: Non-damaging to grass.
- F. Stakes: Softwood lumber, chisel pointed.
- G. String: Inorganic fiber.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this Section.

3.02 PREPARATION

3.03 FERTILIZING

- A. Apply fertilizer in accordance with manufacturer's instructions.
- B. Apply after smooth raking of topsoil and prior to roller compaction.
- C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.
- D. Mix thoroughly into upper 2 inches of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

3.04 SEEDING

- A. Apply seed at a rate of 5 lbs per 1000 sq ft evenly in two intersecting directions. Rake in lightly.
- B. Do not seed areas in excess of that which can be mulched on same day.
- C. Do not sow immediately following rain, when ground is too dry, or during windy periods.
- D. Roll seeded area with roller not exceeding 112 lbs.
- E. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.

- F. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.05 SEED PROTECTION

- A. Identify seeded areas with stakes and string around area periphery. Set string height to 30 inches. Space stakes at 120 inches.
- B. Cover seeded slopes where grade is 4 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.
- C. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 12 inch overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.
- D. Secure outside edges and overlaps at 36 inch intervals with stakes.
- E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

3.06 MAINTENANCE

- A. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.
- B. Neatly trim edges and hand clip where necessary.
- C. Immediately remove clippings after mowing and trimming.
- D. Water to prevent grass and soil from drying out.
- E. Roll surface to remove minor depressions or irregularities.
- F. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- G. Immediately reseed areas which show bare spots.
- H. Protect seeded areas with warning signs during maintenance period.

END OF SECTION

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SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete formwork.
- B. Elevated concrete slabs.
- C. Floors and slabs on grade.
- D. Concrete foundation walls and stairs and ramps.
- E. Concrete reinforcement.
- F. Joint devices associated with concrete work.
- G. Concrete curing.

1.02 RELATED SECTIONS

- A. Section 02751 - Portland Cement Concrete Paving: Sidewalks, curbs and gutters.
- B. Section 07900 - Joint Sealers.

1.03 REFERENCES

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991.
- B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 1996.
- C. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 1989.
- D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 1989.
- E. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 1991.
- F. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 1988.
- G. ACI 308 - Standard Practice for Curing Concrete; American Concrete Institute International; 1992.
- H. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary; American Concrete Institute International; 1995.
- I. ASTM A 185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement; 1994.

- J. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 1996a.
- K. ASTM C 33 - Standard Specification for Concrete Aggregates; 1993.
- L. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 1996.
- M. ASTM C 94 - Standard Specification for Ready-Mixed Concrete; 1996.
- N. ASTM C 150 - Standard Specification for Portland Cement; 1996.
- O. ASTM C 171 - Standard Specification for Sheet Materials for Curing Concrete; 1997.
- P. ASTM C 173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 1994a.
- Q. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete; 1995.
- R. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 1997.
- S. ASTM C 494 - Standard Specification for Chemical Admixtures for Concrete; 1992.
- T. ASTM C 618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete; 1996a.
- U. ASTM C 881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 1990.
- V. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 1983 (reapproved 1991).

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Acquire cement from same source and aggregate from same source for entire project.
- C. Follow recommendations of ACI 305R when concreting during hot weather.
- D. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.01 FORMWORK

- A. Form Materials: 's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
 - 1. Form Facing for Exposed Finish Concrete: 's choice of materials that will provide smooth, stain-free final appearance.

2. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
3. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.02 REINFORCEMENT

- A. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420).
 1. Deformed billet-steel bars.
 2. Unfinished.
- B. Welded Steel Wire Fabric: ASTM A 185, plain type.
 1. Flat Sheets.
 2. Mesh Size and Wire Gage: As indicated on drawings.
- C. Reinforcement Accessories:
 1. Tie Wire: Annealed, minimum 16 gage.
 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C 150, Type I - Normal Portland type.
- B. Fine and Coarse Aggregates: ASTM C 33.
- C. Fly Ash: ASTM C 618, Class F.
- D. Water: Clean and not detrimental to concrete.

2.04 ADMIXTURES

- A. Air Entrainment Admixture: ASTM C 260.
- B. Chemical Admixtures: ASTM C 494, Type A - Water Reducing, and other types identified in mix designs to suit job conditions.
 1. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

2.05 CONCRETE ACCESSORIES

- A. Dovetail Anchor Slots: Formed steel sheet, galvanized, with temporary filler to prevent concrete intrusion during placement. Provide #305 Dovetail Slot, 20 gage, hot dip galvanized manufactured by Hohman & Barnard, Inc..
- B. Epoxy Bonding System: ASTM C 881, type as required by project conditions.
- C. Vapor Retarder: 6 mil thick clear polyethylene film, type recommended for below grade application.
- D. Moisture-Retaining Cover: ASTM C 171; regular curing paper, white curing paper, clear polyethylene, white polyethylene, or white burlap-polyethylene sheet.
- E. Liquid Curing Compound: ASTM C 309, Type 1, clear or translucent.

2.06 JOINT DEVICES AND MATERIALS

- A. Joint Filler: ASTM D 1751; Asphalt impregnated fiberboard or felt, 1/4 inch thick; tongue and groove profile.
- B. Sealant and Primer: As specified in Section 07900.

2.07 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 Humpert Wolnitzek Architects for preparing and reporting proposed mix designs.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
- D. Normal Weight Concrete:
 - 1. Compressive Strength, per ASTM C 39 at 28 days: As indicated on drawings.
 - 2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
 - 3. Water-Cement Ratio: Maximum 40 percent by weight.
 - 4. Total Air Content: for exterior concrete, 6 percent, per ASTM C 173.
 - 5. Maximum Slump: 4 inches.
 - 6. Maximum Aggregate Size: to suit use or 3/4 inch.

2.08 MIXING

- A. Transit Mixers: Comply with ASTM C 94.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
- B. Verify that forms are clean before applying release agent.
- C. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.
- D. Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches and seal watertight by taping edges and ends.

3.03 INSTALLING REINFORCEMENT

- A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

- B. Install wire fabric in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Notify Humpert Wolnitzek Architects not less than 24 hours prior to commencement of placement operations.
- D. Ensure reinforcement, inserts, and waterstops will not be disturbed during concrete placement.
- E. Repair vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.
- F. Separate slabs on grade from vertical surfaces with 1/2 inch thick joint filler.
- G. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to Section 07900 for finish joint sealer requirements.
- H. Install joint devices in accordance with manufacturer's instructions.
- I. Apply sealants in joint devices in accordance with Section 07900.
- J. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- K. Place concrete continuously between predetermined expansion, control, and construction joints.
- L. Do not interrupt successive placement; do not permit cold joints to occur.
- M. Place floor slabs in saw cut pattern indicated.
- N. Saw cut joints within 24 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.
- O. Screed floors level, maintaining surface flatness of maximum 1/4 inch in 10 ft.

3.05 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. 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. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.

- D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
 - 1. Steel trowel surfaces that will receive carpeting, resilient flooring, seamless flooring, thin set quarry tile, and thin set ceramic tile.
 - 2. Steel trowel surfaces that will be left exposed.
- E. 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 308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 - 1. Normal concrete: Not less than 7 days.
- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
- D. Surfaces Not in Contact with Forms:
 - 1. Start initial curing 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.
 - 2. Begin final curing after initial curing but before surface is dry.
 - a. Moisture-retaining cover: Seal in place with waterproof tape or adhesive.
 - b. Curing compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.07 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01400.
- 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 C 39. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 25 cu yd 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.

3.08 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Humpert Wolnitzek Architects and 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 Humpert Wolnitzek Architects. The cost of additional testing shall be borne by when defective concrete is identified.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Humpert Wolnitzek Architects for each individual area.

END OF SECTION

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SECTION 04720

CAST STONE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Customized cast stone components for installation in masonry.
- B. Anchors and accessories.

1.02 RELATED SECTIONS

- A. Section 04810 - Unit Masonry Assemblies.
- B. Section 07900 - Joint Sealers.

1.03 REFERENCES

- A. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary; American Concrete Institute International; 1995.
- B. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 1996a.
- C. ASTM C 33 - Standard Specification for Concrete Aggregates; 1993.
- D. ASTM C 150 - Standard Specification for Portland Cement; 1996.
- E. ASTM C 494 - Standard Specification for Chemical Admixtures for Concrete; 1992.
- F. ASTM C 642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete; 1997.
- G. ASTM C 979 - Standard Specification for Pigments for Integrally Colored Concrete; 1982 (reapproved 1993).
- H. ASTM C 1194 - Standard Test Method for Compressive Strength of Architectural Cast Stone; 1991 (reapproved 1995).
- I. ASTM C 1195 - Standard Test Method for Absorption of Architectural Cast Stone; 1991 (reapproved 1995).
- J. CSI-TM - Technical Manual; Cast Stone Institute; current edition.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Test results of cast stone components made previously by the manufacturer.
- C. Shop Drawings: Include profiles, cross sections, exposed faces, arrangement of joints, anchoring methods, and anchors.
- D. Verification Samples: Pieces of actual cast stone components not less than 1 ft in length, illustrating range

of color and texture to be anticipated in components furnished for the project.

1.05 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** A current producer member of the Cast Stone Institute, with a minimum of five years of experience in producing cast stone of the types required for this project.
 - 1. Plant must have adequate capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the Work.
 - 2. Products previously produced by plant and exposed to weather must exhibit satisfactory appearance.
- B. **Standards:** Comply with requirements of current edition of CSI-TM: Cast Stone Institute Technical Manual.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. **Delivery:** Deliver cast stone components secured to shipping pallets and protected from damage and discoloration.
- B. **Storage and Handling:** Store cast stone components on project site to prevent contact with earth. Handle carefully to avoid chipping and cracking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide cast stone components fabricated by Edwards Precast Concrete Co., Dubuque, Iowa.
- B. Indiana Limestone is an acceptable alternate.
- C. **Substitutions:** See Section 01600 - Product Requirements.

2.02 CAST STONE COMPONENTS

- A. Provide cast stone components with the following properties:
 - 1. Compressive strength: 6500 psi minimum at 28 days, per ASTM C 1194.
 - 2. Absorption: 6 percent maximum at 28 days, per ASTM C 1195 or ASTM C 642.
- B. **Surface Texture:** Fine grained, similar to natural stone. No bugholes or air voids are permitted.
- C. **Color and Finish:** Match color of brick as selected by Humpert Wolnitzek Architects 's office. Finish to be smooth.

2.03 MATERIALS

- A. **Portland Cement:** ASTM C 150, Type I or Type III, white or gray as required to match Architect's sample.
- B. **Coarse Aggregate:** ASTM C 33, except for gradation; granite, quartz, or limestone.
- C. **Fine Aggregate:** ASTM C 33, except for gradation; natural or manufactured sands.
- D. **Pigments:** ASTM C 979, inorganic iron oxides.
- E. **Admixtures:** ASTM C 494.
- F. **Water:** Potable.

- G. Reinforcing Bars: ASTM A 615/A 615M, galvanized or epoxy coated when covered by less than 1-1/2 inch of cast stone material.

2.04 ACCESSORY PRODUCTS

- A. Anchors: Non-corrosive type, sized for conditions. Provide of brass, hot-dip galvanized steel, or Type 304 stainless steel.
- B. Sealant: As specified in Section 07900.

2.05 FABRICATION

- A. Shapes: Unless otherwise indicated on drawings, provide suitable wash on exterior sills, copings, projecting courses, and components with exposed top surfaces and drips on projecting components.
- B. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses.
 - 1. Comply with ACI 318.
 - 2. Provide reinforcement of not less than 1/4 of one percent of cross section area.
- C. Curing and Finishing:
 - 1. Cure components with a direct fired steam generator at a minimum temperature of 105 degrees F for a minimum of 6 hours, within 12 hours of fabrication.
 - 2. Cure components in the presence of carbon monoxide and carbon dioxide to promote carbonation at the surface, for efflorescence control.
 - 3. Remove cement film from exposed surfaces prior to packaging for shipment.
- D. Tolerances: Fabricate cast stone components within the following tolerances:
 - 1. Plus or minus 1/8 inch in all dimensions.
 - 2. Maximum bow, camber, or twist: length/360.

PART 3 EXECUTION

3.01 INSTALLATION

- A. General: Install cast stone components in conjunction with masonry, complying with requirements of Section 04810.
- B. Setting:
 - 1. Drench cast stone components with clear, running water immediately prior to installation.
 - 2. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
 - 3. Set cast stone components in a full bed of mortar unless otherwise detailed.
 - 4. Fill vertical joints with mortar.
 - 5. Make all joints 3/8 inch, except as otherwise detailed.
 - 6. Rake mortar joints 3/4 inch for pointing. Sponge the face of each stone to remove excess mortar.
 - 7. Tuck point joints to a slight concave profile.
- C. Sealant Joints:
 - 1. Comply with requirements of Section 07900.
 - 2. Prime the ends of cast stone components, insert properly sized foam backing rod, and install sealant using sealant gun.
 - 3. Provide sealant joints at the following locations and as otherwise detailed:
 - a. At control and expansion joints.

3.02 TOLERANCES

- A. Comply with requirements of CSI-TM: Cast Stone Institute Technical Manual.
- B. Set cast stone components within 1/8 inch of plane of adjacent component.
- C. Make joints consistent within tolerance of plus 1/16 inch and minus 1/8 inch.

3.03 ADJUSTING, CLEANING, AND PROTECTION

- A. Repair obvious chips with matching touchup material provided by the manufacturer.
- B. Clean cast stone components by wetting with clear running water.
- C. Apply a solution of Sure Clean 600 by ProSoCo Products, Inc. or equivalent, complying with manufacturer's instructions.
- D. Protect cast stone components from splashing and from damage by other operations at the project site.

END OF SECTION

SECTION 04810
UNIT MASONRY ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete Block.
- B. Clay Facing Brick.
- C. Clay Tile
- D. Ceramic Glazed Structural Clay Facing Tile.
- E. Mortar and Grout.
- F. Reinforcement and Anchorage.
- G. Flashings.
- H. Lintels.
- I. Accessories.

1.02 RELATED SECTIONS

- A. Section 05500 - Metal Fabrications: Loose steel lintels.
- B. Section 07212 - Board and Batt Insulation: Insulation for cavity spaces.
- C. Section 07900 - Joint Sealers: Backing rod and sealant at control and expansion joints.

1.03 REFERENCES

- A. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 1995a.
- B. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 1995.
- C. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 1996a.
- D. ASTM C 90 - Standard Specification for Load-Bearing Concrete Masonry Units; 1996a.
- E. ASTM C 126 - Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units; 1996.
- F. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar; 1993.
- G. ASTM C 150 - Standard Specification for Portland Cement; 1996.
- H. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes; 1991 (reapproved 1992).

- I. ASTM C 212 - Standard Specification for Structural Clay Facing Tile; 1996.
- J. ASTM C 270 - Standard Specification for Mortar for Unit Masonry; 1996a.
- K. ASTM C 404 - Standard Specification for Aggregates for Masonry Grout; 1995.
- L. ASTM C 476 - Standard Specification for Grout for Masonry; 1995.
- M. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 1995.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and each type of anchorage device.
- C. Samples: Submit four samples of Structural Tile and Structural Glazed Tile units to illustrate color, texture, and extremes of color range.

1.05 MOCK-UP

- A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high, which includes mortar and accessories, structural backup, flashings, and anchors.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

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.
- B. Handle and store ceramic glazed masonry units in protective cartons or trays. Do not remove from protective packaging until ready for installation.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

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 x 8 inches and nominal depths as indicated on the drawings for specific locations.
 - 2. Load-Bearing Units: ASTM C 90.
 - a. Both hollow and solid block, as indicated.
 - b. Type I - Moisture-controlled; lightweight.
 - c. Exposed faces: Manufacturer's standard color and texture.

2.02 BRICK UNITS

- A. Manufacturers:
1. Darlington Brick & Clay Products Company; Product #75, M4217, Utility size brick.
 2. Yankee Hill Brick & Tile; Product MM#1707, Utility Size Brick.
 3. Taylor Clay Products Inc.: Product French Gray, Modular, Smooth, Utility nsize brick.
 4. Substitutions: See section 01600 - Product requirements.
- B. Facing Brick: ASTM C 216, Type FBS, Grade SW.

2.03 CLAY TILE UNITS

- A. Manufacturers:
1. Stark Ceramics, Inc.
 2. Substitutions: See section 01600 - Product requirements.
- B. Structural Clay Facing Tile: ASTM C 212, Type FTX; Standard Class; single-face units; end-construction type.
1. Color and texture: Paintable CMU textured.
- C. Ceramic Glazed Structural Clay Facing Tile: ASTM C 126; Grade S (Select); Type I (single-faced units).
1. Color and texture: to be selected from manufacturer's standard color line.
 2. Size: 8W Series, thickness as indicated.
 3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn without chipping to produce equivalent effect.

2.04 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I; color as required to produce approved color sample.
1. Hydrated Lime: ASTM C 207, Type S.
 2. Mortar Aggregate: ASTM C 144.
 3. Grout Aggregate: ASTM C 404.
- B. Water: Clean and potable.

2.05 REINFORCEMENT AND ANCHORAGE

- A. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420) deformed billet bars; galvanized (if any).
- B. Single Wythe Joint Reinforcement: Truss type; ASTM A 82 steel wire, hot dip galvanized after fabrication to ASTM A 153/A 153M, Class B; 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.
- C. Multiple Wythe Joint Reinforcement: Tab type; fabricated with moisture drip; adjustable; ASTM A 82 steel wire, hot dip galvanized after fabrication to ASTM A 153/153M, Class B; 0.1483 inch side rods with 0.1875 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.
- D. Flexible Anchors: 4-piece anchors that permit differential movement between masonry and building frame.
1. Concrete frame: dovetail anchors of bent steel strap, 1 x 1-1/2 inch size x 12 ga / 0.1046 inch thick, with triangular wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B-2.
 2. Steel frame: Formed sheet anchors for welding to frame, 14 ga / 0.0747 inch thick, with triangular wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B-2.
 3. Manufacturers:

- a. Hohmann & Barnard, Inc.; Product matching Masonry Veneer Anchor system.
 - b. Substitutions: See Section 01600 - Product Requirements.
- E. Masonry Veneer Anchors: 4-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B-2.
1. Anchor plates: Not less than 14 ga / 0.0747 inch thick, designed for fastening to backup through sheathing by two fasteners.
 2. Wire ties: triangular shape, 0.1875 inch thick.
 3. Vertical adjustment: Not less than 2 inches.
 - a. Hohman and Barnard; Products: DW-10-X Anchor, Byna-Tie, Seismiclip, 0.1875 inch Continuous Joint Reinforcement Wire and #10 Stainless Steel Self-Drilling Self-Tapping Screws.

2.06 FLASHINGS

- A. Copper/Kraft Paper Flashings: 3 oz/sq ft sheet copper bonded to fiber reinforced asphalt treated Kraft paper. Provide Copper Fabric manufactured by Afco Products Inc..
- B. Lap Sealant: Butyl type as specified in Section 07900.

2.07 ACCESSORIES

- A. Joint Filler: Closed cell Neoprene; oversized 50 percent to joint width; self expanding; 3/8 inch wide x by maximum lengths available.
 1. Manufacturers:
 - a. Hohmann & Barnard, Inc.; Product #NS.
 - b. Substitutions: See Section 01600 - Product Requirements.
- B. Building Paper: ASTM D 226, Type I ("No.15") asphalt felt.
- C. Cavity Vents (Weeps): 100% Recycled Polyester with a 90% open mesh; 2.5" x 4" x 0.5"; match mortar color; insect resistant; and 1" x 10" cavity joint filler to prevent mortar from clogging weeps.
 1. Manufacturers:
 - a. Mortar Net (1-800-664-6638); Products: Weep Vents and Mortar Net
 - b. Substitutions: See Section 01600 - Product Requirements.
- D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.08 LINTELS

- A. Precast Concrete Lintels: Fire rated type, 8 x 8 inch size, 4,000 psi strength at 28 days.

2.09 MORTAR AND GROUT MIXES

- A. Mortar for Unit Masonry: ASTM C 270, using the Proportion Specification.
 1. Limit Cementitious materials in mortar to Portland cement - lime.
 2. Exterior, loadbearing masonry: Type S.
 3. Exterior, non-loadbearing masonry: Type S.
 4. Interior, loadbearing masonry: Type S.
- B. Grout: ASTM C 476. Consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- C. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.

3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

3.03 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Concave.
- D. Brick Units:
 - 1. Bond: Running.
 - 2. Coursing: Three units and three mortar joints to equal 8 inches.
 - 3. Mortar Joints: Concave.
- E. Clay Tile Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Concave.

3.04 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar as work progresses.
- E. Interlock intersections and external corners.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform 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.

3.05 WEEPS

- A. Install weeps in veneer and cavity walls at 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls.

3.06 CAVITY WALL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weeps.
- B. Build inner wythe ahead of outer wythe to receive cavity insulation and air/vapor barrier adhesive.

3.07 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHER 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 joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.

3.08 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- 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 joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.

3.09 REINFORCEMENT AND ANCHORAGES - CAVITY WALL 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 openings.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.

3.10 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.
 - 1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry or turn up at least 4 inches to form watertight pan at non-masonry construction.
 - 2. Remove or cover protrusions or sharp edges that could puncture flashings.
 - 3. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Extend laminated flashings to within 1/4 inch of exterior face of masonry.

- C. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.

3.11 LINTELS

- A. Install loose steel lintels over openings.
- B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled. See Structural Drawings for Masonry Lintel reinforcement.
- C. Maintain minimum 8 inch bearing on each side of opening.

3.12 GROUTED COMPONENTS

- A. Lap splices minimum 24 bar diameters.
- B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- C. Place and consolidate grout fill without displacing reinforcing.
- D. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

3.13 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control and expansion joints.
- B. Size control joint in accordance with Section 07900 for sealant performance.
- C. Form expansion joint as detailed.

3.14 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 Joint Thickness: 1/16 inch in 3 ft.

3.15 CLEANING

- A. Remove excess mortar and mortar smears as work progresses.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

3.16 PROTECTION OF FINISHED WORK

- A. Without damaging completed work, provide protective boards at exposed external corners which are subject to damage by construction activities.

END OF SECTION

SECTION 05120

STRUCTURAL STEEL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural steel framing members, support members, sag rods, and struts.
- B. Base plates, anchorages.
- C. Grouting under base plates.

1.02 REFERENCES

- A. AISC M016 - ASD Manual of Steel Construction; American Institute of Steel Construction, Inc.; 1989, Ninth Edition.
- B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.; 1992.
- C. AISC S329 - Allowable Stress Design Specification for Structural Joints Using ASTM A325 or A490 Bolts; American Institute of Steel Construction, Inc.; 1985, Reaffirmed 1994.
- D. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 1996.
- E. ASTM A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 1996.
- F. ASTM A 108 - Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality; 1995.
- G. ASTM A 242/A 242M - Standard Specification for High-Strength Low-Alloy Structural Steel; 1993a.
- H. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength; 1994.
- I. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 1996.
- J. ASTM A 325M - Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric); 1993.
- K. ASTM A 490 - Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength; 1993.
- L. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 1993.
- M. ASTM A 514/A 514M - Standard Specification for High-Yield Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding; 1994a.
- N. ASTM A 563 - Standard Specification for Carbon and Alloy Steel Nuts; 1994.
- O. ASTM A 563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric); 1993.

- P. ASTM C 1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 1997.
- Q. ASTM F 436 - Standard Specification for Hardened Steel Washers; 1993.
- R. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 1993.
- S. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; 1996.

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
 - 2. Connections.
 - 3. Indicate cambers and loads.
 - 4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
- D. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.04 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC M016.
- B. Comply with Section 10 of AISC S303 for architecturally exposed structural steel.
- C. Fabricator: Company specializing in performing the work of this section with minimum 5 years of documented experience.
- D. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Structural Steel Members: ASTM A 36/A 36M.
- B. High-Strength, Corrosion-Resistant Structural Steel: ASTM A 242/A 242M.
- C. Cold-Formed Structural Tubing: ASTM A 500, Grade B.
- D. Steel Bars: ASTM A 108.
- E. Steel Plate: ASTM A 514/A 514M.
- F. Pipe: ASTM A 53, Grade B, Finish black.
- G. Sag Rods: ASTM A 36/A 36M.

- H. Carbon Steel Bolts and Nuts: ASTM A 307, Grade A.
- I. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, plain.
- J. High-Strength Structural Bolts: ASTM A 490, with matching ASTM A 563 nuts and ASTM F 436 washers; Type 1 alloy steel.
- K. Anchor Bolts: ASTM A 307, Grade C.
- L. High-Strength Anchor Bolts: ASTM A 325, Type 1 plain.
- M. Welding Materials: AWS D1.1; type required for materials being welded.
- N. Sliding Bearing Plates: Teflon coated.
- O. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C 1107 and capable of developing a minimum compressive strength of 7,000 psi at 28 days.

2.02 FABRICATION

- A. Shop fabricate to greatest extent possible.
- B. Fabricate connections for bolt, nut, and washer connectors.
- C. Develop required camber for members.

2.03 FINISH

- A. Leave structural steel members un-primed.

2.04 SOURCE QUALITY CONTROL AND TESTS

- A. Welded Connections: Visually inspect all shop-welded connections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

- A. Erect structural steel in compliance with AISC S303.
- B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- C. Field weld components indicated on drawings and shop drawings.
- D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with AISC S329.
- E. Do not field cut or alter structural members without approval of Humpert Wolnitzek Architects.

- F. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

- A. Welded Connections: Visually inspect all field-welded connections.

END OF SECTION

SECTION 05210

STEEL JOISTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Open web steel joists, with bridging, attached seats and anchors.
- B. Supplementary framing for floor and roof openings greater than 18 inches.

1.02 REFERENCES

- A. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 1995.
- B. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength; 1994.
- C. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; 1996.
- D. FS TT-P-664 - Primer Coating, Alkyd, Corrosion-Inhibiting, Lead and Chromate Free, VOC-Compliant; Federal Specifications and Standards; Revision D, 1988.
- E. SJI (SPEC) - Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders; Steel Joist Institute; 1994, Fortieth Edition.
- F. SJI Technical Digest No. 9 - Handling and Erection of Steel Joists and Joist Girders; Steel Joist Institute; 1987.
- G. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1995 (Part of Steel Structures Painting Manual, Vol. Two).

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate standard designations, joist coding, configurations, sizes, spacings, cambers, locations of joists, joist leg extensions, bridging, connections, and attachments.
- C. Welders' Certificates: Submit manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.04 QUALITY ASSURANCE

- A. Perform Work, including that for headers and other supplementary framing, in accordance with SJI Standard Specifications Load Tables and SJI Technical Digest No.9.
- B. Manufacturer Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.
- C. Erector Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.

1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Transport, handle, store, and protect products to SJI requirements.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Open Web Joists: SJI Type K Joists:
 - 1. Provide bottom chord extensions as indicated.
 - 2. End bearing of 2-1/2 inches on steel supports.
 - 3. End bearing of 4 inches on masonry supports.
 - 4. Finish: Shop primed.
- B. Anchor Bolts, Nuts and Washers: ASTM A307, galvanized to ASTM A 153/A 153M.
- C. Welding Materials: AWS D1.1; type required for materials being welded.
- D. Shop and Touch-Up Primer: FS TT-P-664, lead- and chromate-free.

