

Project Manual and Specifications

THE CORBIN CENTER ADDITION

City of Corbin, Kentucky

May 2025

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City of Corbin

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Division 0 – Bidding and Contract Requirements

SECTION 00020 - INVITATION TO BID

The Corbin Center Addition Corbin, Whitley County, Kentucky

Separate sealed bids for the construction of the Corbin Center Addition, will be received on behalf of the City of Corbin by Bruce Carpenter, at the Corbin Center, 222 Corbin Center Dr., Corbin, KY 40701 until 2:00 p.m. EST (local time) on Tuesday, June 3, 2025, and then at said location publicly opened and read aloud.

The CONTRACT DOCUMENTS may be reviewed at the following locations: MSE Web Site: mselex.com under Bid Opportunities.

All Contract Documents and Addenda will be posted on our web page, mselex.com under Bid Opportunities and will be distributed via email to all plan holders from Lynn Imaging.

Copies of the Contract Documents may be obtained at the office of Lynn Imaging, 328 E. Vine St., Lexington, KY 40507, (859) 226-5850 upon receipt of a check made payable to Lynn Imaging in the amount of \$250.00 (non-refundable). All orders must be prepaid. There will be a 24-hour turn-around on all orders.

A certified check or bank draft, payable to the City of Corbin, government bonds, or a satisfactory bid bond executed by the bidder and acceptable sureties in an amount equal to five percent of the bid shall be submitted with bid. The successful bidder will be required to furnish and pay for the following: 1) 5% Bid Bond; and 2) A performance and payment bond for 100% of the contract price.

The Owner may consider informal any bid not prepared and submitted in accordance with the provisions of this advertisement and/or the specifications and may waive any informalities or reject any and all Bids. Any proposal received after the time and date specified shall not be considered and will be returned unopened to the proposer. The owner reserves the right to waive any informalities or to reject any or all bids.

Sealed bid should be labeled "Corbin Center Addition Project".

Federal Wage Rates **do not** apply to this project.

No Bidder may withdraw the Bid for a period of sixty (60) days after the actual date of the opening thereof.

Award will be made to the lowest, responsive, responsible bidder. Bidding is for the sole benefit of the City of Corbin. The City of Corbin is an Equal Employment Opportunity Employer.

SECTION 00100 - INSTRUCTIONS TO BIDDERS
ADDITIONAL INFORMATION

PART 1 - GENERAL

1.01 DEFINITIONS

- A. AIA Document A701/2018, Instructions to Bidders, inclusive, is a part of this Contract.
- B. General Conditions of the Contract for Construction, AIA Document A201/2017 or current edition, are a part of this Contract.

1.02 BIDDING DOCUMENTS

- A. The Bidding Documents are the Bidding and Contract Requirements, the Specifications, the Drawings and any addenda issued prior to receipt of bids.
- B. Documents are on file and may be examined or obtained for bidding purposes as stated in Section 00020 - Advertisement for Bids.

1.03 SUBSTITUTIONS AND APPROVALS DURING BIDDING

- A. Whenever products or materials are specified as "Standards" or they are otherwise named, approval of other equal quality products shall be obtained by requesting in writing and presenting for evaluation, such product or material, to the Architect, no later than seven (7) days prior to date set for receipt of bids. Submittals circumventing the above time frame will not be processed.
 - 1. If approval is granted, product or material will be added by Addendum.
 - 2. No direct reply will be made to any requests for changes, but any requested changes approved by the Architect will be stated in an Addendum issued to all prime-bidders.
 - 3. Issuance of Bidding Documents does not constitute approval of products, materials, or subcontractors.

1.04 ADDENDA

Article 3: Bidding Documents. 3.4 Addenda, 3.4.3. Change the four days to read as follows: Addenda will be issued by the Architect when in the opinion of the Architect the issuance of an addenda is in the interest of the bid process and the Owner.

1.05 BIDDER'S REPRESENTATION

- A. Each Bidder, by making his bid, represents that he has read and understands the bidding documents.

- B. Each Bidder, by making his bid, represents that he has familiarized himself with the local conditions under which the Work is to be performed.
 - 1. No additional costs of any type will be allowed by the failure of the Bidder to avail himself of the privilege of a complete and thorough, on-site inspection.
- C. Each bidder must visit and inspect the site.