2.02 FINISH

- A. Shop prime joists as specified.
- B. Prepare surfaces to be finished in accordance with SSPC-SP 2.

PART 3 EXECUTION

3.01 ERECTION

- A. Erect joists with correct bearing on supports.
- B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.
- C. Coordinate placement of anchors in concrete construction for securing bearing plates.
- D. After joist alignment and installation of framing, field weld joist seats to bearing plates.
- E. Install supplementary framing for floor and roof openings greater than 18 inches.
- F. Do not permit erection of decking until joists are braced bridged, and secured or until completion of erection and installation of permanent bridging and bracing.
- G. Do not field cut or alter structural members without approval of joist manufacturer.

3.02 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 05310

STEEL DECK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof deck.
- B. Metal form deck.
- C. Supplementary framing for openings up to and including 18 inches.

1.02 REFERENCES

- A. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 1996.
- B. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; 1996.
- C. AWS D1.3 - Structural Welding Code - Sheet Steel; American Welding Society; 1989.
- D. SDI 29 - Design Manual for Composite Decks, Form Decks, Roof Decks and Cellular Floor Deck Systems with Electrical Distribution; Steel Deck Institute; 1995.

1.03 PERFORMANCE REQUIREMENTS

- A. Select and design metal deck in accordance with SDI 29.
- B. Calculate to structural working stress design and structural properties specified.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittals procedures.
- B. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.
- C. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.
- D. Certificates: Certify that meet or exceed specified requirements.
- E. Submit manufacturer's installation instructions.
- F. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Cut plastic wrap to encourage ventilation.
- B. Store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Steel Deck:
 - 1. United Steel Deck, Inc.
 - 2. Vulcraft Steel Deck.
 - 3. Wheeling Corrugating Co.

2.02 STEEL DECK

- A. Roof Deck: Non-composite type, fluted steel sheet:
 - 1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), with G60/Z180 galvanized coating.
 - a. Grade as required to meet performance criteria.
 - 2. Structural Properties: See Structural Drawings.
 - 3. Nominal Height: 1-1/2 inch.
 - 4. Profile: Fluted; SDI WR.
 - 5. Formed Sheet Width: 36 inch.
 - 6. Side Joints: See Structural Drawings.
 - 7. End Joints: See Structural Drawings.
- B. Metal Form Deck: Corrugated sheet steel, with provision for ventilation of concrete:
 - 1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS) Grade 33, with G90/Z275 galvanized coating.
 - a. Grade as required to meet performance criteria.
 - 2. Minimum Metal Thickness, Excluding Finish: 28 gage.
 - 3. Nominal Height: 9/16 inch.
 - 4. Formed Sheet Width: 24 inch.
 - 5. Side Joints: See structural drawings.
 - 6. End Joints: See structural drawings.

2.03 ACCESSORY MATERIALS

- A. Welding Materials: AWS D1.1.
- B. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.

2.04 FABRICATED DECK ACCESSORIES

- A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, thickness as shown on Structural Drawings or minimum 22 gage thick sheet steel; of profile and size as indicated; finished same as deck.
- B. Roof Drain Pans: 14 gage sheet steel, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.
- C. Floor Drain Pans: 14 gage sheet steel, flat bottom, sloped sides, recessed 1-1/2 inches below floor deck

surface, bearing flange 3 inches wide, sealed watertight.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions prior to beginning work.

3.02 INSTALLATION

- A. Erect metal deck in accordance with SDI 29 and manufacturer's instructions. Align and level.
- B. On steel supports provide minimum 1-1/2 inch bearing.
- C. Fasten deck to steel support members at ends and intermediate supports as indicated on the Structural Drawings. Welding: Use fusion welds.
- D. Mechanically fasten side laps at midspan. For Roof Deck use (1) #10 TEKS.
- E. Weld deck in accordance with AWS D1.3.
- F. At deck openings from 6 inches to 18 inches in size, provide 2 x 2 x 1/4 inch steel angle reinforcement. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.
- G. Where deck changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Fusion weld 12 inches on center maximum.
- H. At floor edges, install concrete stops upturned to top surface of slab, to contain wet concrete. Provide stops of sufficient strength to remain stationary without distortion.
- I. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.
- J. Close openings above walls and partitions perpendicular to deck flutes with single row of foam cell closures.
- K. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.
- L. Position floor drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

END OF SECTION

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SECTION 05400

COLD FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Formed steel joist framing and bridging.

1.02 RELATED SECTIONS

1.03 REFERENCES

- A. AISI SG-673 - Cold-Formed Steel Design Manual; American Iron and Steel Institute; 1986, 1989 Addendum.
- B. ASTM A 123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 1989a.
- C. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 1996.
- D. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; 1996.
- E. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).

1.04 SYSTEM DESCRIPTION

- A. See Structural Drawings.

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. *Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.*

1.06 QUALITY ASSURANCE

- A. Calculate structural properties of framing members in accordance with requirements of AISI SG-673.
- B. *Manufacturer: Company specializing in manufacturing the types of products specified in this section, and with minimum 5 years of experience.*
- C. *Installer: Company specializing in performing the work of this section with minimum 5 years of experience.*

PART 2 PRODUCTS

2.01 FRAMING MATERIALS

- A. Galvanized Joists and Purlins: ASTM A 653/A 653M.
 - 1. Base Metal: Structural Steel (SS), Grade 33.

2. Gage and depth: As indicated on the drawings.
3. Galvanized finish: G90/Z275.

2.02 ACCESSORIES

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.
- B. Plates, Gussets, Clips: Formed Sheet Steel, 0.06 inch thickness; finish to match framing components.
- C. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type II - Organic.

2.03 FASTENERS

- A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: ASTM A 123, hot dip galvanized to 1.25 oz/sq ft.
- B. Anchorage Devices: Power actuated, Drilled expansion bolts, and Screws with sleeves.
- C. Welding: In conformance with AWS D1.1.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that building framing components are ready to receive work.

3.02 INSTALLATION OF JOISTS AND PURLINS

- A. Install framing components in accordance with manufacturer's instructions.

END OF SECTION

SECTION 05500
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel items.

1.02 RELATED SECTIONS

1.03 REFERENCES

- A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 1996.
- B. ASTM A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 1996.
- C. ASTM A 283/A 283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 1993a.
- D. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 1996.
- E. ASTM A 325M - Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric); 1993.
- F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 1993.
- G. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; 1996.
- H. SSPC-Paint 15 - Steel Joist Shop Paint; Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).
- I. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).
- J. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1995 (Part of Steel Structures Painting Manual, Vol. Two).

1.04 SUBMITTALS

- A. See Section 01300 - 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.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A 36/A 36M.
- B. Plates: ASTM A 283.
- C. Pipe: ASTM A 53, Grade B Schedule 40, black finish.
- D. Fasteners: as detailed.
- E. Bolts, Nuts, and Washers: ASTM A 325.
- F. Welding Materials: AWS D1.1; type required for materials being welded.
- G. Shop and Touch-Up Primer: SSPC-Paint 15, Type I - Red Oxide.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

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. 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. Ship's Ladder: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish; as detailed on drawings.
 - 1. Side Rails: 3/8 x 2 inches members spaced at 20 inches.
 - 2. Rungs: one inch diameter solid round bar spaced 12 inches on center.
 - 3. Space rungs 7 inches from wall surface.
- B. Lintels: As detailed; galvanized finish.

2.04 FINISHES - STEEL

- A. Prime paint all steel items.
- 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.

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 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.

3.03 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. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 ERECTION 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

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SECTION 05510

METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural steel stair framing and supports.
- B. Pan treads to receive concrete fill, and landings.
- C. Integral balusters and handrails.
- D. Handrails at walls.

1.02 RELATED SECTIONS

- A. Section 03300 - Cast-In-Place Concrete: Concrete fill in stair pans and landings; mesh reinforcement for landings.
- B. Section 09900 - Paints and Coatings: Paint finish.

1.03 REFERENCES

- A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 1996.
- B. ASTM A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 1997.
- C. ASTM A 283/A 283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 1993a.
- D. ASTM A 611 - Standard Specification for Structural Steel (SS), Sheet, Carbon, Cold-Rolled; 1997.
- E. ASTM E 935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 1993.
- F. ASTM E 985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 1996.
- G. SSPC-Paint 15 - Steel Joist Shop Paint; Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).
- H. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1995 (Part of Steel Structures Painting Manual, Vol. Two).

1.04 DESIGN REQUIREMENTS

- A. Design and fabricate stair assembly to support a uniform live load of 100 lb/sq ft and a concentrated load of 300 lb/sq ft with deflection of stringer or landing framing not to exceed 1/180 of span. Test in accordance with ASTM A 935.
- B. Design and fabricate railing assemblies in accordance with ASTM E 985.

- C. Design railing assemblies, wall rails, and attachments to resist lateral force of 75 lbs at any point without damage or permanent set. Test in accordance with ASTM A 935.

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

1.06 QUALITY ASSURANCE

- A. Perform design and prepare shop drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the place where the Project is located.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Steel Sections: ASTM A 36/A 36M.
- B. Steel Plates: ASTM A 283.
- C. Pipe: ASTM A 53, Grade B Schedule 40, black finish.
- D. Ungalvanized Steel Sheet: ASTM A 611, Grade C, Type 1.
- E. Shop and Touch-Up Primer: SSPC-Paint 15, Type I - Red Oxide.

2.02 FABRICATION - GENERAL

- A. Fit and shop assemble components in largest practical sections, for delivery to site.
- B. Fabricate components 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.
- F. Fabricate components accurately for anchorage to each other and to building structure.

2.03 FABRICATION - PAN STAIRS AND LANDINGS

- A. Form treads and risers with minimum 12 gage sheet steel stock.
- B. Secure tread pans to stringers with clip angles; welded in place.
- C. Form stringers with rolled steel channels, 12 inches deep.

- D. Form landings with minimum 12 gage sheet stock. Reinforce underside with angles to attain design load requirements.
- E. Form balusters with 1/2 inch square steel sections, welded to stringers.
- F. Prime paint components.

2.04 FINISHING

- A. Prepare surfaces to be primed in accordance with SSPC-SP 2.
- B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- C. Do not prime surfaces in direct contact with concrete or where field welding is required.
- D. Prime paint items with one coat.

END OF SECTION

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SECTION 06114

WOOD BLOCKING AND CURBING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof nailers and cants.
- B. Telephone and electrical panel boards.

1.02 REFERENCES

- A. AWWA C2 - Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes; American Wood-Preservers' Association; 1997.
- B. AWWA C20 - Structural Lumber -- Fire Retardant Treatment by Pressure Processes; American Wood-Preservers' Association; 1996.
- C. PS 1 - Construction and Industrial Plywood; National Institute of Standards and Technology (Department of Commerce); 1995.
- D. SPIB (GR) - Standard Grading Rules for Southern Pine Lumber; Southern Pine Inspection Bureau, Inc.; 1994.

PART 2 PRODUCTS

2.01 DIMENSION LUMBER

- A. Grading Agency: Southern Pine Inspection Bureau, Inc. (SPIB).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Miscellaneous Blocking, Furring, and Nailers:
 - 1. Lumber: S4S, No. 2 or Standard Grade.

2.02 CONSTRUCTION PANELS

- A. Miscellaneous Panels:
 - 1. Concealed Plywood: PS 1, C-C Plugged, exterior grade.
 - 2. Electrical Component Mounting: APA rated sheathing, fire retardant treated.

2.03 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Fasteners: Hot-dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
 - 2. Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete.

2.04 FACTORY WOOD TREATMENT

- A. Fire Retardant Treatment: AWPA Treatment C20, Exterior Type, Chemically treated and pressure impregnated; capable of providing a maximum flame spread/smoke development rating of 25 / 200.
- B. Pressure Treatment of Lumber Above Grade: AWPA Treatment C2 using waterborne preservative to 0.25 lb/cu ft retention.
 - 1. Kiln dry after treatment to maximum moisture content of 19 percent.
 - 2. Treat wood in contact with roofing, flashing, or waterproofing.
 - 3. Treat wood in contact with masonry or concrete.
 - 4. Treat wood less than 18 inches above grade.

PART 3 EXECUTION

3.01 FRAMING INSTALLATION

- A. Set members level and plumb, in correct position.
- B. Place horizontal members with crown side up.
- C. Construct curb members of single pieces.
- D. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.
- E. Coordinate curb installation with installation of decking and support of deck openings.
- F. Provide miscellaneous members as indicated or as required to support finishes, fixtures, specialty items, and trim.

3.02 INSTALLATION OF CONSTRUCTION PANELS

- A. Install telephone and electrical panel back boards made of plywood or other acceptable structural panels at locations indicated. Size back boards to be minimum 48 inches beyond size of telephone and electrical panels.

END OF SECTION

SECTION 06410
CUSTOM CABINETS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Special fabricated cabinet units.
- B. Countertops.
- C. Cabinet hardware.
- D. Prefinished surfaces.
- E. Preparation for installing utilities.

1.02 REFERENCES

- A. AWI P-200 - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute; 1997, Seventh Edition, Version 1.0.
- B. FS MMM-A-130 - Adhesive, Contact; Federal Specifications and Standards; Revision B, 1974, and Amendment 3, 1976.
- C. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 1995.
- D. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 1994.

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
- C. Product Data: Provide data for hardware accessories.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with AWI P-200, Custom quality.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Protect units from moisture damage.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. During and after installation of work of this section, maintain the same temperature and humidity conditions in building spaces as will occur after occupancy.

PART 2 PRODUCTS

2.01 WOOD MATERIALS

- A. Softwood Lumber: NIST PS 20; Graded in accordance with AWI P-200, Custom; average moisture content of 6 percent; species and grade as follows:
 - 1. Cabinet Frame: Species any, Grade Custom.
 - 2. Internal Construction: Species any, Grade Custom.

2.02 PANEL MATERIALS

- A. Particleboard: ANSI A208.1; AWI P-200 standard, composed of wood chips, medium density, made with waterproof resin binders; of grade to suit application; sanded faces, located as follows:
 - 1. Door and Drawer Fronts: Species any, Grade Custom.
 - 2. Drawer Construction: Species any, Grade Custom.

2.03 LAMINATE MATERIALS

- A. Manufacturers:
 - 1. Formica Corp.
 - 2. Nevamar Corp.
 - 3. Wilsonart International, Inc.
 - 4. Substitutions: See Section 01600 - Product Requirements.
- B. Plastic Laminate: NEMA LD 3, HGS; color as selected; textured, low gloss finish.
- C. Laminate Backing Sheet: 0.020 inch Backing Sheet grade, undecorated plastic laminate.

2.04 ACCESSORIES

- A. Adhesive: FS MMM-A-130 contact adhesive.
- B. Fasteners: Size and type to suit application.
- C. Concealed Joint Fasteners: Threaded steel.
- D. Grommets: Plastic material for cut-outs.

2.05 HARDWARE

- A. Shelf Standards and Rests: Formed steel channels and rests, cut for fitted rests spaced at 1 inch centers; chrome finish.
- B. Drawer and Door Pulls: "U" shaped pull, aluminum with satin finish, 4 inch centers.
- C. Catches: Magnetic.
- D. Drawer Slides: Galvanized steel construction, ball bearings separating tracks, full extension type.

- E. Hinges: Knuckle disappearing type, steel with chrome finish.

2.06 FABRICATION

- A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
- B. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- C. Door and Drawer Fronts: 3/4 inch thick; overlay style.
- D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- E. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
- F. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
- G. Mechanically fasten back splash to countertops with steel brackets at 16 inches on center.
- H. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

- A. Set and secure casework in place; rigid, plumb, and level.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- E. Secure cabinet to floor using appropriate angles and anchorages.

3.03 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 07170

BENTONITE WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Bentonite clay waterproofing panels and accessories.
- B. Bentonite waterstop.
- C. Protection boards.

1.02 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product criteria, characteristics, accessories, jointing and seaming methods, and termination conditions.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Northern Kentucky Water Service District 's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

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

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Maintain bentonite products dry. Protect with waterproof cover.

1.05 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water.
 - 1. Exception: Where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.
 - 2. For warranty repair work, remove and replace materials concealing waterproofing.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. CETCO; Product Volclay Type 1 Panels.
- B. Other Acceptable Manufacturers:
 - 1. Mameco International, Inc.
 - 2. Paramount Technical Products, Inc.

2.02 MATERIALS

- A. Bentonite: Granulated pure, dry, bentonite clay comprised of 90 percent minimum sodium montmorillonite; 90 percent minimum passing No. 20 mesh sieve and 10 percent maximum passing No. 200 mesh sieve.
- B. Single-Ply Panels: Single corrugated core, smooth faced Kraft paper panels, core filled with bentonite clay granules.
 - 1. Nominal Panel Size: 48 x 48 x 3/16 inches.
 - 2. Minimum Bentonite Fill: 1 lb/sq ft.
 - 3. Minimum Panel Weight: 18 lbs.
- C. Joint Packing: Water soluble plastic filled with bentonite clay granules; 2 inch diameter x 24 inches long.
- D. Joint Seal: Moist and hydrated bentonite clay gel using water and glycol for below-freezing application and water for above-freezing application.
- E. Concrete Joint Waterstop: An expanding bentonite based, flexible strip adhered in place with adhesive.

2.03 ACCESSORIES

- A. Adhesive: Manufacturer's recommended type.
- B. Polyethylene Sheet: 4 mil thick.
- C. Protection Board: 1/8 inch thick biodegradable hardboard.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify substrate surfaces are smooth and durable; free of matter detrimental to application of waterproofing system.
- C. Verify items which penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

- A. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.
- B. Remove concrete fins, projections, and form ties.
- C. Fill holes, cracks, honeycombs, and voids with bentonite gel seal, minimum 1/8 inch thick, extending minimum 3 inches beyond defect.

3.03 APPLICATION - GENERAL

- A. Install panels in accordance with manufacturer's instructions.
- B. Cut panels parallel to corrugations to prevent bentonite loss.
- C. Seal construction joints with joint seal.

3.04 APPLICATION - VERTICAL SURFACES

- A. Install single-ply panels with masonry nails, starting at base of foundation.
- B. Fold panels around corners with corrugations vertical. Install unfolded panels with corrugations horizontal.
- C. Lap adjoining panels 1-1/2 inches.
- D. Stagger vertical joints minimum 16 inches on succeeding courses.
- E. Install one extra layer of panels at external corners.
- F. Place joint packing continuous along junction of wall and footing. Secure to prevent movement.

3.05 INSTALLATION - PROTECTION BOARD

- A. Place protection board directly over waterproofing; butt joints.
- B. Scribe and cut boards around projections, penetrations, and interruptions.

3.06 PROTECTION

- A. Do not permit traffic over unprotected or uncovered waterproofing.
- B. Cover installed waterproofing with temporary polyethylene sheeting. Remove sheeting just before backfilling begins.

END OF SECTION

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SECTION 07190
WATER REPELLENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water repellents applied to exterior masonry surfaces.

1.02 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description.

1.03 ENVIRONMENTAL REQUIREMENTS

- A. Protect liquid materials from freezing.
- B. Do not apply water repellent when ambient temperature is lower than 50 degrees F or higher than 100 degrees F.
- C. Do not apply water repellents when wind velocity is higher than 5 mph.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Water Repellent: Methyl methacrylate polymer; colorless.
 - 1. Solids by Volume: 7 percent, minimum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify joint sealants are installed and cured.
- C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

3.02 PREPARATION

- A. Do not start work until masonry mortar substrate is cured a minimum of 60 days.
- B. Remove loose particles and foreign matter.
- C. Remove oil or foreign substance with a chemical solvent which will not affect water repellent.
- D. Scrub and rinse surfaces with water and let dry.

3.03 APPLICATION

- A. Apply water repellent in accordance with manufacturer's instructions.

3.04 PROTECTION OF ADJACENT WORK

- A. Protect adjacent surfaces not intended to receive water repellent.
- B. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

END OF SECTION

SECTION 07212

BOARD AND BATT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Board insulation at cavity wall construction and perimeter foundation wall.
- B. Batt insulation for filling crevices in exterior wall and roof.

1.02 REFERENCES

- A. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 1995.
- B. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 1995.

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 BOARD INSULATION MATERIALS

- A. Extruded Polystyrene Board Insulation: ASTM C 578, Type IV; Extruded expanded polystyrene board with natural skin surfaces; with the following characteristics:
 - 1. Board Size: 24 x 96 inch.
 - 2. Board Thickness: 1-1/2 inches.
 - 3. Board Edges: Square.
 - 4. Thermal Conductivity (k factor) at 25 degrees F: 0.18.
 - 5. Manufacturers:
 - a. The Dow Chemical Co.
 - b. Owens Corning Corp.
 - c. Tenneco Building Products.
 - 6. Substitutions: See Section 01600 - Product Requirements.

2.02 BATT INSULATION MATERIALS

- A. Batt Insulation: ASTM C 665; preformed glass fiber batt; friction fit, conforming to the following:
 - 1. Facing: Faced on one side with asphalt treated mesh reinforced Kraft paper.
 - 2. Manufacturers:
 - a. Certainteed Corp.
 - b. Johns Manville Corp.

- c. Owens Corning Corp.
- 3. Substitutions: See Section 01600 - Product Requirements.

2.03 ACCESSORIES

- A. Adhesive: Type recommended by insulation manufacturer 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 and adhesive.
- 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 inch wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
 - 1. Tape seal joints.
 - 2. Extend sheet full height of joint.
- B. Apply adhesive to back of boards:
 - 1. Three continuous beads per board length.
 - 2. Full bed 1/8 inch thick.
- C. Install boards horizontally on foundation perimeter.
 - 1. Place boards to maximize adhesive contact.
 - 2. Butt edges and ends tightly to adjacent boards and to protrusions.
- D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION AT CAVITY WALLS

- A. Install boards to fit snugly between wall ties.
- B. Install boards horizontally on walls.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.04 BATT INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.05 PROTECTION OF FINISHED WORK

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

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SECTION 07221
ROOF INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof insulation and installation.
- B. Support system and installation.

1.02 RELATED SECTIONS

- A. Section 07550 - Modified Bituminous Membrane Roofing.

1.03 REFERENCES

- A. FS HH-I-558 - Insulation, Blocks, Boards, Blankets, Felts, Sleeving, (Pipe and Tube Covering), and Pipe Fitting Covering, Thermal (Mineral Fiber, Industrial Type); Federal Specifications and Standards; Revision B.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's specifications and installation instructions.
- C. Shop Drawings: Include layout and location of structural steel roof framing members, details and locations of support system components, and specific data about insulation, including:
 - 1. R value.
 - 2. Approximate thickness.
 - 3. Facing type.

1.05 REGULATORY REQUIREMENTS

- A. Conform to requirements of local building code.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened packaging, with identifying tags or labels intact and legible.
- B. Coordinate scheduling for timely deliveries and prompt installation of materials.
- C. Store insulation and support system in a dry, protected area. If storage area is outdoors, store material off the ground and protected by a suitable waterproof cover. If installation is delayed for an extended period, open bag ends to allow for ventilation.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Handle and install insulation system only under conditions and temperatures that allow the facing material to remain workable.
- B. Coordinate insulation placement to assure that material can be covered promptly with roof panels. Do not

leave insulation exposed overnight or to inclement weather.

1.08 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's standard warranty.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Products of this section are based on insulations as manufactured by the Celotex Corporation.
- B. Other acceptable manufacturers:
 - 1. Apache Products Company.
 - 2. GAF Materials Corporation.
- C. Substitutions: See Section 01600 - Product Requirements.

2.02 MATERIALS

- A. Polyisocyanurate Insulation: Celotex Hy-Therm AP Roof Insulation.
 - 1. Comply with FS HH-I-1972/Gen. 1.
 - 2. Comply with Factory Mutual: Class 1 Approval per FMRC Standard 4450/4470.
 - 3. Board Size: 48 x 96 inch
 - 4. Thickness: 2 1/2".
 - 5. Board Edges: Square.
 - 6. Thermal Conductivity (k factor): 0.16.
 - 7. Board Density: 1.8 lb/cu ft.
- B. Substitutions: See Section 01600 - Product Requirements.
- C. Fiberboard Roof Insulation: Celotex Regular Fiberboard Roof Insulation - one faces finished with mineral fiber, asphalt and kraft paper, with the following characteristics:
 - 1. Comply with ASTM C208 Class C and ASTM C209
 - 2. Comply with Factory Mutual: Class 1 Approval per FMRC Standard 4450/4470.
 - 3. Board Size: 48 x 96 inch.
 - 4. Thickness: 1/2".
 - 5. Board Edges: Square.
 - 6. Thermal Conductivity (k factor): 0.38.
- D. Substitutions: See Section 01600 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that roof framing system is complete and ready to receive insulation system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install roof insulation in strict accordance with manufacturer's instructions and approved shop drawings.

END OF SECTION

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SECTION 07411
METAL ROOF PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Work described in this section includes preformed metal roofing system complete with clips, perimeter and penetration flashing, closures, gutters, and downspouts.

1.02 RELATED SECTIONS

- A. Section 05120 - Structural Steel
- B. Section 05210 - Steel Joists
- C. Section 05310 - Steel Decks
- D. Section 05400 - Cold Formed Metal Framing

1.03 REFERENCES

- A. American Iron and Steel Institute (AISI): 1986 - Specification for the Design of Cold-Formed Steel Structural Members.
- B. American Society for Testing and Materials (ASTM): A792-96 - Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- C. B209-96 - Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- D. A653-96 - Specification for Steel Sheet Zinc-coated (galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip process.
- E. D1056-91 - Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
- F. D3575-84 - Test Methods for Flexible Cellular Materials made from Olefin Polymers.
- G. E1680-95 - Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.
- H. E1592-95 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
- I. E1646-95 - Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
- J. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): 1993 Architectural Sheet Metal Manual, 5th edition.
- K. Underwriters' Laboratories (UL): Standard UL - 580 Tests for Wind-Uplift Resistance of Roof Assemblies Standard UL - 263 Tests for Fire Resistanc Standard UL - 790 Class A Fire Rating
- L. Factory Mutual Research (FM): Standard FM 4471 Tests for Wind-Uplift Resistance of Roof Assemblies.

1.04 PERFORMANCE REQUIREMENTS

- A. Thermal Movement:
1. Completed metal roofing and flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, producing excess stress on structure, anchors or fasteners, or reducing performance ability.
 2. Interface between panel and clip shall provide for unlimited thermal movement in each direction along the longitudinal direction.
 3. Location of metal roofing rigid connector shall be at roof ridge unless otherwise approved and designed per job conditions by specified manufacturer.
- B. Uniform wind load capacity. Installed roof system shall withstand positive and negative design wind loading pressures complying with:
1. ASCE 7-95.
 2. Safety Factor of 2.5 reduced for wind to 1.875.
 3. Category I Building with a Importance Factor of 0.87.
 4. Wind Speed of 90 mph.
 5. Ultimate Pullout Value is 428 lbs./screw of the two fasteners holding the clip to the substrate or framing system.
 6. Exposure Category of C.
 7. Mean Roof Height 15 ft.
 8. Minimum Building Width 20 ft.
- C. Design Pressures:
- | | Negative |
|-----------------------------------|----------|
| 1. Roof Panel - Zone 1 (mid-roof) | 19.9psf |
| 2. Ridges & Eaves - Zone 2 | 24.5psf |
| 3. Corners - Zone 3 | 44.4psf |
- D. Capacity shall be determined using pleated airbag method in accordance with
1. (7.1) Roof test specimens shall be either full length or representative of the main body of the roof, free from edge restraint or perimeter attachments, continuous over one or more supports, and containing at least five panel modules for standing seam roof.
 2. (7.1.2) No attachments shall be permitted at sides or end perimeter other than those that occur uniformly throughout roof. Side and end seals shall be flexible and in no way restrain crosswise distortion of panels.
 3. (7.2.1) Panels and accessories shall be production materials of same type and thickness proposed for use on project.
- E. Installed roof system shall carry positive uniform design loads with a maximum system deflection of L/180 as measured at the rib (web) of the panel.
- F. Underwriters' Laboratories, Inc., (UL), wind uplift resistance classification: Roof assembly shall be classified as Class UL90, as defined by UL 580.
- G. Underwriters' Laboratories, Inc., (UL) fire resistance P ratings for roof assemblies. Underwriters' Laboratories, Inc., (UL) Class A fire rating per UL 790.
- H. Water penetration (dynamic pressure): No water penetration, other than condensation, when exposed to dynamic rain and 70 mph wind velocities for not less than five minutes duration, when tested in accord with principles of AAMA 501.1.
- I. Factory Mutual Research (FM), wind uplift resistance classification: Roof assembly shall be classified as FM 1-120 (this classification is for RMS-12 panel, 22 gauge steel only).
- J. Capacities for gauge, span or loading other than those tested may be determined by interpolation of test

results within the range of test data. Extrapolation for conditions outside test range are not acceptable.

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data:
 - 1. Include manufacturer's detailed material and system description, sealant and closure installation instructions, engineering performance data and finish specifications.
 - 2. Indicate fastener types and spacings; and provide fastener pullout values.
 - 3. Submit copy of manufacturer's minimum design load calculations according to ASCS-7-95.
- C. Shop drawings:
 - 1. Show roofing system with flashings and accessories in plan and elevation; sections and details.
 - 2. Include metal thickness' and finishes, panel lengths, joining details, anchorage details, flashings and special fabrication provisions for termination and penetrations; purlin and girt locations, thermal expansion provisions and special supports.
 - 3. Indicate relationships with adjacent and interfacing work.
 - 4. Shop drawings must be completed by the metal panel manufacturer's engineering department.
 - 5. Any and/or all changes recommended by the successful bidder must be approved by the manufacturer in writing prior to submittal.

1.06 QUALITY ASSURANCE

- A. INSTALLER QUALIFICATIONS:
 - 1. Engage an experienced metal roofing contractor (erector) to install standing seam system who has a minimum of three (3) years experience specializing in the installation of structural standing seam metal roof systems.
 - 2. Contractor must be certified by manufacturer specified as supplier of structural standing seam system and obtain written certification from manufacturer that installer is approved for installation of specified system. If requested, contractor must supply owner with a copy of this certification.
 - 3. Successful contractor is required to maintain a full-time supervisor/foreman who is on the job-site at all times during installation of new roof system. Foreman must have a minimum of five (5) years experience with the installation of system similar to that specified.
 - 4. Successful contractor must obtain all components of roof system from a single manufacturer including any roll good materials if required. Any secondary products that are required which cannot be supplied by the specified manufacturer must be recommended and approved in writing by primary manufacturer prior to bidding.
 - 5. If required, fabricator/installer shall submit work experience and evidence of adequate financial responsibility. The owners representative reserves the right to inspect fabrication facilities in determining qualifications.
- B. MANUFACTURERS QUALIFICATIONS: The materials outlined in the Material and Method Specifications are the type of materials that should be used on this project. Bidder will not be allowed to supply panels formed at the job-site on portable rollformers; metal panels must be pre manufactured and engineered for this project. Bidder will not be allowed to change materials after the bid opening date. If the bidder wishes to propose an alternate manufacturer and/or material than that specified, the following manufacturer criteria must be submitted with the bid.
 - 1. Submit certified test reports from a testing laboratory that bear the stamp of a registered P.E. to show compliance with specified performance criteria. Test reports must meet the specified negative uplift pressures as listed per this specification for the gauge, panel width and clip spacing specified as confirmed by manufacturers ASTM-E 1592 test results.
 - 2. Tests shall have been made for identical systems within the ranges of specified performance criteria.
 - 3. Empirical calculations for roof performance shall only be acceptable for positive loads.
 - 4. Indicate fastener types and spacings and provide fastener pullout values.

5. Submit copy of UL 90 classification in accordance with UL 580 test procedure.
6. Submit copy of certification from manufacturer stating that specified system has been tested in accordance with ASTM-1592 requirements by an independent Engineering Firm. All test results must be submitted including Air (ASTM E 283 & E1680) and Water (ASTM E 331 & E 1646) Infiltration Tests and meet or exceed those listed in Section 1.8 (Design and Performance Criteria)
7. A list of a minimum of five (5) jobs where the proposed alternate material was used under similar conditions. The reference list shall include date of project, size of project, address and contact telephone number.
8. A financial statement demonstrating a current ratio of 2:1 (current assets to current liabilities).
9. A written statement from the manufacturer stating that they will provide the building owner with a daily site inspection for a minimum of one (1) hour by an experienced, full time employee of the company.
10. A written statement from a corporate officer of the manufacturing company stating that he or she has reviewed the specifications and confirms that the proposed system meets or exceeds all performance requirements listed as well as meets the panel size, gauge, weight, clip design, sealant design, uplift pressures and height of the vertical seam.
11. A copy of manufacturer's 30 year warranty.
12. Submit sample of panel section, at least 6" x 6" showing seam profile and also a sample of color selected.
13. Submit sample of panel clip.
14. Submit sample of purlin (Z) and/or bearing plate if required.
15. Submit sample of base sheet, roll goods and/or mastics if required.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Protect components during fabrication and packing from mechanical abuse, stains, discoloration, and corrosion.
- B. Provide protective interleaving between contact areas of exposed surfaces to prevent abrasion during shipment, storage, and handling.
- C. Store materials off ground providing for drainage; under cover providing for air circulation; and protected from wind movement, foreign material contamination, mechanical damage, cement, lime or other corrosive substances.
- D. Handle materials to prevent damage to surfaces, edges and ends of roofing sheets and sheet metal items. Damaged material shall be rejected and removed from the site.
- E. Protect panels from wind-related damages.
- F. Inspect materials upon delivery. Reject and remove physically damaged or marred material from project site.

1.08 PROJECT CONDITIONS

- A. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage requirements for preformed metal roofing system.
- B. Protection:
 1. Provide protection or avoid traffic on completed roof surfaces.
 2. Do not overload roof with stored materials.
 3. Support no roof-mounted equipment directly on roofing system.
- C. Ascertain that work of other trades which penetrates the roof or is to be made watertight by the roof is in place and approved prior to installation of roofing.

1.09 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Owner shall receive ONE (1) WARRANTY from manufacturer of roof panels covering ALL of the following criteria. Multiple warranties are NOT acceptable.
 - 1. Manufacturer's 30 year limited watertight warranty.
 - 2. 20 year coverage on finish including checking, crazing, peeling, chalking, fading and/or adhesion.
 - 3. 20 year material coverage.
 - 4. Warranty shall commence on date of substantial completion.
 - 5. Installer shall provide manufacturer with 2 year warranty covering roofing system installation and watertightness.

1.10 PART 2 PRODUCTS

- A. METAL ROOFING SYSTEM:
- B. Whenever a particular make of material, trade name and/or manufacturer's name is specified herein, it shall be regarded as being indicative of the minimum standard of quality required. A bidder who proposes to quote on the basis of an alternate material and/or system will only be considered if the proposed alternate is submitted on time and is documented as being equivalent or superior in quality to the specified system as described in these specifications. Additionally, all manufacturer and contractor/fabricator guidelines must be met as specified.
- C. Product names for the metal roof panel system and waterproofing materials used in this section shall be based on performance requirements from materials manufactured by the Garland Company, Cleveland, OH. and form the basis of the contract documents. Any proposed alternate systems must meet or exceed the following listed characteristics and be submitted for approval 10 days prior to bid opening.
 - 1. Panel material: **24 ga., Galvalume steel, type AZ-55, grade 50 B, smooth as per ASTM A792-96.
 - 2. Flashing and flat stock material: Fabricate in profiles indicated on drawings of same material, thickness, and finish as roof system, unless indicated otherwise.
- D. Configuration: Standing seams incorporating mechanically interlocked, concealed anchor clips allowing unlimited thermal movement, and of configuration which will prevent entrance or passage of water.
 - 1. Panel/Cap configuration must have a total of four (4) layers of steel surrounding anchor clip for prevention of water infiltration and increased system strength designed to limit potential for panel blow-off.
 - 2. Profile of panel shall have mesa's every 1/2" o.c. continuous throughout panel which are a minimum of 1.5" wide. These will absorb thermal stresses, reduce oil canning in panel and increase load carrying capacity.
 - 3. Exposed fasteners, screws and/or roof mastic is unacceptable and will be rejected. System configuration only allows for exposed fasteners at panel overlap (if required) and trim details (as per manufacturer's guidelines)
 - 4. Panels must be furnished in continuous lengths from ridge to eave with no overlaps unless approved by manufacturer to length of run.
 - 5. Seam must be 2-3/8" minimum height for added upward pressures and aesthetic appeal. Seam shall have continuous anchor reveals to allow anchor clips to resist positive and negative loading and allow unlimited expansion and contraction of panels due to thermal changes. Integral (not mechanically sealed) seams are not acceptable.
- E. Concealed Anchor Clips: Clips must be 16 guage, 40,000 p.s.i. (G-90 galvanized steel) ONE (1) piece clip with projecting legs for additional panel alignment and provision for unlimited thermal movement in each direction along the longitudinal dimension.
 - 1. Two-piece (2) clips are NOT acceptable.
 - 2. Clip design must isolate sealant in panel cap from clip to insure that no sealant damage occurs from

the clip during expansion and contraction.

3. Clip must maintain a clearance of a minimum of 3/8" between panel and substrate for proper ventilation to help prevent condensation on underside of panel and eliminate the contact of panel fastener head to panel.
- F. Batten Seam Styles: Aluminum alloy 6061-T6, minimum thickness .060"
- G. Seam cap: Snap-on cap shall be a minimum of 1" wide "T" shaped of continuous length up to 45 feet according to job condition and field seamed by means of manufacturer's standard seaming machine.
1. Cap shall be designed to receive continuous double bead of hot applied, foamed in place gasketing sealant which will not come in contact with the anchor clip to allow unlimited thermal movement of panel without damage to cap sealant.
- H. Sealant shall be non-fatigue, nitrogen injected water barrier.
- I. Standing Seam Panel Width: (18")

1.11 ACCESSORIES:

- A. Gable anchor clips: Standing Seam and Batten Seam styles aluminum alloy 6061-T6 minimum thickness .090".
- B. Fasteners:
1. Concealed fasteners: Corrosion resistant steel screws designed to meet structural loading requirements. The normal minimum screw size shall be #14.
 2. Exposed fasteners: Corrosion resistant steel screws (cadmium or zinc coatings are not acceptable) of R-MER SPAN series stainless steel with neoprene sealing washer, or 3/16" diameter waterproof rivets.
- C. Closures: Factory pre-cut closed cell foam meeting ASTM D3575-93 a cross-linked closed cell polyolefin foam, enclosed in metal channel matching panels when used at hip and ridge.
- D. Panel joint (endlap) sealant: Non-curing modified isobutylene tri-polymer tape of thickness to fully adhere to both surfaces being joined with indicated service life of 20 years.
- E. Provide all miscellaneous accessories for complete installation.

1.12 FABRICATION

- A. Shop fabricate metal roofing and flashing components to the maximum extent possible, forming metal work with clear, sharp, straight, and uniform bends and rises. Hem exposed edges of flashings.
- B. Form flashing components from full single width sheet in minimum 10'-0" sections. Provide mitered corners, joined using closed end pop rivets and joint sealant.
- C. Fabricate roofing and related sheet metal work in accord with approved shop drawings and applicable standards.

PART 3 EXECUTION

2.01 EXAMINATION AND PREPARATION

- A. Verify the alignment and placement of the building structure and substrate. Correct any objectionable warp, waves or buckles in the substrate before proceeding with installation of the preformed metal roofing. The installed roof panels will follow the contour of the structure and may appear irregular if not corrected.

- B. Establish straight side and crosswise benchmarks.
- C. Use proper size and length fastener for strength requirements. Approximately 5/16" is allowable for maximum fastener head size beneath the panel.
- D. Rectangular Roofs shall be checked for square and straightness. Gable ends may not be straight; set a true line for the gable clips and flashing with stringline.
- E. Measure the roof lengthwise to confirm panel lengths, overhangs, coverage of flashings at eaves and ridges and verify clearances for thermal movement.

2.02 INSTALLATION

- A. All details will be shown on manufacturer's shop drawings to successful bidder; install roofing and flashings in accordance with approved shop drawings and manufacturer's product data, within specified erection tolerances.
- B. Install insulation as per manufacturers recommendations if required.
- C. Directly over insulation, install a 40 mil layer of Ice & Water Shield per the metal manufacturer's shop drawings.
- D. Directly over the Ice & Water Shield, install 3" x 5" (16 gauge) pre-punched bearing plates with the 16 gauge one piece panel clips. All clips will be set on bearing plates over the two pre-slotted holes and fastened through the insulation and into the deck based on the following spacing pattern.
 - 1. Clip spacing must be 5'-4" for Zone 1 (field)
 - 2. Clip spacing must be 4'-9" for Zone 2 (eave, ridge etc.)
 - 3. Clip spacing must be 3'-2" for Zone 3 (corners)
- E. Installation of Roof Panels: Roof panels can be installed by starting from either end and working towards the opposite end. Due to the symmetrical design of the specified panel system, it is also acceptable to start from the middle of the roof and work toward each end.
 - 1. A stainless steel pop rivet shall be secured through the anchor reveal of the panel leg and extend into the arms of the panel clip located at the ridge of the system. This is done at each arm of the clip along the ridge. The panel is then anchored at both sides of the clip. Be sure to capture all drilling debris during this operation with a rag or cloth placed on the panels at the drilling operation.
 - 2. The seam caps are shipped with two rolls of factory applied hot melt sealant located inside the caps. To install the caps, hook one side of the cap over the panel edge and rotate over the opposite panel leg. For ease of installation, start at one end of the panel and work toward the opposite end.
 - 3. A hand crimping tool is used to crimp the cap around the top of two adjacent panels
 - 4. Caps shall then be permanently seamed with manufacturers mechanical seamer.
- F. Isolate dissimilar metals and masonry or concrete from metals with bituminous coating. Use gasketed fasteners where required to prevent corrosive action between fastener, substrate, and panels.
- G. Limit exposed fasteners to extent indicated on shop drawings.
- H. Anchorage shall allow for temperature expansion/contraction movement without stress or elongation of panels, clips, or anchors. Attach clips to structural substrate using fasteners of size and spacing as determined by manufacturer's design analysis to resist specified uplift and thermal movement forces.
- I. Seal laps and joints in accordance with roofing system manufacturer's product data.
- J. Coordinate flashing and sheet metal work to provide weathertight conditions at roof terminations. Fabricate

and install in accordance with standards of SMACNA Manual.

- K. Provide for temperature expansion/contraction movement of panels at roof penetrations and roof mounted equipment in accordance with system manufacturer's product data and design calculations.
- L. Installed system shall be true to line and plane and free of dents, and physical defects with a minimum of oil canning.
- M. Form joints in linear sheet metal to allow for 1/4" minimum expansion at 20'-0" o.c. maximum and 8'-0" from corners.
- N. At joints in linear sheet metal items, set sheet metal items in two 1/4" beads of butyl sealant. Extend sealant over all metal surfaces. Mate components for positive seal. Allow no sealant to migrate onto exposed surfaces.
- O. Remove damaged work and replace with new, undamaged components.
- P. Touch up exposed fasteners using paint furnished by roofing panel manufacturer and matching exposed panel surface finish.
- Q. Clean exposed surfaces of roofing and accessories after completion of installation. Leave in clean condition at date of substantial completion. Touch up minor abrasions and scratches in finish.

END OF SECTION

SECTION 07550

MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Modified bituminous roofing membrane, protected membrane application.
- B. Base flashings.
- C. Roofing cant strips, accessories, and walkway pads.

1.02 RELATED SECTIONS

- A. Section 06100 - Rough Carpentry: Wood nailers and cant strips.
- B. Section 07221 - Roof Insulation.
- C. Section 07620 - Sheet Metal Flashing and Trim: Counterflashings and fascia gravelstops.
- D. Section 07724 - Roof Hatches: Counterflashings.

1.03 REFERENCES

- A. ASTM D 1079 - Terminology Relating to Roofing, Waterproofing, and Bituminous Materials
- B. ASTM D - 1227 Specification for Emulsified Asphalt Used as a Protective Coating for Roofing
- C. ASTM D 451 - Test Method for Sieve Analysis of Granular Mineral Surfacing for Asphalt Roofing Products.
- D. ASTM D 1863 - Standard Specification for Mineral Aggregate Used on Built-Up Roofs; 1993 (Reapproved 1996).
- E. ASTM D 2178 - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing; 1997a.
- F. ASTM D 2824 - Specification for Aluminum-Pigmented Asphalt Roof Coating
- G. ASTM D - 4601 Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing
- H. ASTM D - 5147 1991 Test Method for Sampling and Testing Modified Bituminous Sheet Materials
- I. ASTM E - 108 Test Methods for Fire Test of Roof Coverings
- J. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.
- K. FM DS 1-28 - Insulated Steel Deck Construction; Factory Mutual Research Corporation; 1991.
- L. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; National Roofing Contractors Association; Fourth Edition.
- M. UL (RMSD) - Roofing Materials and Systems Directory; Underwriters Laboratories Inc.; current edition.

- N. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating membrane and bitumen materials, base flashing materials.
- C. Shop Drawings: Indicate joint or termination detail conditions.
- D. Manufacturer's Installation Instructions: Indicate special procedures.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Northern Kentucky Water Service District 's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with NRCA Roofing and Waterproofing Manual.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 5 years of documented experience.
- C. Applicator Qualifications: Company specializing in performing the work of this section with minimum 5 years experience and approved by manufacturer.

1.06 PRE-INSTALLATION MEETING

- A. Convene one week before starting work of this section.
- B. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.
- B. Store products in weather protected environment, clear of ground and moisture.

1.08 PROJECT CONDITIONS

- A. Coordinate the work with installation of associated counterflashings installed by other sections as the work of this section proceeds.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply roofing membrane during unsuitable weather or when a 40% chance of precipitation is expected.
- B. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

- D. All work must be fully completed on each day. Phased construction will not be accepted.

1.10 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a two year period after Date of Substantial Completion.
- C. Membrane manufacturer will provide an annual inspection for the life of the warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Products specified in this section are as manufactured by The Garland Company.

2.02 GENERAL

- A. When a particular trade name or performance standard is specified it shall be indicative of a standard required.
- B. Any item or materials submitted as an alternate to the manufacturer specified must comply in all respects as to the quality and performance, including job site investigation of the brand name specified. The Architect/Owner shall be the sole judge as to whether or not an item submitted as an equal is truly equal. Should the contractor choose to submit on the equal basis, he shall assume all risk involved, monetary or otherwise, should the Architect/Owner find it unacceptable.

2.03 DESCRIPTION

- A. Modified bituminous roofing work including but not limited to:
1. Two plies of ASTM D-2178 Type IV glass fiber roofing felt bonded to the prepared substrate with hot bitumen.
 2. The hot bitumen will consist of ASTM D-312 Type IV special steep asphalt.
 3. All flashings will be set in bitumen and will be one ply of Type IV felt covered by an additional layer of modified bitumen membrane.
 4. The modified membrane will be: STRESSPLY "E" FR, 80 mil SIS/SBS (Styrene-Isoprene-Styrene/Styrene-Butadiene-Styrene) rubber modified roofing with fire retardant characteristics and a reinforced dual fiberglass scrim and polyester mat.
 5. The surfacing will be ASTM D-1863 roofing aggregate consisting of pea gravel.
- B. BITUMINOUS MATERIALS.
1. Asphalt Primer: V.O.C. compliant, ASTM D-41.
 2. Asphalt Roofing Mastic: V.O.C. compliant, ASTM D-2822, Type II.
 3. Asphalt: Shall meet ASTM Specification D-312 Type IV.
- C. SHEET MATERIALS
1. FELT PLIES: Fiberglass Felts: ASTM D-2178, TYPE IV.
 2. BASE FLASHING PLY: Type IV Fiberglass Felt.
 3. MODIFIED FLASHING PLY: STRESSPLY "E" FR
 4. MODIFIED MEMBRANE: STRESSPLY "E" FR
 - a. TENSILE STRENGTH (ASTM D-5147)
 - 1) 2 in./min. @ 73.4 ± 3.6 °F MD 275 lbf/in. CMD 335 lbf/in.
 - 2) (50 mm/min. @ 23 ± 3 °C) (MD 48.0 kN/m) (CMD 58.5 kN/m)
 - b. ELONGATION at MAXIMUM TENSILE (ASTM D-5147)

- 1) 2 in/min. @ 73.4 ± 3.6 °F MD 6.0%
 - 2) (50 mm/min. @ 23 ± 3 °C) CMD 6.0%
 - c. TEAR STRENGTH (ASTM D-5147)
 - 1) 2 in/min. @ 73.4 ± 3.6 °F MD 525 lbf. CMD 650 lbf.
 - 2) (50 mm/min. @ 23 ± 3 °C) (MD 2335 N) (CMD 2900 N)
 - d. LOW TEMPERATURE FLEX. (ASTM D-5147)
 - 1) passes -35 °F (-37 °C)
5. RELATED MATERIALS
- a. Roof Insulation: Reference Section 07221 - Roof Insulation for requirements.
 - b. Roof Insulation Fasteners: Reference Section 07221 - Roof Insulation for requirements.
 - c. Nails and Fasteners: Non-ferrous metal or galvanized steel, except that hard copper nails shall be used with copper; aluminum or stainless steel nails shall be used with aluminum; and stainless steel nails shall be used with stainless steel. Nails and fasteners shall be flush-driven through flat metal discs of not less than 1-inch diameter. Metal discs may be omitted when one piece composite nails or fasteners with heads not less than 1-inch diameter are used.
 - d. Metal Discs: Flat discs or caps of zinc-coated sheet metal not lighter than 28 gauge and not less than 1-inch in diameter. Discs shall be formed to prevent dishing. Bell or cup-shaped caps are not acceptable.
 - e. Walk-way Pads: As recommended and furnished by the membrane manufacturer.
 - 1) Ultra-Shield Walkway Pad
 - a) Tensile Strength (ASTM D-412, D-2240) 525-550 PSI
 - b) Elongation (ASTM D-412, D-2240) 70-80%
 - c) Tear Strength (ASTM D-624) 100-117 lbs./in.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 GENERAL INSTALLATION REQUIREMENTS

- A. Cooperate with manufacturer, inspection and test agencies engaged or required to perform services in connection with installing modified bitumen roofing system.
- B. Insurance/Code Compliance: Where required, install and test modified bitumen roofing system to comply with governing regulations and specified insurance requirements.
- C. Protect other work from spillage of modified bitumen roofing materials, and prevent liquid materials from entering or clogging drains and conductors. Replace or restore other work damaged by installations of modified bituminous roofing system work.
- D. Coordinate installing roofing system components so that insulation and roofing plies are not exposed to precipitation or left exposed overnight. Provide cut offs at end of each day's work to cover exposed ply sheets and insulation with two (2) plies of #15 organic felt set in full moppings of bitumen and with joints and

edges sealed with roofing cement. Remove cut offs immediately before resuming work.

- E. Asphalt Bitumen Heating: Heat and apply bitumen according to EVT Method as recommended by NRCA. Do not raise temperature above minimum normal fluid-holding temperature necessary to attain EVT (plus 5 °F at point of application) more than 1 hour prior to time of application. Determine flash point, finished blowing temperature, EVT, and fire-safe handling temperature of bitumen either by information from manufacturer or by suitable test. Do not exceed recommended temperature limits during bitumen heating. Do not heat to a temperature higher than 25° below flash point. Discard bitumen that has been held at temperature exceeding finishing blowing temperature (FBT) for more than 3 hours. Keep kettle lid closed except when adding bitumen.
- F. Bitumen Mopping Weights: For interply mopping, apply bitumen at the rate of approximately 25 lb of asphalt per roof square (plus or minus 25 percent on a total job average basis).
- G. Substrate Joint Penetrations: Prevent bitumen from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.
- H. Apply roofing materials as specified herein unless recommended otherwise by manufacturer's instructions. Keep roofing materials dry before and during application. Do not permit phased construction. Complete application of roofing plies, modified sheet and flashing in a continuous operation. Begin and apply only as much roofing in one day as can be completed that same day.
- I. Cut-Offs: At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets and insulation. Provide temporary covering of two (2) plies of #15 organic roofing felt set in full moppings of bitumen with joints and edges sealed.
- J. FELT Ply Installation
 1. Fiberglass Plies: Install (2) two fiberglass ply sheets in 25 lbs. per square of bitumen shingled uniformly to achieve two plies throughout over the prepared substrate. Shingle in proper direction to shed water on each area of roof.
 2. Lap ply sheet ends eight inches. Stagger end laps twelve inches minimum.
 3. Extend plies two inches beyond top edges of cants at wall and projection bases.
 4. Install base flashing ply to all perimeter and projections details.
- K. HPR Modified Membrane Application
 1. The modified membrane shall then be solidly bonded to the base layers with specified asphalt at the rate of 30 to 35 lbs. per 100 square feet.
 2. The roll must push a puddle of asphalt in front of it with asphalt slightly visible at all side laps. Care should be taken to eliminate air entrapment under the membrane.
 3. Apply pressure to all seams to ensure that the laps are solidly bonded to substrate.
 4. Subsequent rolls of modified shall be installed across the roof as above with a minimum of 4" side laps and 8" end laps. The end laps shall be staggered. The modified membrane shall be laid in the same direction as the underlayers, but the laps shall not coincide with the laps of the base layers.
 5. Apply asphalt no more than five feet ahead of each roll being embedded.
 6. Extend membrane 2" beyond top edge of all cants in full moppings of the specified asphalt as shown on the drawings.
- L. Flashing Membrane Installation (GENERAL)
 1. All curb, wall and parapet flashings shall be sealed with an application of mastic and mesh on a daily basis. No condition should exist that will permit moisture entering behind, around, or under the roof or flashing membrane.
 2. Prepare all walls, penetrations and expansion joints to be flashed and where shown on the drawings, with asphalt primer at the rate of one gallon per 100 square feet. Allow primer to dry tack free.
 3. The modified membrane will be used as the flashing membrane and will be adhered to an underlying base flashing ply with specified asphalt unless otherwise noted in these specifications and nailed off 8"

O.C. at all vertical surfaces.