1.06 BID SECURITY

- A. Provide bid security in the form of Bid Bond, AIA Documents A310, for five percent (5%) of bid made payable to the Gateway District Health Department. This security shall be forfeited if the bidder is awarded the contract and subsequently fails to enter into a contract with and furnish the required contract bond to the OWNER within ten (10) days after notice of acceptance of his proposal is made.
- B. The bid security of all unsuccessful bidders will be returned promptly after an award has been made, or in the event that all bids are rejected. The bid security of the successful bidder will be returned when a satisfactory performance and labor and material payment bond has been furnished and the contract executed.

1.07 PREPARATION OF BIDS

- A. Bids shall be submitted in duplicate only on proposal bid form as included herein.
- B. Any interlineation, alteration, or erasure will be grounds for rejection of the Bid. Bids shall contain no recapitulation of the work to be done.
- C. Bids shall be based on the materials, construction, equipment and methods named or described in the specifications and on the drawings, and any addenda issued prior to receipt of bids.
- D. Proposals shall be sealed in an opaque envelope marked with the bidder's name and business address, and bearing the following caption:
 - 1. Proposal for:
Corbin Center Addition
 - 2. Proposals shall be addressed and delivered to:
City of Corbin
Corbin, KY

1.08 BID SUPPLEMENTS

- A. Bids shall be accompanied by the following supplemental documents, all properly signed and notarized:
 - 1. Bid Security, Bid Bond, AIA Document A310
 - 2. Document SC-1 - Subcontractors List (may use your own form)
 - 3. Document PC-1 - Project Cost Breakdown (may use your own form)
 - 4. Non-Collusion Affidavit

1.09 SELECTION OF BIDS

- A. The Owner reserves the right to reject any and/or all bids and to waive any informality in bidding.

1.10 AWARD OF CONTRACTS

- A. Contracts shall be deemed to have been awarded when Notice of Award shall have been duly served upon the Bidder by any officer or agent of the Owner duly authorized to give such notice. Before the contract becomes valid, the Bidder must provide all necessary bonds, insurance and other information herein called for.

1.11 THE SUCCESSFUL BIDDER WILL BE REQUIRED TO FURNISH THE FOLLOWING:

- A. A One Hundred Percent (100%) Performance/Payment Bond, in an amount equal to the total contract price. This bond shall guarantee all labor and materials to be as required, the faithful performance of the contract and the prompt and faithful payment of any claim or liens from any cause for which the Contractor is liable, including those for labor, materials, utility services, transportation costs and for supplies, equipment and machinery (or rental thereof).
- B. Such guarantee bonds shall remain in effect and full force for one (1) year after final acceptance of the work. Such bond shall not be executed as of a date prior to the executing of the contract.

1.12 DETAILED COST BREAKDOWN

- A. Upon award of contract, Contractor will have seven (7) working days to generate a finalized detailed cost breakdown and a detailed project schedule of the project. All construction draws made on the project will require updating the Contractor's cost breakdown. Architect and Owner approval will be required on all pay requests.

1.13 CONTRACTOR'S RESPONSIBILITY REGARDING SUB-CONTRACTORS

- A. It shall be prime contractor's responsibility to check all sub-bids carefully to determine whether or not any exceptions, omissions, or alterations to the drawings and specifications have been noted therein, as he is solely responsible for a complete job in strict accordance with drawings and specifications.

1.14 COMMENCING WORK

- A. Contractor shall commence work within ten (10) days after written Notice to Proceed is issued by the Owner, unless otherwise arranged by the Owner.

1.15 OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

- A. These construction documents are to be governed, at all times, by applicable provisions of the federal laws, including but not limited to the latest amendments of the following:
 - 1. William - Steiger Occupational Safety and Health Act of 1970, Public Law 91-596.
 - 2. Part 1910 - Occupational Safety and Health Standards, Chapter XVII of Title 29, Code of Federal Regulations.
- B. All prime contractors, sub-contractors and their employees shall be solely responsible to conduct their work in conformance with the regulations contained in this act and as amended. All material suppliers and manufacturers shall be fully aware of their responsibilities and the requirements of the finished project under the regulations of this Act, and as amended. Such materials and fabricated products incorporated in this project shall, at the time of installation or application, be in conformance with the regulations of this act, and as amended.

END OF SECTION

SECTION 00310 - BID SCHEDULE

Proposal of _____ (hereinafter called "BIDDER"), organized and existing under the laws of the State of _____ doing business as _____ *

to the City of Corbin (hereinafter called "OWNER").

In compliance with your Advertisement for Bids, BIDDER hereby proposes to perform all WORK for the Corbin Center Addition in strict accordance with the Contract Documents, within the time set forth and the prices stated below.

By submission of this BID, each BIDDER certifies, and in the case of a joint BID, each party thereto certifies as to its own organization, that this BID has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this BID with any other BIDDER or with any competitor.

BIDDER hereby agrees to commence Work under this contract on or before a date to be specified in the Notice to Proceed and to complete the Project within three hundred sixty-five (365) consecutive calendar days following the Notice to Proceed. BIDDER further agrees to pay as liquidated damages, the sum of \$500.00 for each consecutive calendar day thereafter as provided in the General Conditions and the Special Conditions.

BIDDER agrees to perform all the WORK described in the CONTRACT DOCUMENTS for the lump sum contained in the following Bid Schedule.

*Insert "a corporation", "a partnership", or "an individual" as applicable.

Item	Description	Unit	Cost of Item
1.	Architectural	LS	\$ _____
2.	Mechanical/Electrical	LS	\$ _____
3.	Structural	LS	\$ _____
4.	All Other Miscellaneous Costs	LS	\$ _____
TOTAL COST OF ITEMS 1 - 4			\$ _____

The bid prices shall include all labor, materials, overhead, profit, insurance, and other costs necessary to install the finished work of the several items called for. Changes shall be processed in accordance with the General Conditions. Contract will be awarded based on the total cost of items 1-4.

This is an invitation for offer to bid, not an offer to enter into a contract.

Accompanying this Proposal is a certified check or standard Bid Bond in the sum of _____ Dollars (\$ _____), in accordance with the Information for Bidders. The BIDDER, by submittal of this Bid, agrees with the OWNER that the amount of the bid security deposited with this Bid fairly and reasonably represents the amount of damages the OWNER will suffer due to the failure of the BIDDER to fulfill his agreements as provided in this Proposal.

Addenda to the Drawings and Specifications issued heretofore are hereby acknowledged by the undersigned as being:

No. _____ Date: _____ No. _____ Date: _____
No. _____ Date: _____ No. _____ Date: _____

BIDDER understands that the OWNER reserves the right to reject any or all Bids and to waive any informalities in the Bidding.

BIDDER agrees that this Bid shall be good and may not be withdrawn for a period of sixty (60) calendar days after the actual date of bid opening.

Within ten (10) calendar days after receiving written notice of the acceptance of this Bid by the OWNER, the Bidder will execute and deliver to the OWNER four (4) copies of the Agreement and such other required Contract Documents.

BIDDER: _____
(Name of Company or Partnership)

By: _____
(Signature) (Date)

(Print Name) (Title)

(Street Address/P.O. Box) (Phone Number)

(City, State, Zip)

(Email Address)

Attested By: _____
(Signature) (Date)

Seal (If bid is by a corporation)

END OF SECTION

SECTION 00410 - BID SECURITY FORM

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Bid security for this project shall be in the form of a Bid Bond executed on AIA Document A310 form in the amount of five percent (5%) of the bid, made payable to the Owner.
- 1. The bid security of all unsuccessful bidders will be returned promptly after an award has been made or in the event that all bids are rejected. The bid security of the successful bidder will be returned when satisfactory performance and labor and material payment bonds (AIA Document A312) have been furnished and contract executed, including one year warranty period.

END OF SECTION

SECTION 00480 - NON-COLLUSION AFFIDAVIT

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Non-Collusion Affidavit for the project shall be submitted with the bid proposal, and a copy of this document is bound herewith.
- 1. When properly executed, this Document shall become a part of the successful bidder's Contract Document.

END OF SECTION

NON-COLLUSION AFFIDAVIT

The undersigned bidder, on behalf of its officers and agents or representatives being duly sworn, states that it has not in any way, directly or indirectly, entered into any arrangement or agreement with any other bidder, or with any other person or public officer whereby bidder has paid or is to pay to such other bidder or other person or public officer any sum or money, or has given or is to give to such other bidder or other person or public officer anything of value whatever, or such affidavit or either of them has not, directly or indirectly, entered into any arrangement or agreement with any other bidder or bidders, which tends to or does lessen or destroy free competition in the letting of the contract sought for by the attached bids; that no inducement of any form or character other than that which appears upon the face of the bid will be suggested, offered, paid or delivered to any person whomsoever to influence the acceptance of the said bid or awarding of the contract, nor has this bidder any agreement or understanding of any kind whatsoever, with any person whomsoever to pay, deliver to, or share with any other person in any way or manner, any of the proceeds of the contract sought by this bid.

Subscribed and sworn to before me by _____ this
_____ day of _____, 20____.