4. The entire sheet of flashing membrane must be solidly adhered to the substrate.
5. Seal all vertical laps of flashing membrane with a three course application of Flashing Bond and fiberglass mesh.
6. Counter flashing, cap flashings, expansion joints, and similar work to be coordinated with modified bitumen roofing work are specified in other sections.
7. Roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices to be coordinated with modified bituminous roof system work are in other sections.

M. APPLICATION OF SURFACING

1. Aggregate Surfacing

- a. Apply surfacing materials in the quantities specified (500 lbs. per square for aggregate - 400 lbs. per square for slag) after felt flashings, tests, repairs, and corrective actions have been completed and approved. Uniformly embed aggregate in a flood coat of bitumen at a rate of 60 lbs per square coverage. This project shall require the application of a double flood coat and gravel.
- b. Aggregate shall be dry and placed in a manner required to form a compact, embedded overlay. To aid in proper embedment, aggregate may be lightly rolled, provided that there is not damage to the built-up roofing membrane.

2. CLEANING

- a. Remove drippage of bitumen from all walls, windows, floors, ladders, and finished surfaces.
- b. In areas where finished surfaces are soiled by asphalt or any other sources of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their instructions.

3. FINAL INSPECTION

- a. At completion of roofing installation and associated work, meet with Installer, installer of associated work, Owner, roofing system manufacturer's representative, and other representatives directly concerned with the performance of the roofing system.
- b. Walk roof surface areas of the building, inspect perimeter building edges as well as flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each party attending.
- c. The Roofing System Manufacturer reserves the right to request a thermographic scan of the roof during final inspection to determine if any damp or wet materials have been installed. The thermographic scan shall be provided by the Roofing Contractor at a negotiated price.
- d. If core cuts verify the presence of damp or wet materials, the Roofing Contractor shall be required to replace the damaged areas at his own expense.
- e. Repair or replace (as required) deteriorated or defective work found at time above inspection to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- f. The Contractor is to notify the Owner upon completion of corrections.
- g. Following the final inspection, acceptance will be made in writing by the material manufacturer.

END OF SECTION

SECTION 07620

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flashings, counterflashings, gutters, and downspouts.

1.02 RELATED SECTIONS

- A. Section 07411 - Metal Roof Panels
- B. Section 07900 - Joint Sealers.

1.03 REFERENCES

- A. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 1996.
- B. ASTM B 370 - Standard Specification for Copper Sheet and Strip for Building Construction; 1992.
- C. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 1993.
- D. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 1993, Fifth Edition.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.
- B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials which may cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

- A. Pre-Finished Galvanized Steel: ASTM A 653/A 653M, with G90/Z275 zinc coating; 0.02 inch core steel, shop pre-coated with modified silicone coating of color as selected.
- B. Copper: ASTM B370, cold rolled 16 oz/sq ft thick; natural finish.

2.02 ACCESSORIES

- A. Fasteners: Stainless steel, with soft neoprene washers.
- B. Wedges: Lead, spaced 16" on center.
- C. Protective Backing Paint: Zinc chromate alkyd.
- D. Sealant: Type A specified in Section 07900.
- E. Plastic Cement: ASTM D 4586, Type I.

2.03 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Tin edges of copper sheet to be soldered. Solder shop formed metal joints. After soldering, remove flux. Wipe and wash solder joints clean. Weather seal joints.
- F. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- G. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

2.04 GUTTER AND DOWNSPOUT FABRICATION

- A. Gutters: SMACNA Architectural Sheet Metal Manual, Rectangular profile.
- B. Downspouts: Rectangular profile.
- C. Accessories: Profiled to suit gutters and downspouts.
 - 1. Anchorage Devices: In accordance with SMACNA requirements.
 - 2. Gutter Supports: Brackets.
 - 3. Downspout Supports: Brackets.
- D. Downspout Boots: Cast iron.
- E. Seal metal joints.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Conform to drawing details:
 - 1. See drawings for SMACNA Architectural Sheet Metal Manual references for required details.
- B. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
- C. Apply plastic cement compound between metal flashings and masonry.
- D. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- E. Seal metal joints watertight.
- F. Secure gutters and downspouts in place using concealed fasteners.
- G. Slope gutters 1/4 inch per foot minimum.
- H. Connect downspouts to downspout boots. Grout connection watertight.

END OF SECTION

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SECTION 07724

ROOF HATCH AND EXPLOSION VENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 REFERENCES

- A. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.
- B. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on unit construction, sizes, configuration, jointing methods and locations when applicable, and attachment method.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Roof Hatches:
 - 1. BilcoCo.; Product as detailed on drawings.
- B. Equivalent products by other manufacturers, as judged by the Architect, are acceptable.
- C. Substitutions: See Section 01600 - Product Requirements.

2.02 ROOF HATCHES

- A. Unit: Single leaf type, listed by FM.
 - 1. Size as indicated on the drawings.
- B. Integral Steel Curb: 14 gage galvanized steel with 1.0 inch rigid glass fiber insulation; integral cap flashing to receive roof flashing; extended flange for mounting.
- C. Flush Aluminum Cover: 11 gage mill finish aluminum; 1 inch glass fiber insulation; 18 gage aluminum interior liner; continuous neoprene gasket to provide weatherproof seal.
- D. Hardware: Cadmium plated finish:
 - 1. Compression spring operator and shock absorbers.
 - 2. Steel manual pull handle for interior operation.
 - 3. Steel hold open arm with vinyl covered grip handle for easy release.
 - 4. Automatic opening upon explosion pressures of between 25 lb/sf and 30 lb/sf on the underside of the cover.
 - 5. Hinges: Manufacturer's recommended type.
- E. Accessories: Safety Railing, pop-up style extending above the curb.

2.03 FABRICATION

- A. Fabricate components free of visual distortion or defects. Weld corners and joints.
- B. Provide for removal of condensation occurring within components or assembly.
- C. Fit components for weather tight assembly.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Coordinate with installation of roofing system and related flashings for weather tight installation.
- C. Apply bituminous paint on surfaces of units in contact with cementitious materials or dissimilar metals.
- D. Adjust hinges for smooth operation.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sealants and joint backing.

1.02 REFERENCES

- A. ASTM C 834 - Standard Specification for Latex Sealants; 1995.
- B. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 1995.
- C. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 1991 (Reapproved 1995).
- D. ASTM D 1667 - Standard Specification for Flexible Cellular Materials--Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam); 1976 (Reapproved 1990).

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating sealant chemical characteristics.
- C. Samples: Submit two samples, 1/4 x 2 inch in size illustrating sealant colors for selection.

1.04 ENVIRONMENTAL REQUIREMENTS

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

1.05 COORDINATION

- A. Coordinate the work with all sections referencing this section.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Silicone Sealants:
 - 1. GE Silicones; Product Silglaze II.
 - 2. Substitutions: See Section 01600 - Product Requirements.
- B. Polyurethane Sealants:
 - 1. Bostik.
 - 2. ChemRex Inc. (Sonneborn).
 - 3. Pecora Corporation.
 - 4. Tremco, A BFGoodrich Specialty Chemicals Company.
 - 5. Substitutions: See Section 01600 - Product Requirements.
- C. Polysulfide Sealants:

1. ChemRex Inc. (Sonneborn).
2. Pecora Corporation.
3. Substitutions: See Section 01600 - Product Requirements.

D. Acrylic Emulsion Latex Sealants:

1. Bostik.
2. Pecora Corporation.
3. ChemRex Inc. (Sonneborn).
4. Tremco, A BFGoodrich Specialty Chemicals Company.
5. Substitutions: See Section 01600 - Product Requirements.

2.02 SEALANTS

- A. Type A - General Purpose Exterior Sealant: Polyurethane or Polysulfide; ASTM C 920, Grade NS, Class 25, Uses M, G, and A; single or multi- component.
1. Color: Standard colors matching finished surfaces.
 2. Applications: Use for:
 - a. Control, expansion, and soft joints in masonry.
 - b. Joints between concrete and other materials.
 - c. Joints between metal frames and other materials.
 - d. Other exterior joints for which no other sealant is indicated.
- B. Type E - Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.
1. Product: Chem-Calk Butyl Sealant manufactured by Bostik.
 2. Applications: Use for:
 - a. Concealed sealant bead in sheet metal work.
- C. Type F - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, single component, paintable.
1. Color: Standard colors matching finished surfaces.
 2. Applications: Use for:
 - a. Interior wall and ceiling control joints.
 - b. Joints between door and window frames and wall surfaces.
 - c. Other interior joints for which no other type of sealant is indicated.
- D. Type G - Bathtub/Tile Sealant: White silicone; ASTM C 920, Uses M and A; single component, mildew resistant.
1. Applications: Use for:
 - a. Joints between plumbing fixtures and floor and wall surfaces.
- E. Type I - Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C 920, Grade P, Class 25, Uses T, M and A; single component.
1. Approved by manufacturer for wide joints up to 1-1/2 inches.
 2. Color: Standard colors matching finished surfaces.
 3. Applications: Use for:
 - a. Perimeter expansion joints in floors.
- F. Type K - Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C 920, Class 25, Uses T, M and A; single or multi- component.
1. Color: Gray.
 2. Applications: Use for:
 - a. Joints in sidewalks, curbs and where paving abutts walls or other obstructions..
- G. Type S - Silicone Sealant: ASTM C 920, Grade NS, Class 25, Uses NT, A, G, M, O; single component, solvent curing, non-sagging, non-staining, fungus resistant, non-bleeding.

1. Color: Standard colors matching finished surfaces.
2. Product: Silglaze II manufactured by General Electric.
3. Applications: Use for:
 - a. Exposed applications in metal roofing system.

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.
- 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 which might 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 C 1193.
- 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 C 1193.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- D. Install bond breaker where joint backing is not used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave.

3.04 CLEANING

- A. Clean adjacent soiled surfaces.

3.05 PROTECTION OF FINISHED WORK

- A. Protect sealants until cured.

END OF SECTION

SECTION 08111

STANDARD STEEL DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-rated and fire-rated steel doors.
- B. Thermally insulated steel doors.
- C. Glass and glazing.

1.02 RELATED SECTIONS

- A. Section 08112 - Standard Steel Frames.
- B. Section 08710 - Door Hardware.
- C. Section 08800 - Glazing: Glass for doors.
- D. Section 09900 - Paints and Coatings: Field painting of doors.

1.03 REFERENCES

- A. ANSI/CABO A117.1 - American National Standard for Buildings and Facilities - Providing Accessible and Usable Buildings and Facilities; Council of American Building Officials; 1992.
- B. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 1996.
- C. ASTM C 236 - Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box; 1989 (Reapproved 1993).
- D. DHI A115 Series - Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; current edition (ANSI/DHI A115 Series).
- E. NFPA 80 - Standard for Fire Doors and Windows; National Fire Protection Association; 1995.
- F. SDI 100 - Recommended Specifications Standard Steel Doors and Frames; Steel Door Institute; 1991 (ANSI/SDI-100).

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door configurations, location of cut-outs for hardware reinforcement.
- C. Shop Drawings: Indicate door elevations, internal reinforcement, closure method, cut-outs for glazing, and finishes.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of SDI 100 and ANSI A117.1.
- B. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 REGULATORY REQUIREMENTS

- A. Fire Rated Door Construction: Conform to NFPA 252.
- B. Installed Door Assembly: Conform to NFPA 80 for fire rated class as indicated.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Protect doors with resilient packaging sealed with heat shrunk plastic.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.
- C. Break seal on site to permit ventilation.

PART 2 PRODUCTS

2.01 DOORS

- A. Exterior Doors (Thermally Isolated): SDI 100 Grade II, Model 2.
- B. Interior Doors (Non-rated): SDI 100 Grade II, Model 2.
- C. Interior Doors (Fire Rated and Heavy Duty): SDI 100 Grade III, Model 1.
- D. Interior Doors (Fire Rated): SDI 100 Grade I, Model 1.

2.02 DOOR CONSTRUCTION

- A. Face: Steel sheet in accordance with SDI 100.
 - 1. Provide ASTM A 653/A 653M sheet, G60/Z180 coating designation for exterior doors and wet area doors.
- B. End Closure: Channel, 0.047 inches thick, flush.
- C. Core: Manufacturer's standard.
- D. Core: Polystyrene foam for exterior doors.
- E. Thermal Insulated Doors: Total insulation R value of 12, measured in accordance with ASTM C 236.

2.03 ACCESSORIES

- A. Glass: In accordance with Section 08800.
- B. Removable Stops: Rolled steel, rectangular shape, mitered corners; prepared for countersink style screws.
- C. Primer: Zinc chromate type.

2.04 FABRICATION

- A. Hardware Preparation: In accordance with DHI A115 Series.
- B. Fabricate doors with hardware reinforcement welded in place.
- C. Attach fire rated label to each fire rated door unit.

2.05 FINISH

- A. Primer: Baked.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install doors in accordance with SDI 100.
- B. Coordinate installation of glass and glazing.
- C. Coordinate installation of doors with installation of frames specified in Section 08112 and hardware specified in Section 08710.

3.02 ADJUSTING

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

END OF SECTION

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SECTION 08112
STANDARD STEEL FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-rated and fire-rated steel frames.
- B. Thermally insulated steel frames.

1.02 RELATED SECTIONS

- A. Section 08111 - Standard Steel Doors.
- B. Section 08710 - Door Hardware: Hardware and weatherstripping.

1.03 REFERENCES

- A. ANSI/CABO A117.1 - American National Standard for Buildings and Facilities - Providing Accessible and Usable Buildings and Facilities; Council of American Building Officials; 1992.
- B. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 1996.
- C. DHI A115 Series - Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; current edition (ANSI/DHI 115 Series).
- D. NFPA 80 - Standard for Fire Doors and Windows; National Fire Protection Association; 1995.
- E. SDI 100 - Recommended Specifications Standard Steel Doors and Frames; Steel Door Institute; 1991 (ANSI/SDI-100).

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate frame configuration and finishes.
- C. Shop Drawings: Indicate frame elevations, reinforcement, anchor types and spacings, location of cut-outs for hardware, and finish.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of SDI 100 and ANSI A117.1.
- B. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.06 REGULATORY REQUIREMENTS

- A. Fire Rated Frame Construction: Conform to NFPA 252.

- B. Installed Frame Assembly: Conform to NFPA 80 for fire rated class same as fire door.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Accept frames on site in manufacturer's packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 FRAMES

- A. Exterior Frames:
 - 1. Grade II for Door Type 2, 0.058 inch thick material, base metal thickness.
 - 2. Provide ASTM A 653/A 653M sheet, G60/Z180 coating designation.
- B. Interior Frames:
 - 1. Grade II for Door Type 2 and for wood doors, 0.058 inch thick material, base metal thickness.
 - 2. Grade III for Door Type 1a, 0.070 inch thick material, base metal thickness.

2.02 ACCESSORIES

- A. Removable Stops: Rolled steel channel shape, butted corners; prepared for countersink style screws.
- B. Primer: Zinc chromate type.
- C. Silencers: Resilient rubber fitted into drilled hole.
- D. Weatherstripping: Specified in Section 08710.

2.03 FABRICATION

- A. Fabricate frames as welded unit.
- B. Hardware Preparation: In accordance with DHI A115 Series.
- C. Fabricate frames with hardware reinforcement plates welded in place. Provide mortar guard boxes.
- D. Prepare frames for silencers. Provide three single silencers for single doors and mullions of double doors on strike side. Provide two single silencers on frame head at double doors without mullions.
- E. Attach fire rated label to each fire rated door unit.

2.04 FINISH

- A. Primer: Baked.
- B. Coat inside of frame profile with bituminous coating to a thickness of 1/16 inch.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install frames in accordance with SDI 100.

- B. Coordinate installation of glass and glazing.
- C. Coordinate installation of frames with installation of hardware specified in Section 08710 and doors in Section 08111.
- D. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

3.02 ERECTION TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 inch measured with straight edges, crossed corner to corner.

END OF SECTION

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SECTION 08211
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flush wood doors; flush configuration; non-rated.

1.02 RELATED SECTIONS

- A. Section 08112 - Standard Steel Frames.
- B. Section 08710 - Door Hardware.
- C. Section 08800 - Glazing.

1.03 REFERENCES

- A. AWI P-200 - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute; 1997, Seventh Edition, Version 1.0.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cutouts for glazing.
- D. Samples: Submit two samples of door veneer, 12 x12 inch in size illustrating wood grain, stain color, and sheen.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with AWI P-200, Section 1300, Custom Grade.
- B. Finish doors in accordance with AWI P-200, Section 1500, grades identified in schedule.

1.06 DELIVERY, STORAGE, AND PROTECTION

- A. Package, deliver and store doors in accordance with AWI P-200, Section 1300.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 PROJECT CONDITIONS

- A. Coordinate the work with door opening construction, door frame and door hardware installation.

1.08 WARRANTY

- A. See Section 01780 - Closeout Submittals for additional warranty requirements.
- B. Provide warranty for the following term:
 - 1. Interior Doors: Life of installation.
- C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Veneer Doors:
 - 1. Eggers Industries.
 - 2. Southwood Door Company.
 - 3. Weyerhaeuser Architectural Doors.
 - 4. Substitutions: See Section 01600 - Product Requirements.

2.02 DOOR TYPES

- A. Flush Interior Doors: 1-3/4 inches thick; solid core construction; acoustic rated as indicated.

2.03 DOOR CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: AWI P-200, Section 1300, Type PC - Particleboard.

2.04 DOOR FACINGS

- A. Interior Doors - Veneer: Custom grade wood veneer, red oak species, plain sliced, with slip matched grain, for transparent finish.

2.05 ACCESSORIES

- A. Glazing Stops: Wood, of same species as door facing, mitered corners; prepared for countersink style screws.

2.06 FABRICATION

- A. Fabricate doors in accordance with AWI Quality Standards requirements.
- B. Fit door edge trim to edge of stiles after applying veneer facing.
- C. Bond edge banding to cores.
- D. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.
- E. Factory fit doors for frame opening dimensions identified on shop drawings.

- F. Provide edge clearances in accordance with AWI 1600.

2.07 FINISH

- A. Factory finish doors in accordance with AWI P-200, Section 1500 to the following finish designations:
 - 1. Transparent Finish: TR-4, transparent conversion varnish, Premium quality, semi-gloss sheen.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and AWI P-200 requirements.
- B. Trim door height by cutting bottom edges to a maximum of 3/4 inch (19 mm).
- C. Machine cut for hardware.
- D. Coordinate installation of doors with installation of frames specified in Section 08112 and hardware specified in Section 08710.
- E. Coordinate installation of glass and glazing.

3.02 INSTALLATION TOLERANCES

- A. Conform to AWI P-200, Section 1300 for maximum diagonal distortion.
- B. Maximum Vertical Distortion (Bow): 1/8 inch measured with straight edge or taut string, top to bottom, over an imaginary 36 x 84 inches surface area.
- C. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over an imaginary 36 x 84 inches surface area.

3.03 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION

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SECTION 08410

METAL-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass and glass infill panels.
- B. Aluminum doors and frames and door hardware.
- C. Perimeter sealant.

1.02 RELATED SECTIONS

- A. Section 07900 - Joint Sealers: Perimeter sealant and back-up materials.
- B. Section 08800 - Glazing.

1.03 REFERENCES

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 1997.
- B. AAMA 605.2 - Voluntary Specification for High Performance Organic Coatings on Architectural Aluminum Extrusions and Panels; American Architectural Manufacturers Association; 1992, Addendum 1995.
- C. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 1996.
- D. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 1996.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, 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. Warranty: Submit manufacturer warranty and ensure forms have been completed in Northern Kentucky Water Service District 's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND PROTECTION

- 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 which bond to aluminum when exposed to sunlight or weather.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.07 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide 10 year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- C. 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. Kawneer.
- B. Other Acceptable Manufacturers:
 - 1. United States Aluminum Corp.
 - 2. Vistawall Architectural Products.
- C. Substitutions: See Section 01600 - Product Requirements.

2.02 COMPONENTS

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Unitized, shop assembly.
 - 2. Color: As selected from manufacturer's standards.
- B. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
 - 1. Framing members for interior applications need not be thermally broken.
 - 2. Glazing stops: Flush.
 - 3. Cross-Section: As indicated on drawings.
- C. Doors: Glazed aluminum.
 - 1. Thickness: 1-3/4 inches.
 - 2. Top Rail: 4 inches wide.
 - 3. Vertical Stiles: 4-1/2 inches wide.
 - 4. Bottom Rail: 8 inches wide.
 - 5. Glazing Stops: Square.
 - 6. Finish: Same as storefront.

2.03 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Fasteners: Stainless steel.

- C. Perimeter Sealant: Type as specified in Section 07900.
- D. Glass: As specified in Section 08800.
- E. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- F. Glazing Accessories: As specified in Section 08800.

2.04 FINISHES

- A. High Performance Organic Finish: AAMA 605.2; multiple coats, thermally cured fluoropolymer system; color as selected from manufacturer's standard colors.
- B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.05 HARDWARE

- A. Door Hardware: Storefront manufacturer's standard type to suit application.
 - 1. Finish on Hand-Contacted Items: Polished stainless steel.
 - 2. Include for each door weatherstripping, sill sweep strip, threshold, pivots, exit device, narrow stile handle latch, and closer.

2.06 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.
- H. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.
 - 1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that wall openings and adjoining air and vapor 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. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Set thresholds in bed of mastic and secure.
- J. Install hardware using templates provided.
- K. Install glass in accordance with Section 08800, using glazing method required to achieve performance criteria.
- L. Install perimeter sealant in accordance with Section 07900.

3.03 ADJUSTING

- A. Adjust operating hardware for smooth operation.

3.04 CLEANING AND PROTECTION

- 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. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Remove excess sealant by method acceptable to sealant manufacturer.
- D. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.
- E. Protect finished work from damage.

END OF SECTION

SECTION 08520
ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Extruded aluminum windows with fixed sash and operating sash.
- B. Site glazing.
- C. Operating hardware.
- D. Insect screens.

1.02 RELATED SECTIONS

- A. Section 07900 - Joint Sealers: Perimeter sealant and back-up materials.
- B. Section 08800 - Glazing.

1.03 REFERENCES

- A. AAMA 605.2 - Voluntary Specification for High Performance Organic Coatings on Architectural Aluminum Extrusions and Panels; American Architectural Manufacturers Association; 1992, Addendum 1995.
- B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 1997.
- C. ASTM A 123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 1989a.
- D. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 1996.
- E. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 1996.
- F. FS RR-W-365 - Wire Fabric (Insect Screening); Federal Specifications and Standards; 1980, Rev. A (Amended 1986).
- G. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).
- H. SSPC-Paint 25 - Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer; Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).

1.04 PERFORMANCE REQUIREMENTS

- A. Performance Requirements: As specified in PART 2, with the following additional requirements:

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions.
- C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, and installation requirements.
- D. Certificates: Certify that windows meet or exceed specified requirements.

1.06 DELIVERY, STORAGE, AND PROTECTION

- A. Comply with requirements of AAMA CW-10.
- B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

PART 2 PRODUCTS

2.01 WINDOWS

- A. Windows: Tubular aluminum sections, factory fabricated, factory finished, thermally broken, vision glass, related flashings, anchorage and attachment devices.
 - 1. Performance Requirements: AAMA/NWWDA 101/I.S.2 C30
- B. Fixed, Non-Operable Type:
 - 1. Construction: Thermally broken.
 - 2. Glazing: Double; clear; transparent.
 - 3. Exterior Finish: high performance organic coating.
 - 4. Interior Finish: high performance organic coating.
- C. Outswinging Casement Type:
 - 1. Construction: Thermally broken.
 - 2. Provide screens.
 - 3. Screens: Aluminum.
 - 4. Glazing: Double; clear; transparent.
 - 5. Exterior Finish: high performance organic coating.
 - 6. Interior Finish: high performance organic coating.

2.02 COMPONENTS

- A. Frames: 2 inch wide x 3 inch deep profile, of 1/8 inch thick section; thermally broken with interior portion of frame insulated from exterior portion; flush glass stops of snap-on type.
- B. Reinforced Mullion: 1-1/2 inch profile of extruded aluminum with integral reinforcement of shaped steel structural section.
- C. Insect Screen Frame: Rolled aluminum frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit.
- D. Insect Screens: FS RR-W-365, woven aluminum mesh; 14/18 mesh size.

- E. Operable Sash Weatherstripping: Wool pile; permanently resilient, profiled to achieve effective weather seal.
- F. Fasteners: Stainless steel.
- G. Glass and Glazing Materials: As specified in Section 08800.
- H. Sealant and Backing Materials: As specified in Section 07900.

2.03 MATERIALS

- A. Extruded Aluminum: ASTM B 221 (ASTM B 221M), 6063 alloy, T6 temper.
- B. Concealed Steel Items: Profiled to suit mullion sections; galvanized in accordance with ASTM A 123 to 2.0 oz/sq ft.

2.04 HARDWARE

- A. Sash lock: Lever handle with cam lock. Provide pole handle of 7 feet.
- B. Projecting Sash Arms: Cadmium plated steel, friction pivot joints with nylon bearings, removable pivot clips for cleaning.
- C. Pulls: Manufacturer's standard type.
- D. Limit Stops: Resilient rubber.

2.05 FABRICATION

- A. Fabricate components with smallest possible clearances and shim spacing around perimeter of assembly that will enable window installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- C. Arrange fasteners and attachments to ensure concealment from view.
- D. Prepare components with internal reinforcement for operating hardware.
- E. Provide steel internal reinforcement in mullions as required to meet loading requirements.
- F. Provide internal drainage of glazing spaces to exterior through weep holes.
- G. Assemble insect screen frames with mitered and reinforced corners. Secure wire mesh tautly in frame. Fit frame with four, spring loaded steel pin retainers.
- H. Double weatherstrip operable units.

2.06 FINISHES

- A. High Performance Organic Finish: AAMA 605.2; multiple coats, thermally cured fluoropolymer system; color as scheduled.
- B. Shop and Touch-Up Primer for Steel Components: SSPC-Paint 25, red iron oxide.
- C. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

3.02 INSTALLATION

- A. Install windows in accordance with manufacturer's instructions.
- B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- D. Install sill and sill end angles.
- E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- F. Coordinate attachment and seal of perimeter air barrier and vapor retarder materials.
- G. Install operating hardware not pre-installed by manufacturer.
- H. Install glass in accordance with requirements specified in Section 08800.
- I. Install perimeter sealant in accordance with requirements specified in Section 07900.

3.03 ERECTION TOLERANCES

- A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.04 ADJUSTING AND CLEANING

- A. Adjust hardware for smooth operation and secure weathertight closure.
- B. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.
- C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

END OF SECTION

SECTION 08710
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware for wood and hollow steel doors.
- B. Hardware for fire-rated doors.
- C. Lock cylinders for doors for which hardware is specified in other sections.
- D. Thresholds.
- E. Weatherstripping, seals and door gaskets.

1.02 RELATED SECTIONS

- A. Section 08111 - Standard Steel Doors.
- B. Section 08112 - Standard Steel Frames.
- C. Section 08211 - Flush Wood Doors.
- D. Section 08410 - Metal-Framed Storefronts: Hardware for same except cylinders; installation of cylinders.