My Commission expires:

Notary Public

END OF AFFIDAVIT

SECTION 00490 - NOTICE OF AWARD

To: _____

Project Description: Corbin Center Addition

The Owner has considered the Bid submitted by you for the above, described Work in response to its Advertisement for Bids dated _____ and Information for Bidders.

You are hereby notified that your Bid has been accepted for items in the amount of \$_____

You are required by the Information for Bidders to execute the Agreement and furnish the Required Contractor's Performance Bond, Payment Bond and certificates of insurance within ten (10) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said Bonds within ten (10) days from the date of this Notice, said Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your Bid as abandoned and as a forfeiture of your Bid Bond. The Owner will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this Notice of Award to the Owner.

Dated this _____ day of _____, 2025.

City of Corbin
Owner

By: _____

(Name/Title)

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged by _____ this the _____ day of _____, 2025.

By: _____

(Name/Title)

SECTION 00500 - AGREEMENT

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The contract Agreement for this project shall be AIA Document A101, Owner - Contractor Agreement Form - Stipulated Sum, 2017 edition and Guide 27 Attachment 3.
- B. This form, when fully executed, shall become a part of the successful bidder's Contract Documents.

END OF SECTION

SECTION 00610 - PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

PART 1 - GENERAL

1.01 DESCRIPTION

- A. A performance bond for 100% of the final contract amount shall be executed in favor of the Owner; the forms for this bond shall be AIA Document A 312, "Performance Bond", 2010 edition.
- B. A Payment Bond on part of the contractor for 100% of the contract price as it may be increased, the forms for this bond shall be, AIA Document A312, "Payment Bond", 2010 edition.
- C. Consent of Surety to Reduction in or Partial Release of Retainage: AIA Document G707A, 1994 Edition.
- D. Consent of Surety to Final Payment: AIA Document G707, 1994 Edition.
- E. Furnish the required bonds within seven (7) days of receipt of Notice of Award.
- F. When fully executed, these bonds shall become part of the successful bidder's Contract Documents.
- G. Application and Certificate for Payment: AIA Document G702 and G703, 1992 Edition.
- H. Contractors Affidavit of Payment of Debts: AIA Document G706, 1994 Edition.
- I. Contractors Affidavit of Release of Liens: AIA Document G706A, 1994 Edition.
- J. Certificate of Substantial Completion: AIA Document G704, 2017 Edition.

END OF SECTION

SECTION 00650 - CERTIFICATES OF INSURANCE

PART 1 - GENERAL

1.01 GENERAL

- A. Certificates of Insurance shall be filed with the Owner prior to the commencement of any work. Insurance shall be purchased by the General Contractor.
 - 1. These certificates shall contain a provision that coverages afforded under the policies shall not be canceled or in any way terminated until at least thirty days prior written notice has been given to the Owner and Architect.
 - 2. The Owner and the Architect shall be specifically named as additional insureds on all insurance coverage for this project.
- B. Detailed insurance requirements are covered in Section 00800 - Supplementary General Conditions, and all certificates shall reflect these minimum requirements for the project.

END OF SECTION

SECTION 00680 - NOTICE TO PROCEED

TO: _____ Date: _____

Project: Corbin Center Addition

You are hereby notified to commence WORK in accordance with the Agreement dated_____,
on or before_____, and you are to complete the WORK within_consecutive calendar
days thereafter. The date of completion of all WORK is therefore_____.

Owner

Signature

Name/Title

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by _____
_____this the _____ day of _____, 20_____.

Contractor

Signature

Name/Title

SECTION 00800 - SUPPLEMENTAL CONDITIONS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The "General Conditions of the Contract for Construction," AIA Document A201, 2017 is a part of this Contract.

1.02 SUPPLEMENTS

- A. The following supplements modify, change, delete or add to the "General Conditions of the Contract for Construction." Where any Article, Paragraph, Sub-Paragraph or Clause thereof is modified or deleted by these supplements, the unaltered provisions of that Article, Paragraph, SubParagraph or Clause shall remain in effect.

PART 2 - ARTICLE 2: OWNER

2.01 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

- 2.2.5 The Contractor can download pdf's from mselex.com.
MSE will not furnish the Contractor any sets of drawings or project manuals for their use during construction.