1.03 ALLOWANCES

- A. See Section 01210 - Allowances, for allowances affecting this section.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate locations and mounting heights of each type of hardware, schedules, catalog cuts.
 - 2. Submit manufacturer's parts lists and templates.
- C. Project Record Documents: Record actual locations of installed cylinders and their master key code.
- D. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- E. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Northern Kentucky Water Service District's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with the following requirements:
 - 1. NFPA 101.
 - 2. NFPA 80.
 - 3. NFPA 252.

- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- C. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with 5 years of experience.

1.06 REGULATORY REQUIREMENTS

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

1.07 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.
- C. Coordinate Northern Kentucky Water Service District 's keying requirements during the course of the Work.

1.08 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year warranty for door closers.

1.09 MAINTENANCE PRODUCTS

- A. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 PRODUCTS

2.01 KEYING

- A. Door Locks: Grand master keyed.
 - 1. Include construction keying.
 - 2. Key to existing keying system.
- B. Supply keys in the following quantities:
 - 1. 3 master keys.
 - 2. 1 grand master keys.
 - 3. 1 construction keys.
 - 4. 3 change keys for each lock.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions.

- B. Use templates provided by hardware item manufacturer.
- C. Mounting heights for hardware from finished floor to center line of hardware item: As listed in Schedule, unless otherwise noted:
 - 1. For wood doors: Comply with DHI "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 2. Wood doors: See Section 08211.

3.03 ADJUSTING

- A. Adjust work under provisions of Section 01700.
- B. Adjust hardware for smooth operation.

3.04 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01700.
- B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

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SECTION 08800

GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glass.
- B. Glazing compounds and accessories.

1.02 RELATED SECTIONS

- A. Section 08111 - Standard Steel Doors: Glazed doors.
- B. Section 08211 - Flush Wood Doors: Glazed doors.
- C. Section 08410 - Metal-Framed Storefronts.
- D. Section 08520 - Aluminum Windows: Glazed windows.

1.03 REFERENCES

- A. ASTM C 864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 1993.
- B. ASTM C 1036 - Standard Specification for Flat Glass; 1991.
- C. ASTM E 773 - Standard Test Methods for Seal Durability of Sealed Insulating Glass Units; 1988 (Reapproved 1993).
- D. ASTM E 774 - Standard Specification for Sealed Insulating Glass Units; 1992.
- E. GANA (GM) - GANA Glazing Manual; Glass Association of North America; 1997.
- F. GANA (SM) - FGMA Sealant Manual; Glass Association of North America; 1990.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.

1.06 ENVIRONMENTAL REQUIREMENTS

- 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.

1.07 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide a ten (10) year warranty to include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

PART 2 PRODUCTS

2.01 FLAT GLASS MATERIALS

- A. Manufacturers:
 - 1. LOF, Libby-Owens-Ford Co..
 - 2. PPG Industries Inc., Glass Group.
 - 3. Other manufacturers which are equivalent in the judgement of the Architect.
- B. Clear Float Glass: Clear, annealed.
 - 1. Comply with ASTM C 1036, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select.
 - 2. 6 mm minimum thick.
- C. Clear Float Glass: Clear, fully tempered.
 - 1. Comply with ASTM C 1036, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select.
 - 2. 6 mm minimum thick.
- D. Low E Glass: Float type, heat strengthened, clear.
 - 1. Coating on inner surface.
 - 2. 6 mm minimum thick.
- E. Wired Glass: Clear.
 - 1. Diagonal mesh of woven stainless steel wire.
 - 2. 1/2 inch grid size.
 - 3. Polished both sides.
 - 4. 1/4 inch thick.

2.02 SEALED INSULATING GLASS MATERIALS

- A. Manufacturers:
 - 1. Guardian Industries, Falconer Glass Industries.
 - 2. Interpane Glass Co.
 - 3. Viracon, Apogee Enterprises, Inc.
 - 4. Substitutions: Refer to Section 01600 - Product Requirements.
- B. Insulated Glass Units: Double pane with glass to elastomer edge seal.
 - 1. Outer pane of low E glass, inner pane of clear float glass.
 - 2. Place low E coating on No.2 surface within the unit.
 - 3. Comply with ASTM E 774 and E 773.
 - 4. Purge interpane space with dry hermetic air.
 - 5. Total unit thickness of 1 inch.
- C. Edge Seal Construction: Aluminum, bent and soldered corners.

2.03 GLAZING COMPOUNDS

- A. Polysulfide Sealant: Two component; chemical curing, non-sagging type; cured Shore A hardness of 15 to 25; color as selected.

2.04 GLAZING ACCESSORIES

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C 864 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 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 sealant in accordance with manufacturer's instructions.

3.03 INSTALLATION - EXTERIOR WET METHOD (SEALANT AND SEALANT)

- A. Place setting blocks at 1/4 points and install glazing pane or unit.
- B. Install removable stops with glazing centered in space by inserting spacer shims both sides at 24 inch intervals, 1/4 inch below sight line.
- C. Fill gaps between glazing and stops with polysulfide type sealant to depth of bite on glazing, but not more than 3/8 inch below sight line to ensure full contact with glazing and continue the air and vapor seal.
- D. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.04 INSTALLATION - INTERIOR WET METHOD (COMPOUND AND COMPOUND)

- A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 24 inch centers, kept 1/4 inch below sight line.
- B. Locate and secure glazing pane using glazers' clips.

- C. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.05 CLEANING

- A. Remove glazing materials from finish surfaces.
- B. Remove labels after Work is complete.
- C. Clean glass and adjacent surfaces.

END OF SECTION

SECTION 09511

SUSPENDED ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.02 RELATED SECTIONS

- A. Section 07900 - Joint Sealers: Acoustical sealant.

1.03 REFERENCES

- A. ASTM C 635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 1995.
- B. ASTM C 636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels; 1996.
- C. ASTM E 580 - Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Moderate Seismic Restraint; 1996.
- D. ASTM E 1264 - Standard Classification for Acoustical Ceiling Products; 1996.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on suspension system components and acoustical units.
- C. Samples: Submit two samples 8 x 8 inch in size illustrating material and finish of acoustical units.
- D. Samples: Submit two samples each, 6 inches long, of suspension system main runner.

1.05 ENVIRONMENTAL REQUIREMENTS

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

1.06 PROJECT CONDITIONS

- 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. Install acoustical units after interior wet work is dry.

PART 2 PRODUCTS

2.01 ACOUSTICAL UNITS

- A. Manufacturers:
 - 1. Armstrong World Industries, Inc.
 - 2. Celotex Corp.
 - 3. USG Interiors, Inc.
 - 4. Substitutions: See Section 01600 - Product Requirements.

- B. Acoustical Units - General: ASTM E 1264, Class A.

- C. Acoustical Panels: ASTM E 1264 Type III, Painted mineral fiber, conforming to the following:
 - 1. Size: 24 x 48 inches.
 - 2. Thickness: 5/8 inches.
 - 3. Light Reflectance: 80 percent.
 - 4. NRC Range: 0.50 to 0.60.
 - 5. Edge: Reveal edge.
 - 6. Surface Color: White.
 - 7. Surface Pattern: Non-directional fissured.
 - 8. Product: Cortega Tegular #703 by Armstrong.
 - 9. Suspension System: Exposed grid Type 1.

2.02 SUSPENSION SYSTEM

- A. Suspension Systems - General: ASTM C 635; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.

- B. Exposed Steel Suspension System Type 1: Formed steel, commercial quality cold rolled, with painted finish; Heavy-duty.
 - 1. Profile: Tee; 15/16 inch wide face.
 - 2. Construction: Double web.
 - 3. Finish: White.
 - 4. Product: Prelude XL #7301 by Armstrong.

2.03 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

- B. Perimeter Moldings: Same material and finish as grid.
 - 1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

- C. Acoustical Sealant For Perimeter Moldings: Specified in Section 07900.

- D. 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. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- E. 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. Install in bed of acoustical sealant.
 - 2. Use longest practical lengths.
 - 3. 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. Fit border trim neatly against abutting surfaces.
- D. Install units after above-ceiling work is complete.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- F. Cutting Acoustical Units:
 - 1. Make field cut edges of same profile as factory edges.
 - 2. Double cut and field paint exposed reveal edges.
- G. Where round obstructions occur, provide preformed closures to match perimeter molding.
- H. Install hold-down clips on panels within 20 ft of an exterior door.

3.04 ERECTION 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.

END OF SECTION

SECTION 09650
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Resilient base.
- C. Resilient stair accessories.
- D. Installation accessories.

1.02 REFERENCES

- A. ASTM F 1066 - Standard Specification for Vinyl Composition Floor Tile; 1995.
- B. FS RR-T-650 - Treads, Metallic and Nonmetallic, Skid Resistant; Federal Specifications and Standards; Revision E, 1994.

PART 2 PRODUCTS

2.01 MATERIALS - TILE FLOORING

- A. Vinyl Composition Tile: ASTM F 1066:
 - 1. Size: 12 x 12 inch.
 - 2. Thickness: 0.125 inch.
 - 3. Pattern: Premium Patterns and Solid Colors. (VCT-1)
 - 4. Pattern: Marbleized. (VCT-2)

2.02 MATERIALS - STAIR COVERING

- A. Vinyl Stair Treads: FS RR-T-650, Composition B; full width and depth of stair tread in one piece; tapered thickness; nosing not less than 1-1/4 inch deep.
 - 1. Nominal Thickness: 0.1875 inch.
 - 2. Nosing Style: Square.
 - 3. Type: 1-smooth.
 - 4. Pattern: Squares.
 - 5. Color: Solid.
- B. Stair Nosings: 1-1/2 inch horizontal return, 1-1/8 inch vertical return, full width of stair tread in one piece:

2.03 MATERIALS - BASE

- A. Base: Rubber; top set covered:
 - 1. Height: 4 inch.
 - 2. Thickness: 0.125 inch thick.
 - 3. Finish: Satin.
 - 4. Length: Roll.
 - 5. Color: Color as selected from manufacturer's standards.

6. Accessories: Premolded external corners and end stops.

2.04 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.
- C. Moldings and Edge Strips: Metal.
- D. Filler for Coved Base: Plastic.
- E. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within tolerances specified in Section 03300 and are ready to receive resilient flooring.
- B. Verify that wall surfaces are smooth and flat within tolerances specified in Section 09260, are dust-free, and are ready to receive resilient base.
- C. Verify that concrete sub-floor surfaces are ready for resilient flooring installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- B. Prohibit traffic until filler is cured.
- C. Clean substrate.
- D. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - TILE FLOORING

- A. Install in accordance with manufacturer's instructions.
- B. Mix tile from container to ensure shade variations are consistent when tile is placed.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Set flooring in place, press with heavy roller to attain full adhesion.
- E. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.
- F. Where floor finishes 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. Secure metal strips after installation of flooring with stainless steel screws.
- H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- I. Install flooring in recessed floor access covers. Maintain floor pattern.

3.04 INSTALLATION - 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.

3.05 INSTALLATION - STAIR COVERINGS

- A. Install stair nosing and stair treads in one piece for full width and depth of tread.
- B. Adhere over entire surface. Fit accurately and securely.

3.06 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean, seal, and wax resilient flooring products in accordance with manufacturer's instructions and Owner's maintenance program.

3.07 PROTECTION OF FINISHED WORK

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

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SECTION 09680

CARPET

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet, direct-glued.
- B. Accessories.

1.02 ALLOWANCES

- A. See Section 01210 - Allowances, for cash allowances affecting this section.

1.03 REFERENCES

- A. ASTM D 2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 1996.
- B. CRI 104 - Standard for Installation of Commercial Textile Floorcovering Materials; Carpet and Rug Institute; 1994.
- C. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; National Fire Protection Association; 1995.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. 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 with minimum three years experience.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.
- B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.
- C. Ventilate installation area during installation and for 72 hours after installation.

1.07 EXTRA MATERIALS

- A. See Section 01600 - Product Requirements, for additional requirements.
- B. Provide 120 sq ft of carpeting of each type, color, and pattern specified.

PART 2 PRODUCTS

2.01 CARPET

- A. Carpet: Tufted, nylon, conforming to the following criteria:
 - 1. Critical Radiant Flux: Conform to NFPA 253, 0.22 watts/sq cm.
 - 2. Surface Flammability Ignition: Pass ASTM D 2859 (the "pill test").
 - 3. Roll Width: 12 ft.
 - 4. Max. Electrostatic Charge: 3 Kv. @ 20 percent R.H..
 - 5. Pile Weight: 28 oz/sq yd.

2.02 ACCESSORIES

- A. Sub-Floor Filler: Type recommended by carpet manufacturer.
- B. Moldings and Edge Strips: Embossed aluminum, black color.
- C. Adhesives: Compatible with materials being adhered.
- D. Seam Adhesive: Recommended by manufacturer.
- E. Contact Adhesive: Compatible with carpet material; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within tolerances specified in Section 03300 and are ready to receive carpet.
- B. Verify that concrete sub-floor surfaces are ready for carpet installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by carpet manufacturer and adhesive materials manufacturer.
- C. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.
- B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- C. Clean substrate.

3.03 INSTALLATION - GENERAL

- A. Install carpet and cushion in accordance with manufacturer's instructions and CRI 104.
- B. Verify carpet match before cutting to ensure minimal variation between dye lots.
- C. Lay out carpet and locate seams in accordance with shop drawings:
 - 1. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
 - 2. Do not locate seams perpendicular through door openings.

3. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
4. Locate change of color or pattern between rooms under door centerline.
5. Provide monolithic color, pattern, and texture match within any one area.

D. Install carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance.

3.04 DIRECT-GLUED CARPET

- A. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and unfrayed. Apply seam adhesive to cut edges of woven carpet immediately.
- B. Apply contact adhesive to floor uniformly at rate recommended by manufacturer. After sufficient open time, press carpet into adhesive.
- C. Apply seam adhesive to the base of the edge glued down. Lay adjoining piece with seam straight, not overlapped or peaked, and free of gaps.
- D. Roll with appropriate roller for complete contact of adhesive to carpet backing.
- E. Trim carpet neatly at walls and around interruptions.
- F. Complete installation of edge strips, concealing exposed edges. Bind cut edges where not concealed by edge strips.

3.05 CLEANING

- A. Remove excess adhesive from floor and wall surfaces without damage.
- B. Clean and vacuum carpet surfaces.

END OF SECTION

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SECTION 09900

PAINTS AND COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints and other coatings.
- C. See Schedule - Surfaces to be Finished, at end of Section.

1.02 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on all finishing products.
- C. Samples: Submit one paper chip samples, 3 x 3 inch in size illustrating range of colors available for each surface finishing product scheduled.

1.03 DELIVERY, STORAGE, AND PROTECTION

- 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.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- C. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
- D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers - Paints and Coatings:
 - 1. Porter.

2. Perry & Derrick.
3. Pratt & Lambert.
4. Sherwin Williams.

B. Substitutions: See Section 01600 - Product Requirements.

2.02 PAINTS AND COATINGS - GENERAL

- A. Paints and Coatings: Ready mixed, except field-catalyzed coatings. Prepare pigments:
1. To a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
 2. For good flow and brushing properties.
 3. Capable of drying or curing free of streaks or sags.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Paint ME-OP-3A - Ferrous Metals, Unprimed, Alkyd, 3 Coat:
1. One coat of alkyd primer.
 2. Gloss: Two coats of alkyd enamel.
- B. Paint ME-OP-2A - Ferrous Metals, Primed, Alkyd, 2 Coat:
1. Touch-up with zinc chromate primer.
 2. Gloss: Two coats of alkyd enamel.
- C. Paint MgE-OP-3A - Galvanized Metals, Alkyd, 3 Coat:
1. One coat galvanize primer.
 2. Gloss: Two coats of alkyd enamel.

2.04 PAINT SYSTEMS - INTERIOR

- A. Paint CI-OP-2L - Concrete/Masonry, Opaque, Latex, 2 Coat:
1. One coat of block filler.
 2. Semi-gloss: One coat of latex enamel.
- B. Paint MI-OP-3L - Ferrous Metals, Unprimed, Latex, 3 Coat:
1. One coat of latex primer.
 2. Gloss: Two coats of latex enamel.
- C. Paint MI-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat:
1. Touch-up with latex primer.
 2. Gloss: Two coats of latex enamel.
- D. Paint Mgl-OP-3A - Galvanized Metals, Alkyd, 3 Coat:
1. One coat galvanize primer.
 2. Gloss: Two coats of alkyd enamel.

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; 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.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.

3.02 PREPARATION

- A. *Surface Appurtenances:* Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- B. *Surfaces:* Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
- C. *Marks:* Seal with shellac those which may bleed through surface finishes.
- D. *Impervious Surfaces:* Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- E. *Concrete and Unit Masonry Surfaces to be Painted:* Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- F. *Galvanized Surfaces to be Painted:* Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- G. *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.
- H. *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.
- I. *Interior Wood Items to Receive Transparent Finish:* Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.
- J. *Metal Doors to be Painted:* Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.

- B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- 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. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- F. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

3.04 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Refer to Section 15075 and Section 16075 for schedule of color coding of equipment, duct work, piping, and conduit.
- B. Paint shop-primed equipment, where indicated.
- C. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- D. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.05 CLEANING

- A. Collect waste material which may 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 2, Paint Systems Articles.
- C. Mechanical and Electrical: Use paint systems defined for the substrates to be finished.
 - 1. Paint all insulated and exposed pipes occurring in finished areas to match background surfaces, unless otherwise indicated.
 - 2. Paint all equipment, including that which is factory-finished, exposed to weather or to view on the roof and outdoors.
 - 3. Paint shop-primed items occurring in finished areas.
 - 4. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
 - 5. Paint dampers exposed behind louvers, grilles, to match face panels.
- D. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

3.07 SCHEDULE - PAINT SYSTEMS

- A. Concrete, Concrete Block, Brick Masonry: Finish all surfaces exposed to view.
 - 1. Interior: CI-OP-2L, semi-gloss.

- B. Steel Doors and Frames: Finish all surfaces exposed to view; ME-OP-2A, gloss.

- C. Steel Fabrications: Finish all surfaces exposed to view.
 - 1. Exterior: ME-OP-3A, gloss; finish all surfaces, including concealed surfaces, before installation.
 - 2. Interior: MI-OP-3L, gloss.

- D. Galvanized Steel: Finish all surfaces exposed to view.
 - 1. Exterior: MgE-OP-3A - Gloss.
 - 2. Interior: Mgl-OP-3A - Gloss.

- E. Shop-Primed Metal Items: Finish all surfaces exposed to view.
 - 1. Finish the following items:
 - a. Exposed surfaces of lintels.
 - b. Exposed surfaces of steel stairs and railings.
 - 2. Exterior: ME-OP-2A - Gloss.
 - 3. Interior: MI-OP-2L - Gloss.

END OF SECTION

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SECTION 10523

FIRE EXTINGUISHERS & CABINETS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.02 REFERENCES

- A. NFPA 10 - *Standard for Portable Fire Extinguishers*; National Fire Protection Association; 1998.
- B. UL (FPED) - *Fire Protection Equipment Directory*; Underwriters Laboratories Inc.; current edition.

1.03 PERFORMANCE REQUIREMENTS

- A. Conform to NFPA 10.
- B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate cabinet physical dimensions.
- C. Product Data: Provide extinguisher operational features.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. *Fire Extinguishers, Cabinets and Accessories:*
 - 1. Manufacturers: JL Industries is the Basis of Design and their model numbers are shown on the drawings. Equivalent products by other manufacturers are acceptable.
 - 2. Substitutions: See Section 01600 - Product Requirements.

2.02 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, 40 inches from finished floor to inside bottom of cabinet.
- C. Secure rigidly in place.
- D. Place extinguishers and accessories in cabinets.

END OF SECTION

SECTION 10800
TOILET ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Accessories for toilet rooms.
- B. Grab bars.

1.02 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

1.03 COORDINATION

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Products listed on drawings by model number are made by Bobrick.
- B. Products by other manufacturers which are judged equivalent by the architect are acceptable.
- C. Substitutions: Section 01600 - Product Requirements.
- D. All items of each type to be made by the same manufacturer.

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.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights and Locations: As required by accessibility regulations, as indicated on drawings, and as follows:

END OF SECTION

SECTION 11610
LABORATORY FUME HOODS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Bench-mounted fume hoods.

1.02 RELATED SECTIONS

- A. Section 12345 - Laboratory Casework.
- B. Division 15 - Mechanical Work.
- C. Division 16 - Electrical Work.

1.03 REFERENCES

- A. ASHRAE Std 110 - Method of Testing Performance of Laboratory Fume Hoods; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 1995.
- B. ASTM A 167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip; 1996.
- C. ASTM A 366/A 366M - Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality; 1996.
- D. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1997a.

1.04 DESIGN REQUIREMENTS

- A. Negative variations of face velocity shall not exceed 20% of the average face velocity.
- B. Average illumination of work area: Minimum 80 foot-candles.
- C. Fume hood shall be designed to minimize static pressure loss with adequate slot area and rectangular exhaust collar configuration. Maximum static pressure loss readings shall not exceed the following maximum with sash in full open position:
 - 1. Face Velocity Measured S.P.L. (w.g.)
 - 2. 100 F.P.M. . 30 inches
- D. Maximum variation in exhaust CFM, static pressure and average face velocity as a result of baffle adjustment shall not exceed 5% for any baffle position.
- E. Noise Criteria: Test data of octave band analysis verifying hood is capable of a 50 NC value when connected to a 50 NC HVAC source. Reading taken 3' in front of open sash at 100 fpm. face velocity.
- F. Bypass Type Fume Hoods: Bypass shall be sufficient in size to allow sash as it is closed to provide no more than four times increase in face velocity as measured when the sash was full open.

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's catalog data, specification sheets, and product manuals.
- C. Shop Drawings: Prepared specifically for this project; show dimensions and interface with other products.
- D. Test reports: Submit test reports on each size and type of hood verifying conformance to test performance specified.

1.06 QUALITY ASSURANCE

- A. Maintain testing facility at manufacturer's place of business for testing and evaluating laboratory fume hoods under both ideal and adverse conditions, in accordance with ASHRAE Std 110.
- B. Evaluation of manufacturer's standard product shall take place in manufacturer's own test facility, with testing personnel, samples, apparatus, instruments, and test materials supplied by the manufacturer at no cost to the Owner.
- C. Hood shall achieve a rating of 4.0 AM 0.1 PPM or better when subjected to ASHRAE/110-1995 test procedures.
- D. Single source responsibility: Fume hood casework, work surfaces, and other laboratory equipment and accessories shall be manufactured or furnished by a single laboratory furniture company.
 - 1. Five years or more experience in manufacture of laboratory fume hoods and equipment of type specified.
- E. Manufacturer Qualifications: Minimum 5 years of manufacturing fume hoods as a principal product.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver fume hoods, work surfaces, and accessories free of damage.
- B. Store and handle in a manner to prevent damage to fume hoods, work surfaces, accessories, or adjacent work.

1.08 WARRANTY

- A. Warrant against defects in materials and workmanship on fume hoods, work surfaces, and accessories; include labor and replacement parts (except lamps).
- B. Warranty Period: One year from date of installation or two years from date of purchase, whichever is sooner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Provide products made by Fisher Hamilton Inc., 1316 18th Street, Two Rivers, WI 54241.
- B. Substitutions: See Section 01600 - Product Requirements.

- C. Provide all laboratory fume hoods from a single manufacturer.

2.02 MANUFACTURED UNITS

- A. Bench-mounted fume hoods.
1. By-pass air flow design configuration.

2.03 MATERIALS

- A. Sheet Steel: High quality, cold rolled, mild steel meeting requirements of ASTM A 366; gauges U.S. Standard and galvanized..
- B. Stainless Steel: Type 304; gauges U.S. Standard.
- C. Ceiling enclosure panels: Minimum 18 gauge steel, upward directional louvers.
- D. Bypass grilles: Low resistant type, 18-gauge steel, upward directional louvers.
- E. Safety glass: 7/32" thick laminated safety glass
- F. Sash cables: Stainless Steel, uncoated, 1/8" diameter military spec. quality. (MIL-W-83420D-3)
- G. Sash guides: Corrosion resistant poly-vinyl chloride.
- H. Pulley assembly for sash cable: 2" diameter, zinc dichromate finish, ball bearing type, with cable retaining device. (Nylon tires not acceptable.)
- I. Sash Pull: Full width corrosion resistant plastic, stainless steel or steel with chemical resistant powder coating.
- J. Gaskets: 70 durometer PVC for interior access panels. Gasket interior access panels to eliminate air leakage and to retain liquids inside hood.
- K. Fasteners:
1. Interior fastening devices concealed. Exposed screws not acceptable.
2. Exterior panel member fastening devices to be corrosion resistant, non-metallic material. Exposed screws not acceptable.
- L. Work Surfaces for Bench-Mounted Fume Hoods: Black epoxy resin.

2.04 FINISHES

- A. Preparation: Spray clean metal with a heated cleaner/phosphate solution, pretreat with iron phosphate spray, water rinse, and neutral final seal.
- B. Application: Electrostatically apply urethane powder coat of selected color and bake in controlled high temperature oven.
1. Exterior and interior surfaces exposed to view: 1.5 mil., average and 1.2 mil., minimum coverage.
- C. Fume hood liner: Resisto-Roc panel coated with chemically resistant enamel finish, off-white in color. Finish shall be chemical fume and splash resistant. Allow prime coat to dry; sand and wipe prior to application of finish coat.

2.05 FUME HOOD CONSTRUCTION

- A. Superstructure: Rigid, self-supporting assembly of double wall construction, maximum 4-7/8" thick. Panels must be attached to a full frame construction, minimum 14 gauge galvanized members. Panels and brackets attached to eliminate screw heads and metallic bracketry from hood interior.
- B. Exhaust outlet: Rectangular with end radiused.
- C. Access opening perimeter: Air foil or streamlined shape with all right angle corners radiused or angled. Bottom foil shall provide access areas for electrical cords.
- D. Fume hood sash: Full view type with clear, unobstructed, side-to-side view of fume hood interior and service fixture connections.
 - 1. Counterbalance system: Single weight, pulley, cable, counter balance system. Maximum 7-lbs. pull required to raise or lower sash throughout its full length of travel. Life cycle test 100 lb., sash and weight to 100,000 cycles without sign of failure. Provide independent test data.
- E. Fume hood liner: Resisto-Roc panel coated with chemically resistant enamel finish, off-white in color. Finish shall be chemical fume and splash resistant. Allow prime coat to dry; sand and wipe prior to application of finish coat.
- F. Baffles: Provide exhaust slots full height on vertical sides of the baffle with upper and lower slots adjustable. Minimum depth of 19" for interior workspace is required at the extreme upper portion of the fume hood to provide maximum interior work area. All baffle supports/brackets to be non-metallic.
- G. Electrical Services: Three wire grounding type receptacles rated at 120 V.A.C. at 20 amperes.
- H. Work surfaces: 1-1/4" thick surface, dished a nominal 1/2" to contain spills.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify equipment rough-in before proceeding with work, including rough opening dimensions required for fume hood installation.
- B. Coordinate with other trades for proper installation of plumbing and electrical services.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions; comply with standards required by authorities having jurisdiction.
- B. Install equipment plumb, square, and straight, without distortion; securely anchor.
- C. Schedule installation to ensure that utility connections are achieved in an orderly and expeditious manner.
- D. Demonstrate fume hood operations and functions to Owner at completion of installation.

3.03 FIELD QUALITY CONTROL TESTING OF FUME HOODS

- A. Field testing requirements:
 - 1. Perform tests after installation is complete, the building ventilation system has been balanced, all connections have been made, and written verification has been submitted that the above conditions

have been met.

- B. Test procedure - SEFA 1-1992:

3.04 ADJUSTING AND CLEANING

- A. Adjust operating equipment, with the exception of air moving equipment, to provide efficient operation for intended use and as required by manufacturer.
1. Vertical-Rising Sashes: Operate smoothly without tilting when raised or lowered from either end; remain at rest in any open position.
- B. Clean equipment, casework, countertops, and other surfaces as recommended by manufacturer, rendering work in new and unused appearance.
- C. Clean adjacent construction and surfaces soiled in the course of installation of this work.
- D. Touch up minor damaged surfaces caused by installation. Replace damaged components as directed by Architect.

3.05 PROTECTION

- A. Provide protective measures to prevent equipment and surfaces from exposure to other construction activity.

END OF SECTION

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SECTION 12345

STEEL LABORATORY CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Steel casework.
- B. Work surfaces.
- C. Sinks and outlets.
- D. Service fittings.
- E. Accessory equipment.

1.02 RELATED SECTIONS

- A. Section 07900 - Joint Sealers.
- B. Section 11610 - Laboratory Fume Hoods
- C. Division 15 - Mechanical Work
- D. Division 16 - Electrical Work

1.03 DESIGN REQUIREMENTS

A. CASEWORK

1. Flush construction: Surfaces of doors, drawers and panel faces shall align with cabinet fronts without overlap of case ends, top or bottom rails. Horizontal and vertical case shell members (panels, top rails and bottoms) shall meet in the same plane without overlap, cracks or crevices.
2. Slimline styling: Front width of end panels 3/4" and front height of top and bottom members 1".
3. Self-supporting units: Completely welded shell assembly without applied panels at ends, backs or bottoms, so that cases can be used interchangeably or as a single, stand-alone unit.
4. Interior of case units: Easily cleanable, flush interior. Base cabinets, 30" and wider, with double swinging doors shall provide full access to complete interior without center vertical post.
5. Drawers: Sized on a modular basis for interchange to meet varying storage needs, and designed to be easily removable in field without the use of special tools.
6. Case openings: Rabbeted-like joints all four sides of case opening for hinged doors and two sides for sliding doors in order to provide dust resistant case.
7. Framed glazed doors: Identical in construction, hardware and installation to solid panel doors. Design frame glazed doors to be removable for glass replacement.

1.04 PERFORMANCE REQUIREMENTS

A. CASEWORK

1. Structural performance requirements: Casework components shall withstand the following minimum loads without damage to the component or to the casework operation:
2. Steel base unit load capacity: 500 lb. per lineal foot.
3. Suspended units: 300 lb.
4. Drawers in a cabinet: 150 lb.

5. Utility tables (4 legged): 300 lb.
6. Hanging wall cases: 300 lb.
7. Load capacity for shelves of base units, wall cases and tall cases: 100 lb.

B. Metal Finish

1. Abrasion resistance: Maximum weight loss of 5.5 mg. per 100 cycle when tested on a Taber Abrasion Tester #E40101 with 1000 gm wheel pressure and Calibrase #CS10 wheel.
2. Hardness: Surface hardness equivalent to 4H or 5H pencil.
3. Humidity resistance: Withstand 1000-hour exposure in saturated humidity at 100 degrees F.
4. Moisture resistance:
5. No visible effects to surface finish after boiling water trickled over test panel inclined at 45 degrees for five minutes.
6. No visible effects to surface finish following 100-hour continuous application of a water soaked cellulose sponge, maintained in a wet condition throughout the test period.
7. Adhesion: Score finish surface of test panel with razor blade into 100 squares, 1/16" x 1/16", cutting completely through the finish but with minimum penetration of the substrate, and brush away particles with soft brush. Minimum 95 squares shall maintain their finish.
8. Salt spray: Withstand minimum 200-hour salt spray test.

C. Chemical Resistance Finish

1. Test procedure: Apply 10 drops (approximately 0.5 cubic centimeters) of each reagent identified to the surface of the finished test panes laid flat and level on a horizontal surface. Ambient temperature: 68 - 72 F (20 - 22 C). After one hour flush away chemicals with cold water and wash surface with detergent and warm water at 150 F (65.5 C) and with alcohol to remove surface stains. Examine surface under 100 foot candles of illumination.
2. Evaluation ratings: Change in surface finish and function shall be described by the following ratings:
 - a. Excellent: No change to slight detectable change in color or gloss.
 - b. Good: Clearly discernible change in color or gloss. Finish remains intact and protective with no significant impairment to function or life.
 - c. Failure: Obvious and significant deterioration, visible blistering, bare spots, or roughness of surface.
3. Test results shall meet or exceed the following: (Concentration by weight)
 - a. REAGENT RATING
 - b. Acetic Acid, 98% Excellent
 - c. Formic Acid, 88% Good
 - d. Hydrochloric Acid, 37% Excellent
 - e. Nitric Acid, 25% Excellent
 - f. Nitric Acid, 60% Good
 - g. Phosphoric Acid, 75% Excellent
 - h. Sulfuric Acid, 25% Excellent
 - i. Sulfuric Acid, 85% Excellent
 - j. Ammonium Hydroxide, 58% Excellent
 - k. Sodium Hydroxide, 10% Excellent
 - l. Sodium Hydroxide, 25% Excellent
 - m. Acetone Excellent
 - n. Sodium Hypochlorite, 5.25% Excellent
 - o. Ethyl Acetate Excellent
 - p. Ethyl Alcohol Excellent
 - q. Ethyl Ether Excellent
 - r. Formaldehyde, 37% Excellent
 - s. Hydrogen Peroxide, 30% Excellent
 - t. Methylene Ketone Excellent
 - u. Phenol, 85% Good
 - v. Xylene Excellent

D. EPOXY RESIN WORK SURFACE

1. Test procedure: Apply five drops of each reagent to surface and cover with 25mm watch glass, convex side down; test volatiles using one ounce bottle stuffed with saturated cotton. After 24-hour exposure flush surface, clean, rinse and wipe dry.
2. Evaluation ratings: Change in surface finish and function shall be described by the following ratings:
 - a. No Effect: No detectable change in surface material.
 - b. Excellent: Slight detectable change in color or gloss, but no change to the function or life of the work surface material.
 - c. Good: Clearly discernible change in color or gloss, but no significant impairment of work surface function or life.
 - d. Failure: Pitting, cratering or erosion of work surface material; obvious and significant deterioration.
3. Test Results - Epoxy Resin Work Surface:
 - a. REAGENT RATING
 - b. Hydrochloric Acid 37% Excellent
 - c. Sulfuric Acid 33% No Effect
 - d. Sulfuric Acid 77% No Effect
 - e. Sulfuric Acid 96% Failure
 - f. Formic Acid 90% Excellent
 - g. Nitric Acid 20% Excellent
 - h. Nitric Acid 30% Excellent
 - i. Nitric Acid 70% Good
 - j. Hydrofluoric Acid 48% Fair
 - k. Phosphoric Acid 85% No Effect
 - l. Chromic Acid 60% Failure
 - m. Acetic Acid 98% Excellent
 - n. 3 & 8 Equal Parts Excellent
 - o. Ammonium Hydroxide 28% No Effect
 - p. Sodium Hydroxide 10% No Effect
 - q. Sodium Hydroxide 20% No Effect
 - r. Sodium Hydroxide 40% No Effect
 - s. Sodium Hydroxide Flake No Effect
 - t. Sodium Sulfide Excellent
 - u. Zinc Chloride No Effect
 - v. Tincture of Iodine Excellent
 - w. Silver Nitrate No Effect
 - x. Methyl Alcohol No Effect
 - y. Ethyl Alcohol No Effect
 - z. Butyl Alcohol No Effect
 - aa. Benzene Excellent
 - ab. Xylene No Effect
 - ac. Toluene Excellent
 - ad. Gasoline No Effect
 - ae. Dichlor Acetic Acid Good
 - af. Di Methyl Formamide Excellent
 - ag. Ethyl Acetate No Effect
 - ah. Amyl Acetate Excellent
 - ai. Acetone Excellent
 - aj. Chloroform Excellent
 - ak. Carbon Tetrachloride No Effect
 - al. Phenol Excellent
 - am. Cresol Excellent
 - an. Formaldehyde No Effect
 - ao. Trichlorethylene Excellent
 - ap. Ethyl Ether Excellent
 - aq. Furfural Good

- ar. Methylene Chloride Excellent
- as. Mono Chlor Benzene Good
- at. Dioxane Excellent
- au. Methyl Ethyl Ketone Excellent
- av. Acid Dichromate Fair
- aw. Hydrogen Peroxide No Effect
- ax. Naphthalene Excellent

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Provide 3/4" = 1'-0" scale elevations of individual and battery of casework units, cross sections, rough-in and anchor placements, tolerances and clearances. Indicate relation of units to surrounding walls, windows, doors and other building components. Provide 1/4" = 1'-0" rough-in plan drawings for coordination with trades. Rough in shall show free area.
- C. Finish Samples: Submit 3 x 5 inch samples of each color of finish for casework, work surfaces and for other prefinished equipment and accessories for selection by [Architect].
- D. Test Reports: When requested by Architect, submit independent laboratory certified test reports verifying conformance to test performance specified.
- E. Product Data: Provide component dimensions, configurations, construction details, joint details, and attachments, utility and service requirements and locations, and _____.

1.06 QUALITY ASSURANCE

- A. Single source responsibility: Casework, work surfaces, laboratory fume hood and equipment and accessories shall be manufactured or furnished by a single laboratory furniture company.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Accept casework on site. Inspect on arrival for damage.
- B. Schedule delivery of casework and equipment so that spaces are sufficiently complete that material can be installed immediately following delivery.
 - 1. Protect finished surfaces from soiling or damage during handling and installation. Keep covered with polyethylene film or other protective coating.
- C. Protect all work surfaces throughout construction period with 1/4" corrugated cardboard completely covering the top and securely taped to edges. Mark cardboard in large lettering "No Standing".

1.08 PROJECT CONDITIONS

- A. Coordinate casework installation with size, location and installation of service utilities.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- C. Do not deliver or install equipment until the following conditions have been met:
 - 1. Windows and doors are installed and the building is secure and weathertight.
 - 2. Ceiling, overhead ductwork and lighting are installed.
 - 3. All painting is completed and floor tile is installed.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Design, materials, construction and finish of casework specified is the minimum acceptable standard of quality for flush front steel laboratory casework. The basis of this specification is Fisher Hamilton Inc., 1316 - 18th Street, Two Rivers, WI 54241 product.
- B. Substitutions: See Section 01600 - Product Requirements.

2.02 MATERIALS

- A. Sheet steel: Mild, cold rolled and leveled unfinished steel.
- B. Minimum gauges:
 - 1. 20 gauge: Solid door interior panels, drawer fronts, scribing strips, filler panels, enclosures, drawer bodies, shelves, security panels and sloping tops.
 - 2. 18 gauge: Case tops, ends, bottoms, bases, backs, vertical posts, uprights, glazed door members, door exterior panels and access panels.
 - 3. 16 gauge: Top front rails, top rear gussets, intermediate horizontal rails, table legs and frames, leg rails and stretchers.
 - 4. 14 gauge: Drawer suspensions, door and case hinge reinforcements and front corner reinforcements.
 - 5. 11 gauge: Table leg corner brackets and gussets for leveling screws.
- C. Glass for glazed swinging and sliding doors: 1/8" (3mm) framed doors, 7/32" (6mm) unframed doors thick, clear float glass.

2.03 CASEWORK FABRICATION

- A. Base Units and Cases:
 - 1. Base units and 25", 31" and 37" high wall cases: End panels and back reinforced with internal reinforcing front and rear posts.
 - 2. 49" and 84" high cases: Formed end panels with front and rear reinforcing post channels; back shall be formed steel panel, recessed 3/4" for mounting purposes.
- B. Posts: Front post fully closed with full height reinforcing upright. Shelf adjustment holes in front and rear posts shall be perfectly aligned for level setting, adjustable to 1/2" o/c.
- C. Secure intersection of case members with spot and arc welds. Provide gusset reinforcement at front corners.
- D. Base unit backs: Provide drawer units without backs and cupboard units with removable backs for access to services behind units.
- E. Bottoms: Base units and 25", 31", 37" and 49" high wall cases shall have one piece bottom with front edge formed into front rail, rabbeted as required for swinging doors and drawers and flush design for sliding doors.
- F. Top rail for base units: Interlock with end panels, flush with front of unit.
- G. Horizontal intermediate rails: Recessed behind doors and drawer fronts.
- H. Base for base units: 4" high x 3" deep with formed steel base and 11 ga. die formed steel gussets at corners. Provide 3/8" diameter leveling screw with integral bottom flange of minimum 0.56 sq. in. area at each corner, accessible through openings in toe space.

- I. Tops of wall cases: One piece, with front edge formed into front rail.
- J. Drawers:
 1. Drawer fronts: 3/4" thick, double wall construction, prepainted prior to assembly and sound deadened.
 2. Drawer bodies: Bottom and sides formed into one-piece center section with bottom and sides coved and formed top edges. Front and back panels spot-welded to center section.
 3. Drawer suspension: Heavy duty coved raceways for both case and drawer with nylon tired, ball bearing rollers; self-centering and self-closing when open to within 3" of the closed position.
 4. Provide drawer with rubber bumpers. Friction centering devices are not acceptable.
 5. Provide security panels for drawers with keyed different locks.
 6. File drawers: Provide with 150# full extension slides for full access and operation.
- K. Doors:
 1. Solid panel doors: 3/4" thick, double wall, telescoping box steel construction with interior prepainted and sound deadened, top corners welded and ground smooth. Reinforce interior of front panel with welded steel hat channels. Hinges with screws to internal 14 gauge reinforcing in case and door. Hinges shall be removable; welding of hinges not acceptable. Doors shall close against rubber bumpers.
 2. Frame glazed doors: Outer head to be one piece construction. Inner head to consist of top, bottom and side framing members which are removable for installation or replacement of glass. Provide continuous vinyl glazing retainer to receive glass. In all other respects, framed glazed door construction and quality shall match solid panel doors.
 3. Sliding doors - solid or framed glazed: Design for tilt-out removal after removal of bottom guide. Doors shall be hung with nylon tired sleeve bearing rollers in formed steel top hung track and shall close against rubber bumpers.
 4. Unframed sliding glass doors: Glass with edges ground set in extruded aluminum shoe with integral pulls, wheel assemblies and top and bottom extruded aluminum track. Provide rubber bumpers at fully opened and closed door position.
- L. Shelves:
 1. Form front and back edges down and back 3/4". Form ends down 3/4".
 2. Reinforce shelves over 36" long with welded hat channel reinforcement the full width of shelf.
 3. Pull out shelves: Same suspension as specified for drawers.
- M. Base molding: 4" high, to be furnished and installed by flooring contractor.
- N. Hardware:
 1. Drawer and hinged door pulls: Clear anodized extruded aluminum, screw attached on 4" centers. [Architect specify optional pulls].
 2. Sliding door pulls: Recessed stainless steel, styled and sized to harmonize with drawer pulls.
 3. Hinges: Institutional type, five knuckle projecting barrel hinges, minimum 2-1/2" long, type 302 or 304 stainless steel. Provide two hinges for doors up to 36" high; three hinges for doors over 36" high. Drill each leaf for three screw attachment to door and frame.
 4. Door catches: Adjustable type, spring actuated nylon roller catches.
 5. Elbow catches: Spring type of cadmium plated steel, with strike of suitable design.
 6. Locks: National Lock Remove-A-Core 5- pin tumbler, heavy-duty cylinder type. Exposed lock noses shall be dull nickel (satin) plated and stamped with identifying numbers.
 7. Keying: Locks [location shown on drawings] shall have capacity for 225 primary key changes. Master key one level with the potential of 40 different, non-interchangeable master key groups.
 8. Keys: Stamped brass available from manufacturer or local locksmith, and supplied in the following quantities unless otherwise specified:
 - a. 2 - for each keyed different lock.
 - b. 3 - for each group keyed alike locks.
 - c. 2 - for master keys for each system.
 9. Label holders: [Locations shown on drawings] Formed steel with satin chrome finish, 1" x 1-1/2", screw

installed.

10. Shelf clips: Die formed steel, zinc plated, designed to engage in shelf adjustment holes.

O. TABLE FRAMES

1. Table frames: 4-1/2" high "C" channel front and back aprons, end rails and cross rails.
2. Table drawers: Provide front and back rails; drawer unit, hardware and suspension same as specified for base unit drawers.
3. Legs: 2" x 2" steel tube legs with welded leg bracket. Attach legs with two bolts to front and back aprons and weld to end rails. Each leg shall have a recessed leveling screw and a black, coved vinyl or rubber leg shoe, 2" in height.
4. Knee space frame: 2" high apron where no drawers required.

P. METAL FINISH

1. Preparation: Spray clean metal with a heated cleaner/phosphate solution, pretreat with iron phosphate spray, water rinse, and neutral final seal. Immediately dry in heated ovens, gradually cooled, prior to application of finish.
2. Application: Electrostatically apply powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high-grade laboratory furniture quality finish of the following thickness:
3. Exterior and interior exposed surfaces: 1.5 mil average and 1.2 mil min.
4. Backs of cabinets and other surfaces not exposed to view: 1.0 mil average.

Q. Chemical Resistance

1. Test procedure: Apply 10 drops (approximately 0.5 cc) of each reagent identified to the surface of the finished test panels laid flat and level on a horizontal surface. Ambient temperature: 68-72 deg F. (20-22 deg C.). After one hour flush away chemicals with cold water and wash surface with detergent and warm water at 150 deg F. (65.5 deg C.) and with alcohol to remove surface stains. Examine surface under 100 foot candles of illumination.
2. Evaluation ratings: Change in surface finish and function shall be described by the following ratings:
 - a. Excellent: Indicates excellent to superior integrity of finish film. Includes no effect of slight change in gloss and slight discoloration.
 - b. Good: Allows change of gloss or discoloration or slight swelling while retaining integrity of finish film.
 - c. Failure: Obvious and significant deterioration, including blistering, pitting, cratering, erosion and/or loss of finish material.
3. Test results (concentration by weight) Modular Steel Casework:
4. CHEMICAL RATING
5. Acetic Acid, 93% Excellent
6. Formic Acid, 33% Good
7. Hydrochloric Acid, 37% Excellent
8. Nitric Acid, 25% Excellent
9. Nitric Acid, 60% Good
10. Phosphoric Acid, 75% Excellent
11. Sulfuric Acid, 28% Excellent
12. Sulfuric Acid, 85% Excellent
13. Ammonium Hydroxide, 10% Excellent
14. Sodium Hydroxide, 10% Excellent
15. Sodium Hydroxide, 25% Excellent
16. Acetone Excellent
17. Carbon Tetrachloride Excellent
18. Ethyl Acetate Excellent
19. Ethyl Alcohol Excellent
20. Ethyl Ether Excellent
21. Formaldehyde, 37% Excellent
22. Hydrogen Peroxide, 5% Excellent

23. Methylene Ketone Excellent
24. Phenol, 85% Good
25. Xylene Excellent

R. EPOXY RESIN WORK SURFACE

1. Material: Chemical and abrasion resistant, durable top of one inch thick cast material of epoxy resins and inert products, cast flat, with a uniform low-sheen black surface.
 - a. Where indicated on plans provide work surfaces with: 1-1/4" thick surface, dished a nominal 1/2" to contain spills.
2. Backsplash curb: Same material as top, 4" high, butt jointed and cemented to top. Provide where tops abut wall surfaces and at reagent ledges. Include end curb where top abuts end wall or adjacent top of different level.
3. Reagent ledges: Same material as top. Provide 6" high x 7-1/2" wide single faced units and 6" high x 9" wide double faced units [as shown on drawings] [as required]. Ledge face shall permit installation of service fixtures and top shall be removable for access to service utilities

S. SINKS, DRAINS AND TRAPS

1. Epoxy resin sinks: Integrally molded from modified thermosetting black epoxy resin, specially compounded and oven cured. Cove inside corners and pitch bottom to threaded drain outlet.
 - a. Size as noted on drawings.
 - b. Drain location as noted on drawings.
 - c. Hamilton Model No.as noted on drawings.

T. Sink supports:

1. Cabinet sinks: Support sinks on 11 gauge, adjustable, 1" x 2" x 1" channel with reagent resistant finish. Provide two channels across width of cabinet, attached to 3/8" diameter threaded hanger rods.
2. Table sinks: Support sinks on 2" wide, U-shaped steel straps screwed to cross rails. Straps shall be 1/4" thick; 1/2" thick for sinks over 250-sq. in. in area. Straps shall have baked enamel finish.
3. Caulk joint between top and sink with non-hardening mastic.
4. Epoxy resin cupsinks: Integrally molded from modified thermosetting black epoxy resin, specially compounded and oven cured. Cove inside corners and pitch bottom to threaded drain outlet.
 - a. Size as noted on drawings.
 - b. Hamilton Model No. as noted on drawings.

U. Traps: 1-1/2" size, type S in thermoplastic polyethylene.

V. LABORATORY FITTINGS

1. Water Service Fittings:
 - a. Water service faucets and valves shall have renewable unit containing all working parts subject to wear, including replaceable stainless steel seat. Unit shall have serrations for position locking into valve body.
 - b. Gooseneck vacuum breakers: Brass forgings integral with gooseneck, with renewable seat and special design valve member for fine flow control.
 - c. Goosenecks shall have separate 3/8" IPS coupling securely brazed to gooseneck to provide full thread for attachment of anti-splash outlet fittings, serrated tips and filter pumps.
 - d. Air, Gas and Vacuum Systems Fittings:
 - e. Needle valves: Small pattern needle valve, straightway type with stainless steel replaceable floating cone and brass seat (non-renewable). Ten serrated end is integral with valve body.
 - f. Ground key cocks: Straightway ground key cocks, individually ground and lapped and tested at 100 psi. air under water. Cocks shall have single arm long easy grip handle with screw-on type index. Ten serrated end is integral with valve body.
 - g. Distilled Water Faucet and Valves: Polyvinyl chloride (PVC) with rigid gooseneck and removable ten serrated hose end, arranged for manual operation.
 - h. Steam Fittings: Bonnet assembly similar to needle valve fixture. Provide valve stem with flat teflon valve disc and renewable, stainless steel valve seat.

- i. Turrets for gas, air, vacuum, steam or water fixtures: "Round" type design, provided with brass shanks, locknuts and washers.
 - j. Handles for service cocks, faucets and remote controls: Four-arm type except ground key cocks. Provide removable screw-on type colored plastic discs with letter stamped on disc in contrasting color as scheduled below:
 - 1) Service Disc/Letter Colors Letters
 - 2) Gas Blue/White Gas
 - 3) Vacuum Yellow/Black Vac.
 - 4) Compressed Air Orange/White C-Air
 - 5) Cold Water Green/White C.W.
 - 6) Hot Water Red/White H.W.
 - 7) Steam Black/White Strm.
 - 8) Chilled Water Brown/White CH.
 - 9) Distilled Water White/Black D.W.
- W. Fixture finish: Chrome finish developed by the following sequence of platings over properly prepared brass castings or forgings:
1. Plating Minimum Plating Thickness
 2. Copper (Initial) 0.000050 IN.
 3. Nickel 0.000350 IN.
 4. Chromium (Final) 0.000015 IN.
- X. Electrical fixtures and fittings: Flush, pedestal or line type, provided in strict accordance with the current edition of the National Electric Code of the National Fire Protection Association, and with requirements of all local regulatory authorities.
1. Pedestal and line type housings: Heavy "Iustrebrite" corrosion resistant aluminum alloy polished to a chrome like color.
 2. Pedestals: Provide with integral bases; low design for use on either single or double faces.
 3. Line type housings: Similar in design to pedestals; designed to be self-supporting when installed with rigid conduit.
 4. Receptacles: Rated 120 volts AC at 20 amps., three wire grounding type with "Automatic Ground" feature. Provide single or duplex receptacles as required, with ivory or black colored molded thermo-set bodies.
 5. Switches: Single pole, toggle type.
 - a. Flush boxes: Galvanized steel.
 - b. Flush plates: Chrome plated or nylon plastic.
 6. Conduit: Rigid type, of size to accommodate easy pulling of wire. Boxes, component parts and fittings shall be the screw type. Provide enamel finish on exposed conduit and ferrous fittings.
 7. Pedestal and line type housings, flush boxes, receptacles and flush plates must be grounded.

PART 3 EXECUTION

3.01 INSTALLATION

3.02 CASEWORK INSTALLATION:

- A. Set casework components plumb, square, and straight with no distortion and securely anchored to building structure. Shim as required using concealed shims.
- B. Bolt continuous cabinets together with joints flush, tight and uniform, and with alignment of adjacent units within 1/16" tolerance.
- C. Secure wall cabinets to solid supporting material, not to plaster, lath or gypsum board.

- D. Abut top edge surfaces in one true plane. Provide flush joints not to exceed 1/8" between top units.

3.03 WORK SURFACE INSTALLATION:

- A. Where required due to field conditions, scribe to abutting surfaces.
- B. Only factory prepared field joints, located per approved shop drawings, shall be permitted. Secure joints in field, where practicable, in the same manner as in factory, with dowels, splines, adhesive or fasteners recommended by manufacturer.
- C. Secure work surfaces to casework and equipment components with material and procedures recommended by the manufacturer.
- D. Sink installation: Sinks which were not factory installed shall be set in chemical resistant sealing compound and secured and supported per manufacturer's recommendations.
- E. Accessory installation: Install accessories and fittings in accordance with manufacturer's recommendations. Turn screws to seat flat; do not drive.

3.04 ADJUSTING

- A. Repair or remove and replace defective work, as directed by [Architect] [Owner] upon completion of installation.
- B. Adjust doors, drawers, hardware, fixtures, and other moving or operating parts to function smoothly.

3.05 CLEANING

- A. Clean shop finished casework, touch up as required.
- B. Clean countertops with diluted dishwashing liquid and water leaving tops free of all grease and streaks. Use no wax or oils.

3.06 PROTECTION OF FINISHED WORK

- A. Do not permit finished casework to be exposed to continued construction activity.
- B. Advise contractor of procedures and precautions for protection of material, installed laboratory casework and fixtures from damage by work of other trades.

END OF SECTION

SECTION 15020

GENERAL MECHANICAL REQUIREMENTS

RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of all Division-15 sections.

SCOPE

The base bid shall include furnishing all materials, labor, tools, equipment and installation of all work required to install complete mechanical systems as outlined in Division-15.

Submittal of a bid indicates that the contractor has examined the drawings, specifications, and visited the site and has included all required allowances.

Contractor shall be designated as the sub-contractor for that section of work unless specifically stated otherwise.

ALLOWANCES

In addition to all work shown on the drawings, the HVAC contractor shall include a \$2000. cost allowance and the Plumbing contractor shall include a \$1000. cost allowance in the base bid for miscellaneous moves, adds and/or changes to the mechanical systems which may occur. This allowance or portions of this allowance shall not be used unless written permission is first obtained in the form of a change order from the Architect or Engineer. Any and all unused portions of this allowance shall be refunded by the respective contractor at the close of the contract.

MATERIALS AND EQUIPMENT

Materials installed shall be new, full weight, of the best quality. All similar materials shall be of the same type and manufacturer.

Contractor is responsible for the safety and good condition of the materials and equipment installed until final acceptance by the Owner. Materials shall be stored to prevent damage or weathering prior to installation.

When several materials, products or items of equipment are specified by name for one use, the contractor may select any one of those specified and shall include with his bid an Equipment List listing the equipment selected.

Bidders may bid on other materials, products or equipment. Other products, material, article, device, fixture or form of construction not mentioned as approved equal must be approved by the Engineer. Request for approval must be made in writing and approved by the Architect ten (10) days prior to bid opening date, and issued by addendum.

The responsibility for costs incurred from deviation from the base equipment shall be the equipment supplier and this contractor. Use of any equipment will be considered as a statement that clearances and arrangements have been checked and found satisfactory.

GENERAL STANDARDS

The installation of all work shall conform to the applicable State and Local codes and statutes.

The applicable provisions of the following standards shall govern:

- Kentucky Building Code
- American Society for Test Materials (ASTM);
- National Fire Protection Association (NFPA);
- Underwriters Laboratories (UL);
- American Gas Association (AGA);
- National Sanitation Foundation (NSF).
- Sheet Metal & Air Conditioning Contractors National Association (SMACNA).
- American National Standards Institute (ANSI)

RECORD DOCUMENTS

Record Drawings: Provide two sets of As-Built Drawings on mylar reproducibles to the Owner at the date of final acceptance.

Prepare record documents in accordance with the requirements in Division 1.

In addition to the requirements specified in Division 1, indicate the following installed conditions:

Ductwork mains and branches, size and location, locations of dampers and other control devices; filters, boxes, and terminal units.

Mains and branches of piping systems, with valves and control devices located and numbered, concealed unions, traps, strainers, expansion compensators, tanks, etc. located). Indicate actual inverts and horizontal locations of underground piping.

Equipment locations (exposed and concealed), dimensioned from prominent building lines.

PLANS

Plans are diagrammatic indicating required size, points of termination of ducts and pipes and suggested routes. However, it is not intended that drawings indicate all necessary offsets. It shall be the work of the contractor to install piping and ductwork in such manner as to conform to the structure, avoid obstructions and preserve headroom.

Coordination Drawings: The contractor shall provide a 1/4" scale double line set of coordination drawings to the Engineer prior to installation of the systems. The top elevation of all disciplines shall be clearly marked throughout the drawings so that no interferences occur. Drawings shall depict actual clearances of installed equipment, penetration locations and service clearances. Indicate scheduling, sequencing, movement and positioning of large equipment during construction. Indicate where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the work. Conflicts in equipment and materials shall be corrected prior to installation. Contractor shall provide a reproducible mylar showing all disciplines and three blue line drawings of the HVAC discipline only.

Exact location of electric outlets, heating equipment, piping, lighting fixtures, ducts, etc., shall be coordinated so there will be no interferences at installation between the various trades. It is the work of the contractor to prepare complete coordination drawings indicating exact location of all items.

All ducts and piping shall be run as straight as possible and symmetrical with architectural items.

Piping and ducts shall be concealed in pipe shafts. Pipe spaces and furring wherever possible.

Piping and ductwork fabricated before coordination with the other trades will be done at the contractor's risk.

SUBMITTALS

Refer to Division 1 Requirements for further details.

Clearly state equipment markings (i.e. ACU-1), capacities, voltages and model numbers on all submittals. This information shall be clearly stated on the cover sheet in tabular form.

Product Data: Submit manufacturer's specifications for equipment showing dimensions, weights, capacities, ratings, performance with operating points clearly indicated, motor electrical characteristics, gages and finishes of materials, and installation instructions.

Shop Drawings: Submit assembly-type shop drawings showing unit dimensions, construction details, and field connection details in accordance with general conditions and supplementary general conditions.

Maintenance Data: Submit maintenance instructions, including all factory published maintenance information and include this information in maintenance manuals.

PRODUCT DELIVERY, STORAGE AND HANDLING

Deliver equipment and materials according to factory shipping requirements. Pack components in factory-fabricated protective containers. Units shall be delivered in sections of such size as will pass through available openings.

44Store equipment and materials in clean dry place and protect from weather and construction traffic. When stored inside, do not exceed structural capacity of the floor.

Handling and rigging of equipment and products shall be as recommended by the manufacturer. Components and equipment damaged during shipment or handling shall not be installed. Replace and return damaged components to the manufacturer.

SUPERVISION AND WORKMANSHIP

Workmanship throughout shall conform to the standards of best practice and all labor employed must be competent to do all the work required.

Contractor shall furnish the services of an experienced superintendent to be in constant charge of the work at all times.

Quality Assurances: Contractor if requested shall demonstrate his ability to perform all work to be included under the contract. Assurance if requested, shall be in the form of a list of past projects of similar size and complexity and a list of six (6) references pertaining to those projects. Failure to demonstrate these quality assurances shall be taken as a statement of the contractors inability to perform.

Contractor shall have a minimum five (5) years experience in the installation of HVAC systems similar to the systems specified.

Welders shall show proof satisfactory to the Engineer that they have passed qualifications prescribed by are certified by the National Certified Pipe Welding Bureau or by other reputable and recognized agency, acceptable to the Engineer, using welding procedures set forth in the ASME Boiler Construction Code, Section IX, Welding Qualifications. No welder shall be employed who does not meet the above requirements.

PIPING

Pipe shall be cleaned and ends properly reamed. Until final connections are made, piping shall be capped or plugged. All piping shall bear the ASTM label and be U.S. made pipe. Foreign pipe shall be allowed only with the written approval of the engineer.

Valves and specialties shall be placed for easy operation and access. Valves shall be installed in a horizontal or vertical position.

Provide numbered brass tags not less than 1-1/2" diameter on all shutoff valves and furnish the Owner with typewritten sheets in duplicate showing the number of valves, where the valve is located, and what it controls. Typewritten sheets shall be furnished framed under glass.

All fixtures, specialties and items of equipment shall be flanged or union connected and shall have stop valves for isolation.

Locate and install piping so that 1/2" minimum clearance is maintained after insulation is applied. Install piping free of sags and bends and installed perpendicular or parallel to the building structure.

Piping over electrical equipment is prohibited unless approved by the engineer and the piping is panned and piped to a floor drain.

Provide dielectric insulation at points where copper or brass piping comes in contact with ferrous piping, reinforcing steel or other dissimilar metal in structure. Provide dielectric unions or couplings where dissimilar metals are in contact.

Gas Piping: The contractor or sub-contractor responsible for the installation of each gas fired piece of equipment, shall provide the final gas connections within 20 feet of the units, including drops through roof with patching, gas valve, union, drip leg and manifolds as required for multiple installation.

All welding shall conform to the applicable requirements of the American Standard Code for Pressure piping. See Supervision and Workmanship.

SPECIFICATIONS

Specifications shall be interpreted in connection with the drawings hereinbefore described, and if anything is shown on drawings and not mentioned in the specifications, or vice versa, it is to be included in the work the same as though clearly set forth by both.

Furthermore, all materials or labor previously required to fully complete the work shall be included in the contractor's work even though each item necessarily involved be not specifically mentioned or shown. Such work and/or materials shall be of the same grade or quality as the parts actually specified and shown. Should there be a conflict between the plans and specifications, the greater quantity or better quality shall be furnished.

PERMITS, FEES, INSPECTION, LAWS AND REGULATIONS

Permits and fees of every nature required in connection with this work shall be obtained and paid for by this contractor who shall also pay for all the installation fees and similar charges. Laws and regulations which bear upon or affect the various branches of this work shall be complied with by this contractor, and are hereby made a part of this contract. All work which such laws require to be inspected shall be submitted to the proper public officials for inspections and certificates of final approval must be furnished to the Owner before final acceptance will be given by the Engineer.

ELECTRICAL REQUIREMENTS AND MOTORS

Electrical wiring shall be provided under Division 16 unless specifically called for in another section of the specifications.

An enclosed safety type, NEMA Type HD motor disconnect switch shall be furnished and installed under the Electrical Division for each motor installation unless specifically mentioned as furnished under another section of these specifications.

The motor control apparatus shall be furnished complete as a part of the motor and apparatus which it operates when called for in certain instances in the Mechanical Division. Motor control apparatus except as above shall be complete, factory wired and tested, ready for connections to be made under Division 16.

All motors shall be in accordance with the latest standards of NFPA 70, "National Electrical Code".

Refer to Schedule of Equipment for voltages and phase.

All mechanical equipment shall be U. L. listed for use with "HACR" circuit breakers.

Service Factors indicated for motors are minimum values and apply at frequency and utilization voltage at which motor is connected. Provide motors which will not operate in the service factor range when supply voltage is within 10 percent of motor voltage rating.

Temperature Rise: Based on 40 deg. C ambient except as otherwise indicated.

Enclosure: Open drip-proof.

Wherever in these specifications, a motor voltage is listed, the motor shall be wound for the listed voltage and none other will be accepted.

The Electrical Section of the specifications and drawings shall be consulted for the exact voltage.

Polyphase Motors

Squirrel cage induction type

NEMA design letter Designation "B"

Internal thermal overload protection

Bearings: double shielded, prelubricated, regreasable

Energy Efficient Motors: equal or greater than NEMA MG-1

1.25 Service factor

Multi Speed Motors: separate windings for each speed

Single-Phase Motors

Internal Thermal overload protection

Sealed, prelubricated bearings

TEMPORARY SERVICE: Refer to Section 01500

TESTING AND BALANCING

Air Systems

The contractor shall procure the services of an independent Air Balance and Testing Agency, approved by the engineer, and a member of AABC or NEBB, which specializes in the balancing and testing of heating ventilating and air conditioning systems, to balance, adjust and test air moving equipment and air distribution or exhaust systems as herein specified. All work by this agency shall be done under direct supervision of a qualified Heating and Ventilating Engineer employed by this agency. All instruments used by this agency shall be accurately calibrated and maintained in good working order.

Air balance and testing shall not begin until the system has been completed and is in full working order. The Contractor shall put all heating, ventilating and air conditioning systems and equipment into full operation and shall continue the operation of same during each working day of testing and balancing. The contractor shall submit within 30 days after receipt of contract, 8 copies of submittal data for the testing and balancing of the air conditioning, heating, and ventilating systems. The Air Balance and Testing Agency shall provide proof of having successfully completed at least five projects of similar size and scope.

OPERATING AND MAINTENANCE MANUALS

The scope of such operating and maintenance manuals shall include the following:

- Description of mechanical equipment and systems.
- Operating instructions.
- Routine maintenance schedules and procedures.

Organization - A manual of such purpose shall be arranged in two parts, with Part I dealing with information pertaining to systems and Part II covering information pertaining to equipment. These may be bound in as many volumes as may be required for convenience of use and reference.

HANGERS AND SUPPORTS AND FOUNDATION

Support all piping, ductwork and equipment by hangers or brackets. Furnish structural steel members, (prime painted with zinc chromate) where required to support piping and equipment. No portion of piping or valves shall be supported by equipment. Double nut all threaded rods.

Pipe hangers to be ITT Grinnel (Clevis Hanger) Fig. 260, Elcen or approved equal. Rod sizes to conform to the following: 3/8" rods for 3/4"-2" pipe; 1/2" rods for 2-1/2"-3" pipe; 5/8" for 4"-5" and 3/4" for 6". All piping within 100 feet of pumps or vibrating equipment to be supported on vibration isolators. Hangers shall be sized to allow insulation to pass through unobstructed, provide saddle support for insulation at all hanger. Note: 1/4" rods are not acceptable.

Riser clamps to be ITT Grinnel Fig. 261 or equal.

Ductwork - Support by means of hangers as follows:

Duct Width	Hanger Size and Type	Max. Spacing
60 or less	1"x.109" (#12 gage)	8
61 to 90	3/8" dia. rod	8
Over 90	3/8" dia. rod	4

A pair of hangers shall be located at every transverse joint and elsewhere according to the table. Where ductwork is hung via rods, rods shall be double nutted.

Suspend hangers from joist or I beam by means of C clamps with lock nut and retaining clip. ITT Grinnel Fig. 86. Suspend hanger rods from structural concrete slab by means of universal insert.

Brace piping by structural steel members securely attached to building construction.

Anchor pipes by means of structural steel members securely attached to building construction.

Where piping is close to floor, support on adjustable pipe support.

Hanger spacing for piping unless otherwise noted is to be as follows: 1-1/4" or smaller to be 8' O.C.; 1-1/2"-2" to be 10' O.C.; 2-1/2" and larger to be 12' O.C. and at each change of direction. Hanger spacing for copper pipe to be as follows: 1" or smaller 6' O.C.; 1-1/4" or larger 8' O.C. Hanger spacing for cast iron soil pipe - 5' O.C. and at each hub. Piping shall be also supported at each change in direction at valves and equipment.

Piping connections to all equipment with moving parts shall be isolated with braided copper or stainless steel flexible links, which shall be selected to absorb the deflection on the isolating members.

All mechanical equipment shall have concrete bases and/or structural steel supports and shall be furnished and installed by sub-contractor. Minimum base height equals 4".

Concrete bases shall extend at least 4" beyond the bed or frame of the supported machine. Bases shall have straight and finished sides and a 1"-45 degree chamfer at the top. Reinforcing steel bars shall be placed in both directions of the base.

The use of pumps or other equipment as piping supports shall be prohibited. All such connectors and their supports shall be independently supported from the building structure and inspected and approved by the Engineer before bolting.

Provide flexible connectors where pipes or ducts cross building expansion joints equal to Flexonics.

PHOTOELECTRIC SMOKE DETECTORS:

Fire Alarm Related Work For Mechanical Systems

The following applies whether or not shown on drawings. Prior to submitting a bid, each contractor shall review documents of all other branches which may have an impact on such work.

It shall be the responsibility of the contractor who installs the alarm panel and/or wiring to provide all necessary working drawings and submittals (wiring diagrams, zone schedule, plan view layouts, routing, wiring, device & panel submittals, etc.). These submittals shall be approved by the state fire marshall's office (or a similar agency as locally required) prior to submittal to engineer. All components shall be UL listed and NFPA approved for their specific application. Where control panels are required, provide remote annunciator (at location as directed in field) and provide full battery back-up as required by NFPA.

All smoke detectors shall be specifically UL listed for use with the existing or new building fire alarm panel(s) and shall be provided with all required power supply/alarm wiring, sampling tubes, test station, auxiliary contacts, etc.

All work shall be in strict compliance with all applicable sections of the latest edition of NFPA. Each air handling unit, sprinkler flow switch and/or sprinkler tamper switch shall be separately zoned. All fire alarm system wiring shall be supervised and installed in conduit (3/4" minimum).

Unless local prevailing codes require otherwise, fire alarm related work for mechanical systems shall be provided as follows.

Buildings with Sprinkler System and/or with Fire Protective Signaling System and/or with Automatic Fire Detection System:

For air handling units and air systems with capacity of 2000 cfm or above, HVAC contractor shall furnish, install & wire a UL listed photoelectric smoke detector (with all required sampling tubes, test stations, auxiliary contacts, etc.) in the main supply duct, consult with local authorities in jurisdiction for exact location. Electrical contractor will install smoke detector and make alarm system connections. Temperature contractor shall make shut down control wiring connections thru auxiliary NC contacts in detector sub base. Consult local authorities in jurisdiction for exact location.

If a sprinkler system exists in the building, the sprinkler contractor shall furnish and install all required flow and tamper switches. The electrical contractor shall furnish, install and wire all required fire alarm system wiring as well as all required additional components within the fire alarm system control and annunciator panels to allow for the additional zoning.

Electrical contractor shall coordinate with mechanical contractors and shall install the detectors in easily accessible locations. Electrical contractor shall provide all necessary fire alarm system wiring (in conduit) and supplementary work, components, equipment, etc. as required to interface the sprinkler and/or smoke detector work with the building fire alarm system(s).

HVAC contractor shall make wiring connection from the auxiliary contacts of the detectors into fan control circuits to stop fans in event of presence of smoke.

ARCHITECTURAL COORDINATION ITEMS

Cut and drill all openings in walls and floors required for the installation. Secure approval of Engineer before cutting and drilling. Neatly patch all openings cut.

Cutting and patching to be held to a minimum by arranging with other contractors for all sleeves and openings before construction is started.

Patching through fire rated walls and enclosures shall not diminish the rating of that wall or enclosure. Patch shall be equal to rockwool, firestop, caulk or approved "rated" patch.

Provide products equivalent to the following:

For Floor Openings:	Instant Firestop; 305-SL
For Wall Openings:	Instant Firestop; 344-GG
Mineral Felt:	Instant Firestop; Type MW
For Insulated Pipes:	Instant Firestop; Type PI
For Fill Areas:	Instant Firestop; C-1000

Furnish all access panels required for proper servicing of equipment. Provide access panels for all concealed valves, vents, controls and cleanout doors. Provide frame as required for finish. Furnish panels to General Contractor. Exact locations to be determined by the Engineer. Minimum size to be 12" x 12", units to be 16 gauge steel, locking device shall be screw driver cam locks.

Install standard Schedule 40 black steel pipe sleeves two sizes larger than pipes passing through floors, walls or masonry construction.

Sleeves through walls to be cut flush with both faces.

Sleeves through floor to extend one inch above floor top elevation.

Pipes penetrating roof shall use a pipe curb assembly equal to Pate Co.

Caulk between sleeves and pipes with rockwool and caulk around sleeves with sealing compound. Material must meet all applicable fire ratings required.

Crane Company, B&C or approved equal chromium plates to be used wherever uninsulated exposed pipes pass through walls or ceilings.

Furnish and set all forms required in masonry walls or foundation to accommodate pipes.

EXCAVATING AND BACKFILLING

Comply with all codes in jurisdiction. Provide slope sides, shore and brace as required for stability. Refer to Division 2, "Earthwork" for further requirements.

The contractor shall perform all excavation and backfilling required for his work and shall consult with utilities prior to beginning excavation.

Remove materials of every nature and description encountered in obtaining indicated lines and grades as shown on drawings. No extras will be allowed due to variations of proportion and the variation of materials.

All piping shall be laid on a bed of sand, 6" deep, well tamped into place and properly graded to permit the pipe to have an even bearing throughout its entire length.

Excess excavated earth materials shall be removed from the site.

All backfilling of excavation under concrete slabs, concrete drives and walks or blacktop surfaces shall be bankrun gravel. All excavations shall be compacted to prevent settling.

Roadways, walks and slabs	100%
Yard areas	95%

Compaction shall be performed in 12" lifts and spread evenly.

The contractor shall pay for all expenses for the proper restoration of all streets, sidewalks, concrete and blacktop surfaces broken for installing piping.

CLEANING EQUIPMENT AND PREMISES

Clean all parts of the apparatus and equipment. Exposed parts which are to be painted shall be cleaned of cement, plaster and other materials and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all corners and cracks scraped out.

Exposed metal work shall be brushed down with steel brushes to remove rust and other spots and left smooth and clean. Remove trapped elements during cleaning and flushing period, after which they shall be replaced and adjusted.

During the progress of the work, the contractor shall clean up after his men and leave the premises and all portions of the building in which he is working in a clean and safe condition.

PAINTING, MARKING AND NAMEPLATE DATA

Nameplate: For each piece of power operated mechanical equipment provide a permanent operational data nameplate indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

All exposed piping, ductwork and equipment shall be identified by stenciling as follows (or as listed in the identification section) by this contractor.

Provide directional arrows at least 4" long spaced at least every 50 feet.

Contents of piping and ductwork shall be labeled: Example - Air Conditioning Supply - A.C. Sup.; Air Conditioning Return - A. C. Ret.; Toilet Exhaust Air - Toilet Exh.

Equipment shall be labeled with unit numbers same shown on drawings or indicated in specifications.

Letters shall be 1" tall for piping and 4" tall for ductwork and equipment. The air conditioning system numbers and zone numbers shall be added after each designation of the air conditioning supply ductwork.

GUARANTEE

The contractor shall provide a guarantee in written form stating that all work under this section shall be free of defective work, materials, or parts for a period of one year from the date of substantial completion and shall repair, revise or replace at no cost to the owner any such defects occurring within the guarantee period. Contractor shall also state in written form that any items or occurrences arising during the guarantee period will be attended to in a timely manner and will in no case exceed four (4) working days from date of notification by owner.

END OF SECTION

SECTION 15100

VALVES

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

Types of valves specified in this section include the following:

- Gate Valves
- Ball Valves
- Globe Valves
- Check Valves

PART 2 - PRODUCTS

Manufacturer: Subject to compliance with requirements, provide valves of one of the following:

- Milwaukee
- Crane
- Hammond
- Stockham
- Lunkenheimer:
- Powell:
- Keystone:
- Watts:

VALVE FEATURES:

Bronze Valves shall be listed for domestic use.

Valve Design: Valves shall have rising stem, or rising outside screw and yoke stems; except, non-rising stem valves may be used where headroom prevents full extension of rising stems.

Pressure and Temperature Ratings: as required to suit system pressures and temperatures.

Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe size.

Operators: Provide the following special operator features:

Handwheels, fastened to valve stem, for valves other than quarter turn.

Lever Handle on quarter-turn valves 6 inch and smaller, except for plug valves. Provide one wrench for every 10 plug valves.

Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.

End Connections:

Flanged:

Threaded:

GATE VALVES:

Gate Valves - 2 Inch and Smaller: Class 125, body and bonnet of cast bronze, threaded or solder ends, solid disc, copper-silicon alloy stem, brass packing gland, "Teflon" impregnated packing, and malleable iron handwheel. Class 150 valves meeting the above shall be used where pressure requires.

Gate Valves - 2-1/2 Inch and Larger: Class 125 iron body, bronze mounted, with body and bonnet conforming to ASTM A 126 Class B, flanged ends, and "Teflon" impregnated packing and two-piece backing gland assembly.

BALL VALVES:

Ball Valves - 1 Inch and Smaller: 2-piece Ball Valves 2" and smaller, 600 WOG, 150 SWP, Cast Bronze body, Teflon seats, conventional port, blow-out roof stem, adjustable packing gland, chrome plated bronze ball, screwed ends. Provide solder ends for domestic hot and cold water service; threaded ends for heating hot water condenser water, chilled water and low pressure steam. Provide extended valve stems for valves used on insulated lines.

Ball Valves - 1-1/4 Inch to 2 Inch: rated for 150 psi saturated steam pressure, 600 psi WOG pressure; 3-piece construction, bronze body, conventional port, chrome-plated brass ball, "blowout proof stem, and vinyl-covered steel handle. Provide solder ends for domestic hot and cold water service; threaded ends for heating hot water, condenser water, chilled water and low pressure steam. Provide extended valve stems for valves used on insulated lines.

GLOBE VALVES:

Globe Valves - 2 Inch and Smaller: Class 125, body and screwed bonnet of cast bronze, threaded or solder ends, brass or replaceable composition disc, copper-silicon alloy stem, brass packing gland, and malleable iron handwheel. Class 150 valves meeting the above shall be used where pressure requires.

Globe Valves - 2-1/2 Inch and Larger: Class 125 iron body and bolted bonnet, Class B; outside screw and yoke, bronze mounted, flanged ends, and two-piece backing gland assembly.

CHECK VALVES:

Swing Check Valves - 2 Inch and Smaller: Class 125, cast bronze body and cap, horizontal swing, Y-pattern, with a bronze disc, and having threaded or solder ends. Valve shall be capable of being reground while the valve remains in the line. Class 150 valves meeting the above specifications may be used where pressure requires or Class 125 are not available. Provide solder ends for domestic hot and cold water service; threaded ends for heating hot water, condenser water, chilled water and low pressure steam.

Swing Check Valves - 2-1/2 Inch and Larger: Class 125 (Class 175 FM approved for fire protection piping systems), cast iron body and bolted cap, Class B; horizontal swing, with a bronze disc or cast iron disc with

bronze disc ring, and flanged ends. Valve shall be capable of being refitted while the valve remains in the line. Class 150 valves meeting the above specifications may be used where pressure requires or Class 125 are not available.

PART 3 - EXECUTION

EXAMINATION:

Examine valve interior through the end ports, for cleanliness, freedom from foreign matter and corrosion. Remove special packing materials, such as blocks used which prevents disc movement during shipping and handling.

Actuate valve through an open-close and close-open cycle. Examine functionally significant features, such as guides and seats made accessible by such actuation. Following examination, return the valve closure member to the position in which it was shipped.

Examine threads on both the valve and the mating pipe for form (out-of-round or local indentation) and cleanliness.

Replace defective valves with new valves.

Examine mating flange faces for conditions which might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size and material, and for freedom from defects and damage.

VALVE SELECTION:

Copper Tube Size 2 Inch and Smaller: Solder ends, except in heating, chilled, condenser water and low pressure steam service which shall have threaded ends.

Steel Pipe Sizes 2 Inch and Smaller: threaded.

Steel Pipe Sizes 2-1/2 Inch and Larger: flanged.

VALVE INSTALLATIONS:

General Application: Use gate, ball, and butterfly valves for shut-off duty. Use ballcentric and butterfly for throttling duty.

Control Valves shall be globe type modulating valves.

Locate valves for easy access and provide separate support where necessary.

Install valves and unions for each fixture and item of equipment in a manner to allow equipment removal without system shut-down. Unions are not required on flanged devices. Isolation valves shall be installed on branch lines serving two or more pieces of equipment and every 100 feet.

Install valves in horizontal piping with stem at or above the center of the pipe.

Install 3-valve bypass around each pressure reducing valve using throttling type valves.

Install balancing valve in the bypass of 3-way valves.

Installation of Check Valves: Install for proper direction of flow as follows:

Swing Check Valves: horizontal position with hinge pin level.

SOLDER CONNECTIONS:

Cut tube square and to exact lengths.

Clean end of tube to depth of valve socket, using steel wool, sand cloth, or a steel wire brush to a bright finish. Clean valve socket in same manner.

Apply proper soldering flux in an even coat to inside of valve socket and outside of tube.

Open gate and globe valves to fully open position.

Remove the cap and disc holder of swing check valves with composition discs.

Insert tube into valve socket making sure the end rests against the shoulder inside valve. Rotate tube or valve slightly to insure even distribution of the flux.

Apply heat evenly to outside of valve around joint until solder will melt upon contact. Feed solder until it completely fills the joint around tube. Avoid hot spots or overheating the valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.

THREADED CONNECTIONS:

Note the internal length of threads in valve ends, and proximity of valve internal seat or wall, to determine how far pipe should be threaded into valve.

Align threads at point of assembly.

Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified).

Assemble joint wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

FLANGED CONNECTIONS:

Align flanges surfaces parallel.

Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using a torque wrench.

For dead end service, butterfly valves require flanges both upstream and downstream for proper shutoff and retention.

FIELD QUALITY CONTROL:

Testing: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks; replace valve if leak persists.

ADJUSTING AND CLEANING:

Cleaning: Clean mill scale, grease, and protective coatings from exterior of valves and prepare to receive finish painting or insulation.

END OF SECTION

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SECTION 15120
PIPING SPECIALTIES

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

Types of piping specialties specified in this section include the following:

- Pipe Escutcheons.
- Pipeline Strainers.
- Vandal-Proof Vent Caps.
- Dielectric Unions.
- Mechanical Sleeve Seals.
- Fire Barrier Penetration Seals.
- Pipe Sleeves.
- Sleeve Seals.

PART 2 - PRODUCTS

PIPING SPECIALTIES:

PIPE ESCUTCHEONS:

General: Provide pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.

Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.

Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.

Manufacturer: Subject to compliance with requirements, provide pipe escutcheons of one of the following:

- Chicago Specialty Mfg. Co.
- Producers Specialty & Mfg. Corp.
- Sanitary-Dash Mfg. Co.

LOW PRESSURE Y-TYPE PIPELINE STRAINERS:

General: Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 125 psi working pressure, with Type 304 stainless steel screens, with 3/64" perforations @ 233 per sq. in.

Threaded Ends, 2" and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.

Flanged Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.

Butt Welded Ends, 2-1/2" and Larger: Schedule 40 cast carbon steel body, bolted screen retainer with off-center blowdown fitted with pipe plug.

Manufacturer: Subject to compliance with requirements, provide low pressure Y-type strainers of one of the following:

Armstrong Machine Works.
Hoffman Specialty ITT; Fluid Handling Div.
Metraflex Co.
Spirax Sarco.
Trane Co.
Victaulic Co. of America.
Watts Regulator Co.

VANDAL-PROOF VENT CAPS:

General: Provide cast-iron vandal-proof vent caps, full size of vent pipe, caulked base connection for cast-iron pipes, threaded base for steel pipes.

Manufacturer: Subject to compliance with requirements, provide vandal-proof vent caps of one of the following:

Josam Mfg. Co.
Smith (Jay R.) Mfg. Co.
Tyler Pipe; Sub. of Tyler Corp.
Zurn Industries, Inc.; Hydromechanics Div.

DIELECTRIC UNIONS:

General: Provide standard products recommended by manufacturer for use in service indicated, which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action, and stop corrosion.

Manufacturer: Subject to compliance with requirements, provide dielectric unions of one of the following:

B & K Industries, Inc.
Capital Mfg. Co.; Div. of Harsco Corp.
Eclipse, Inc.
Epcos Sales, Inc.
Perfection Corp.
Rockford-Eclipse Div.

MECHANICAL SLEEVE SEALS:

General: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

Manufacturer: Subject to compliance with requirements, provide mechanical sleeve seals of one of the following:

Thunderline Corp.

FIRE BARRIER PENETRATION SEALS:

Provide seals for any opening through fire-rated walls, floors, or ceilings used as passage for mechanical components such as piping or ductwork.

Cracks, Voids, or Holes Up to 4" Diameter: Use putty or calking, one-piece intumescent elastomer, non-corrosive to metal, compatible with synthetic cable jackets, and capable of expanding 10 times when exposed to flame or heat, UL-listed.

Openings 4" or Greater: Use sealing system capable of passing 3-hour fire test, consisting of wall wrap or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250 to 350 deg. F (121 to 177 deg. C), UL-listed.

Manufacturer: Subject to compliance with requirements, provide fire barrier penetration seals of one of the following:

Electro Products Div./3M.
Nelson; Unit of General Signal.

FABRICATED PIPING SPECIALTIES:

Pipe Sleeves: Provide pipe sleeves of one of the following:

Sheet-Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gages: 3" and smaller, 20 gage; 4" to 6" 16 gage; over 6", 14 gage.

Steel-Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.

Plastic-Pipe: Fabricate from Schedule 80 PVC plastic pipe; remove burrs.

Sleeve Seals: Provide sleeve seals for sleeves located in foundation walls below grade, or in exterior walls, of one of the following:

Mechanical Sleeve Seals: Installed between sleeve and pipe.

PART 3 - EXECUTION

INSTALLATION OF PIPING SPECIALTIES:

Pipe Escutcheons: Install pipe escutcheons on each pipe penetration thru floors, walls, partitions, and ceilings where penetration is exposed to view; and on exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and is flush with adjoining surface.

Y-Type Strainers: Install Y-type strainers full size of pipeline, in accordance with manufacturer's installation instructions. Install pipe nipple and shutoff valve in strainer blow down connection, full size of connection, except for strainers 2" and smaller installed ahead of control valves feeding individual terminals. Where indicated, provide drain line from shutoff valve to plumbing drain, full size of blow down connection.

Locate Y-type strainers in supply line ahead of the following equipment, and elsewhere as indicated, if integral strainer is not included in equipment:

Pressure reducing valves.

Vandal-Proof Vent Caps: Install vandal-proof vent caps on each vent pipe passing through roof, and elsewhere as indicated. Locate base of vent cap 6" above roof surface, or higher where require by Code.

Dielectric Unions: Install at each piping joint between ferrous and non-ferrous piping. Comply with manufacturer's installation instructions.

Mechanical Sleeve Seals: Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal.

Provide at all locations where piping exits building below grade.

Fire Barrier Penetration Seals: Fill entire opening with sealing compound. Adhere to manufacturer's installation instructions.

Provide at all fire wall separations where piping or ducts penetrate the wall.

INSTALLATION OF FABRICATED PIPING SPECIALTIES:

Pipe Sleeves: Install pipe sleeves of types indicated where piping passes through walls, floors, ceilings, and roofs. Do not install sleeves through structural members of work, except as detailed on drawings, or as reviewed by Architect/Engineer. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than 2 pipe sizes larger than piping run. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves. Extend floor sleeves 1/4" above level floor finish, and 3/4" above floor finish sloped to drain. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves.

END OF SECTION

SECTION 15250
MECHANICAL INSULATION

PART 1 - GENERAL

DESCRIPTION OF WORK:

Extent of mechanical insulation required by this section is indicated on drawings, and by requirements of this section.

Types of mechanical insulation specified in this section include the following:

Piping System Insulation:

Domestic Water Piping Systems.
Chilled Water Piping System.
Refrigerant Piping Systems.

Ductwork System Insulation:

Cold Ductwork.

Manufacturer: Subject to compliance with requirements, provide products of one of the following:

Armstrong World Industries, Inc.
Owens-Corning Fiberglass Corp.
Keene Corp.
CertainTeed.
Johns Manville.
Pittsburg Corning Corp.

Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread rating of 25 or less, and smoke-developed rating of 50 or less, as tested by ANSI/ASTM and NFPA 255.

PART 2 - PRODUCTS

PIPING INSULATION MATERIAL:

Fiberglass piping insulation: ASTM C 547, Class 1

Flexible Unicellular Piping Insulation: ASTM C 534, Type I

Encase pipe fittings insulation with one-piece premolded PVC fitting covers.

Vapor Barrier Material: Paper-backed aluminum foil, except as otherwise indicated, strength and permeability rating equivalent to adjoining pipe insulation jacketing.

Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for applications indicated.

Adhesives, Sealers, and Protective Finishes: As recommended by insulation manufacturer for applications indicated.

DUCTWORK INSULATION MATERIALS:

Rigid Fiberglass Ductwork Insulation:

Flexible Fiberglass Ductwork Insulation:

Vapor Barrier Material for Ductwork: Paper-backed aluminum-foil, except as otherwise indicated; strength and permeability rating equivalent to factory-applied vapor barriers on adjoining ductwork insulation, where available; with following additional construction characteristics:

High Puncture Resistance: Low vapor transmission (for ducts in exposed areas).

Moderate Puncture Resistance: Medium vapor transmission (for ducts in concealed areas).

Ductwork Insulation Accessories: Provide staples, bands, wires, tape, anchors, corner angles and similar accessories as recommended by insulation manufacturer for applications indicated.

Ductwork Insulation Compounds: Provide cements, adhesives, coatings, sealers, protective finishes and similar compounds as recommended by insulation manufacturer for applications indicated.

PART 3 - EXECUTION

PLUMBING PIPING SYSTEM INSULATION:

Insulation Omitted: Omit insulation on exposed plumbing fixture runouts from faces of wall or floor to fixture; on unions, flanges, strainers, flexible connections, and expansion joints.

Cold Piping:

Application Requirements: Insulate the following cold plumbing piping systems:

Domestic cold water piping.

Horizontal Roof Leaders and underside of roof drain sumps in the interior of building.

Insulate each piping system specified above with one of the following types and thicknesses of insulation:

Insulation: Flexible unicellular 1/2" thickness.

Hot Piping:

Application Requirements: Insulate the following hot plumbing piping systems:

Domestic hot water piping.

Domestic hot water recirculating piping.

Insulate each piping system specified above with one of the following types and thicknesses of insulation:

Insulation: Flexible unicellular 3/4" thick.

HVAC PIPING SYSTEM INSULATION:

Insulation Omitted: Omit insulation on hot piping within radiation enclosures or unit cabinets; on cold piping within unit cabinets provided piping is located over drain pan; and on unions, flanges, strainers, flexible connections, and expansion joints.

Cold Piping (40 Deg F (4.4 Deg C) to ambient):

Application Requirements: Insulate the following cold HVAC piping systems:

Air conditioner condensate drain piping.

Insulate each piping system specified above with one of the following types and thicknesses of insulation:

Fiberglass: 1" thick for pipe sizes up to and including 4", 1-1/2" thick for pipe sizes over 4".

Sub-Freezing Piping (0 to 39 Deg F (-18 to 4 Deg C)):

Application Requirements: Insulate the following sub-freezing HVAC piping systems:

Refrigerant suction lines between evaporators and compressors.

Insulate each piping system specified above with one of the following types and thicknesses of insulation:

Insulation: Armaflex, 1/2" thick for pipe sizes up to and including 1", 1" thick Armaflex for pipe sizes over 1".

DUCTWORK SYSTEM INSULATION:

Cold Ductwork (below ambient temperature):

Application Requirements: Insulate the following cold ductwork:

Outdoor air intake ductwork between air entrance and fan inlet or HVAC unit inlet.
HVAC supply ductwork between fan discharge, or HVAC unit discharge, and room terminal outlet.
HVAC Ductwork three feet downstream of roof penetrations.
HVAC Louvers, Plenums and Ductwork three feet downstream of wall penetrations.

Insulate each ductwork system specified above with one of the following types and thicknesses of insulation:

Insulation: Externally wrapped rigid fiberglass; 1-1/2" thick.

Insulation: Externally wrapped flexible fiberglass; 1-1/2" thick, application limited to concealed locations.

Insulation: Internal fiberglass insulation; 1" thick only where specifically noted on drawings.

INSTALLATION OF PIPING INSULATION:

Install insulation on pipe systems subsequent to testing and acceptance of tests.

Repair or replace damaged existing insulation as indicated or required.

Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other.

Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.

Maintain integrity of vapor-barrier jackets on pipe insulation, and protect to prevent puncture or other damage.

Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated.

Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.

Install protective metal shields and insulated inserts wherever needed to prevent compression of insulation.

INSTALLATION OF DUCTWORK INSULATION:

Install insulation materials with smooth and even surfaces.

Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.

Maintain integrity of vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage.

Extend ductwork insulation without interruption through walls, floors and similar ductwork penetrations, except where otherwise indicated.

Lined Ductwork: Except as otherwise indicated, omit insulation on ductwork where internal insulation or sound absorbing linings have been installed. Duct lining to be 3-lb density, 1" thick unless otherwise noted. Size of ductwork shown on the drawings is free net area, outside dimension of ducts will need to be increased if lined duct is used.

Ductwork Exposed to Weather: Protect outdoor insulation from weather by installing outdoor protective finish or jacketing as recommended by manufacturer.

Corner Angles: Install corner angles on external corners of insulation on ductwork in exposed finished spaces before covering with jacketing.

PROTECTION AND REPLACEMENT:

Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

Protection: Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION

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SECTION 15350

NATURAL GAS PIPING SYSTEMS

PART 1 - GENERAL:

RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to this Section.

Division 15 Basic Materials and Methods sections apply to work of this section - 15020, 15100, 15120.

DESCRIPTION OF WORK:

Extent of natural gas piping system work, is indicated on drawings and schedules, and by requirements of this section.

Applications for natural gas piping systems include the following:

Gas service from street main to building meter outside of building.

Gas main to building from gas meter.

Building distribution system from gas mains to gas-fired equipment connections.

Gas meter only will be provided by the utility company to the site, ready for installation.

Trenching and backfill required in conjunction with gas service piping is specified in applicable Division 15 Basic Materials and Method sections, and is included as work of this section.

QUALITY ASSURANCE:

Manufacturers: Firms regularly engaged in manufacturer of natural gas piping products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than five years.

Installer: A firm with at least three years of successful installation experience on projects with natural gas piping system work similar to that required for project.

ANSI Code Compliance: Comply with applicable provisions of ANSI 31.2 "Fuel Gas Piping."

National Fuel Gas Code Compliance: Comply with applicable provisions of NFPA 54 (ANSI Z223.1) "National Fuel Gas Code," and ANSI Z223.1a "Supplement to National Fuel Gas Code."

Local Utility Compliance: Comply with requirements of local gas utility company. Refer to CG&E specification at end of this section for exterior plastic gas service requirements.

SUBMITTALS:

Product Data: Submit manufacturer's data for fuel gas piping systems materials and products.

PART 2 - PRODUCTS

NATURAL GAS PIPING MATERIALS AND PRODUCTS:

General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with ANSI B31.2 where applicable, base pressure rating on natural gas piping system maximum design pressures. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials use in natural gas piping systems. Where more than one type of material or product is indicated, selection is Installer's option.

BASIC IDENTIFICATION:

General: Provide identification complying with Division 15 Basic Materials and Methods sections in accordance with the following listing:

Building Distribution Piping: Plastic pipe markers

Gas Service: Underground-type plastic line markers

Gas Valves: Plastic valve tags

BASIC PIPE, TUBE, AND FITTINGS:

General: Provide pipe, tube, and fittings in accordance with the following listing:

Gas Service Piping:

All Pipe Sizes: Black steel pipe.

Pipe Weight: Schedule 40.

Fittings: Wrought-steel buttwelding.

Wrapping: Machine wrap pipe using 50% overlap wrap, with polyvinyl chloride tape. Land wrap fittings using 100% overlap wrap extending 6" beyond fitting onto wrapped pipe. Comply with tape manufacturer's installation instructions.

Coated Pipe may be used as approved by local utility company. Anode bags shall be provided on outside metallic mains per utility company recommendations.

Building Distribution Piping:

Pipe Size 2" and Smaller: Black steel pipe

Pipe Weight: Schedule 40

Fittings: Malleable iron threaded

Pipe Size 2-1/2" and Larger: Black steel pipe

Pipe Weight: Schedule 40

Fittings: Wrought-steel butt welding

BASIC PIPING SPECIALTIES:

General: Provide piping specialties complying with Division 15 Basic Materials and Methods sections in accordance with the following listing:

Pipe escutcheons
Pipe sleeves
Sleeve seals

BASIC SUPPORTS, ANCHORS, AND SEALS:

General: Provide supports, anchors, and seals in accordance with the following listing:

Adjustable swivel pipe rings for horizontal-piping hangers and supports.
Two-bolt riser clamps for vertical piping supports.
Concrete inserts, C-clamps, and steel brackets for building attachments.
Fire barrier penetration seals.

SPECIAL VALVES:

General: Special valves required for natural gas piping systems include the following types:

Gas Cocks:

Gas Cocks 2" and Smaller: 150 psi non-shock WOG, bronze straightway cock, flat or square head, threaded ends.

Gas Cocks 2-1/2" and Larger: 125 psi non-shock WOG, iron body bronze mounted, straightway cock, square head, flanged ends.

Lab gas cocks shall be provided by casework contractor.

Available Manufacturers: Subject to compliance with requirements, manufacturers offering gas cocks which may be incorporated in the work include, but are not limited to, the following:

DeZurik; Unit of General Signal
Homestead Industries, Inc.; Valve Division
Jenkins Brothers
Lunkenheimer Co., Division of Conval Corporation
NIBCO, Inc.
Powell Company

Rockwell Manufacturing co.
Walworth Company

GAS METER:

General: Gas meter will be furnished by utility company. Coordinate with utility company for installation requirements.

PART 3 - EXECUTION

INSTALLATION OF BASIC IDENTIFICATION:

General: Install natural gas distribution piping with Mechanical Identification.

INSTALLATION OF NATURAL GAS PIPING:

General: Install mechanical identification in accordance with applicable codes and local Utility Company requirements.

Use sealants on metal gas piping threads which are chemically resistant to natural gas. Use sealants sparingly, and apply to only male threads of metal joints.

Remove cutting and threading burrs before assembling piping.

Do not install defective piping or fittings. Do not use pipe with threads which are chipped, stripped or damaged.

Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping, or equipment connections are completed.

Ground gas piping electrically and continuously within project, and bond tightly to grounding connection if required by utility company requirements.

Install drip-legs in gas piping where indicated, and where required by code or regulation.

Install "tee" fitting with bottom outlet plugged or capped, at bottom of pipe risers.

Use dielectric unions where dissimilar metals are joined together.

Install piping with 1" drop in 60' pipe run (0.14%) in direction of flow.

Install piping parallel to other piping, but maintain minimum of 12" clearance between gas piping and steam or hot water piping above 200 degrees F (93 degrees C).

For piping buried in building substrate, or below floor slabs, install in welded conduit, ventilated to outdoors on both ends, and tested to same requirements as gas piping.

GAS SERVICE:

General: Arrange with Utility Company to provide gas service to indicated locations with shutoff at terminus. Consult with Utility as to extent of its work, costs, fees and permits involved. Pay such costs and fees; obtain permits.

Contact Cinergy Corp., 7200 Industrial Road, Florence, KY 41042.

Gas main will be provided from street main to a point 2 feet to the east side of Alexandria Pike by utility company. Plumbing Subcontractor shall extend from this point to gas meter location at building.

Extend service pipes from gas meter to inside building wall, under Utility's direction.

Provide shutoff outside building where indicated, in adjustable gas service valve box, with cover set flush to finished grade.

INSTALLATION OF PIPING SPECIALTIES:

Install piping specialties in accordance with Division 15 Basic Materials and Methods sections.

INSTALLATION OF SUPPORTS, ANCHORS, AND SEALS:

Install supports, anchors, and seals in accordance with Division 15 Basic Materials and Methods section.

INSTALLATION OF VALVES:

Gas Cocks: Provide at connection to gas train for each gas-fire equipment item, and on risers and branches where indicated.

Locate gas cocks where easily accessible, and where they will be protected from possible injury.

Pressure Regulating Valves: Install as indicated; comply with Utility requirements. Pipe atmospheric vent to outdoors, full size of outlet. Install gas shutoff valve upstream of each pressure regulating valve.

INSTALLATION OF GAS METER:

Install gas meter in accordance with local Utility Company's installation instructions, and comply with requirements.

Set Meter on concrete pad as indicated.

EQUIPMENT CONNECTIONS:

General: Connect gas piping to each plumbing equipment gas-fired equipment item, with drip leg and shutoff gas cock. Comply with equipment manufacturer's instruction. Plumbing Subcontractor shall make final connections to plumbing equipment. HVAC Subcontractor shall make final connections to HVAC equipment.

PIPING TESTS:

Test natural gas piping in accordance with ANSI B31.2, and local utility requirements.

SPARE PARTS:

Furnish to Owner, with receipt, two valve wrenches for each type of valve installed, requiring same.

EXTERIOR GAS MAIN:

The following exterior gas main installation requirements were taken from CG&E Gas Installers Manual:

All gas service piping shall conform to CG&E Company's specifications. Choice of materials will be subject to CG&E approval. Refer to Gas Installers Manual furnished by CG&E Company.

Plumbing Subcontractor shall be responsible for any local or state permits required to install the gas service pipe and shall be responsible for any damage to utilities that are caused by their activities.

Street gas main must be located before trenching is started. To have gas piping located, along with other underground utility facilities that may be buried in the vicinity of where you plan to dig, you must call the Utilities Protection Service at least two (2) working days in advance. In Kentucky call 1-800-762-6007.

Polyethylene plastic pipe that meets the requirements of ASTM Specification D 2513 shall be used. Polyethylene plastic pipe material designated by the Plastic Pipe Institute (PPI) as PE 2406 shall be used.

The service riser shall be of steel pipe (ASTM A53, API 5L, or equal) and shall be fabricated in accordance with CG&E Company drawings. Schedule 40 wall thickness shall be used. Wall thickness must be at least 0.188 inches for three through eight inch steel pipe. Buried steel piping must be protected against corrosion by coating and the use of Magnesium anodes in accordance with CG&E Company requirements.

Each end of the gas service piping must be temporarily and securely capped to keep dirt and water out.

Plastic piping must be located outside and below ground.

The meter set assembly shall not be placed under any operable window or air duct, within 10 feet of any adjacent air duct, or within 10 feet of any source of ignition. Electrical equipment within 3 feet of the meter set must be suitable for Class 1, Division 1, Group D locations. Electrical equipment between 3 and 10 feet must be suitable for Class 1, Division 2, Group D locations.

Service piping must be installed in a trench that is separate from other utilities, drains, etc. The trench bottom shall be continuous, relatively smooth, and free of rock. The width of the trench shall be sufficient to provide for adequate room for visual inspection and for compacting side fills.

The trench shall be of sufficient depth to provide 3' minimum cover at the street and 2'-6" minimum cover at the service riser. The remainder of the service route shall have 2'-6" nominal cover. Service piping installed in sod areas shall have at least 2'-0" cover.

The service piping must not be installed closer than three feet to septic systems, drains, conduits, other utility ducts, lines or pipes. If the service piping must cross over, under or near one of the above, a twelve inch minimum separation must be maintained. Exception: Gas service piping in joint service trench must not be closer than six inches to shared trench utilities.

Service piping may be installed in a joint service trench with electric service cable in conduit, telephone cable, and television cable. The pipe must not be closer than six inches from these cables. If the gas piping must cross any of these cables, the six inch minimum separation must be maintained.

Only electric, telephone, and cable television utilities are permitted in the same trench with gas piping. There are no exceptions. When other facilities parallel gas piping, three feet of separation between trenches must be maintained. If the gas piping must cross a facility other than shared trench occupants, a twelve inch minimum separation must be maintained.

All occupants in the trench with gas service piping must enter the building above ground level.

The requirements are for gas piping and electric service cable only. Contact your cable television company and your telephone company for their requirements.

Plastic to plastic joints shall be accomplished by butt fusion. Only individuals qualified by CG&E are permitted to make fusion joints on plastic pipe. CG&E inspector to record names and social security numbers of individuals making fusion joints. Only Phillips Dricopipe 6500, PE 2406, medium density, polyethylene is approved when fusion is required.

Plastic pipe to steel pipe transition shall be accomplished using a transition fitting or coupling with stiffener. Coupling with stiffener to be tightened by CG&E at time of visual inspection.

A #12 AWG or heavier (smaller AWG number), solid, insulated (RHW, THW, or polyethylene insulation is recommended), copper wire shall be taped to pipe at 15 to 20 foot intervals. Do not wrap wire around pipe. The wire must be one continuous, unbroken length. Coil tracer wire at meter location and street end with enough wire to extend a minimum of two feet above grade.

Plastic gas services longer than 1000 feet in length from curb valve to meter riser must have tracer wire boxes installed and maintained at customer's expense in accordance with CG&E standards. Contact CG&E representative for tracer wire box installation requirements.

Pipe found to be buckled, fractured, kinked, cut gouged beyond 10 percent wall thickness, or contaminated by exhaust, oil, or dirt cannot be used.

Changes in direction will be made with fusion elbows where minimum bending radius of plastic pipe must be exceeded. The minimum bending radius for each service is as follows:

<u>Service Size</u>	<u>With Fusion Joints</u>	<u>No Fusion Joints</u>
3"	25'	5'
4"	30'	7'
6"	45'	10'
8"	60'	15'

Mitered joints, and cut or altered plastic fittings are prohibited.

Transition fittings and couplings are not permitted within 10 feet of a bend.

CG&E construction drawing will specify steel riser and concrete meter pad dimensions for this particular application.

Protection of underground metallic piping against corrosion shall be accomplished by coatings, designed specifically for use on underground pipe, and cathodic protections, by the use of magnesium anodes.

Steel service pipe designed for underground use having an acceptable coating applied at a coating mill is available and is preferred. Acceptable mill applied coatings include reinforced coal tar enamel, extruded polyethylene, and fusion bonded epoxy.

Bare steel pipe, fittings, and welds located below ground must be field coated with an acceptable coating system designed for underground use.

Paint type coatings are not acceptable. Field applied coatings must be installed in accordance with the manufacturer's instructions. In general, these materials should be spiral wrapped and overlapped 1/2 inch minimum.

Acceptable field applied coatings include coal tar/synthetic resin tape with plastic backing, coal tar/synthetic resin tape with glass reinforcement, pressure sensitive polyethylene or polyvinyl chloride tape, or wax impregnated tape.

Surfaces to be coated must be dry, and free of loose rust, scale, and foreign material prior to coating application.

Anodes used for protection of short sections (less than 30 feet) of buried steel gas piping such as service risers for plastic gas services shall consist of 3 pounds of magnesium with connecting wire attached, centered in a bag containing low-resistance backfill material. Larger sizes are available and may be used.

Anodes shall be buried a minimum distance of two feet from the pipe and at or below the pipe depth and backfilled with soil. The connecting wire shall be attached to the steel pipe using a thermite weld or brazed connection. The point of attachment to the service must be cleaned to a bright metal to insure a durable, low resistance connection. After the connection is made, exposed steel shall be coated with acceptable coating material.

The service trench shall not be backfilled until the pipe has been visually inspected and approved by a CG&E representative. If the electric service lateral also occupies a joint service trench, it must be inspected by the appropriate electrical code inspection authority before the trench can be backfilled. After you have completed the installation, and before you backfill, call either (513) 651-0444 or (800) 634-4300 for visual inspection.

Except where tunneling is necessary, the gas service pipe must be completely visible and exposed from end to end. All fusion joints must be visible. If the service piping is being installed using trenchless technology, the actual pipe installation must be inspected by CG&E personnel.

The service shall be continuously supported beneath its entire length by clean, firm backfill material (no rocks). Intermittent blocking shall not be used to support plastic pipe. The first layer of fill must be free of rocks, stones, cinders, slag, concrete blocks, pieces of wood, or other materials that may cause damage to the pipe or pipe coating. If native rock free soil is not available, the first layer of fill material around and 6" over the pipe shall be sand. Pea gravel backfill is not permitted. Trench must be backfilled 48 hours after visual inspection.

The pressure test and tie-in are done after the service line has passed the visual inspection and has been backfilled. Delays can occur on the test and tie-in if the service line has not been backfilled. Obtaining permits to excavate from various communities can also cause delays. An inspection fee is charged for the service piping pressure test. There is no charge for the gas meter installation or service tie-in.

END OF SECTION