PART 3 - ARTICLE 3: CONTRACTOR

3.01 REVIEW OF CONTRACT SUB-PARAGRAPHS

- A. Add the following sub-paragraphs:
 - 322 The Contractor shall not perform any work at any time requested by persons other than the Architect. Any interpretations to the documents, or request for minor changes in the work will be by the Architect.
 - 323 Where there is a conflict in or between the Drawings and Specifications, the Contractor shall be deemed to have estimated on the more expensive way of doing the work and/or the larger quantity required. Only changes in interpretations covered by Addenda or in writing from the Architect will be permitted during construction of the work.

3.02 WARRANTY

- A. Add the following sub-paragraph:
 - 3.5.2 General Contractor shall guarantee the work for a period of one year from the date of acceptance by the Owner, except where a longer guarantee is specified and will thus control and leave the work in perfect order at completion. Neither the final certificate of payment any provision in the Contract Documents shall relieve the Contractor of responsibility within the extent and period provided by said guarantee or by law whichever is longer. Upon written notice, he shall remedy any damage to other work resulting therefrom, including necessary labor for removing and replacing.

PART 4 - ARTICLE 8: TIME OF COMPLETION AND LIQUIDATED DAMAGES

See the Bid Schedule, Section 00310, for the time allotted for this contract. The time allowed for completion shall begin at midnight, local time, on the date which the Owner shall instruct the Contractor, in writing, to start work, but not later than 7 days after Notice to Proceed.

The Contract completion time stipulated above includes an allowance for an average number of inclement weather days as follows:

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Precip.	7	7	9	8	8	8	8	7	6	5	6	7
Freeze	10	6	1								1	5

- When number of days (including Saturdays, Sundays and Holidays) of precipitation in excess of 0.1" per day or maximum daily temperatures of 32 F exceed those shown above in any month, the Contractor shall be entitled to an equal number of additional days for Contract Completion.

This provision for inclement weather shall only apply to that time while foundations are being constructed and prior to the building being "under-roof".

It is understood that time is the essence of this contract and that the Owner will sustain damages, monetary and otherwise, in the event of delay in completion of the work hereby contracted.

Therefore, if the said Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as part consideration for the awarding of this contract, to pay the Owner the amount specified in the contract, not as a penalty, but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the contract for completing the work.

The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the extreme difficulty in fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.

PART 5 - ARTICLE 9: PAYMENTS AND COMPLETION

5.01 APPLICATIONS FOR PAYMENT

A. Add the following sub-paragraph:

- 9.3.1.1 Monthly payments will be based on one hundred (100%) percent of the value of the work done and materials delivered and suitably stored until work under this contract is fifty (50%) completed. If at that time, progress of the work has been satisfactory, there will be no additional retainage, provided the Contractor submits Consent of Surety for each application, authorizing any remaining partial payments to be paid in full. The form of Application for Payment shall be AIA Document G702, Application for Certificate for Payment, supported by AIA Document G702A Continuation Sheet.

PART 6 - ARTICLE 11: INSURANCE AND BONDS

6.01 11.1 CONTRACTOR'S LIABILITY INSURANCE

A. Change as follows:

General Contractor shall take out and maintain insurance of such types and in such amounts as are necessary to cover his responsibilities and liabilities on all projects, and shall require all his subcontractors to carry similar insurance.

1. The Owner will accept in lieu of all subcontractors carrying similar insurance an "Owner's and Contractor's Protective Liability Policy" paid for by the Contractor and written in the name of the Owner for the amount specified hereinafter including all the special coverages. Said policy must protect the Owner for all claims for bodily injury and/or property damage arising out of operations for the named insured by said Contractor, or any subcontractor of said Contractor.
- B. No Contractor shall commence work under this contract until he has obtained all insurance required under this section and such insurance has been approved by the Owner, nor shall any Contractor allow any subcontractor to commence work on his subcontract until the same insurance has been obtained by the subcontractor and approved by the Owner. Each and every contractor and subcontractor shall maintain all insurance required under paragraphs (1) and (2) of this section for not less than one year after completion of this contract.
- C. Each Contractor shall file with the Owner and Architect, a Certificate of Insurance. Any certificate submitted and found to be altered or incomplete will be returned as unsatisfactory.
- D. If requested by the Owner, Contractor shall furnish the Owner with true copies of each policy required of him or his subcontractors. Said policies will not be canceled or materially altered, except after fifteen (15) days advance written notice to the Owner and Architect, mailed to the addresses indicated herein.
- E. Insurance under this section, as a minimum, shall include the following coverages:
 1. Workman's Compensation and Employer's Liability Insurance: Workman's Compensation and Occupational Disease Insurance of statutory limits as provided by the state in which his contract is performed and Employers' Liability Insurance at a limit of not less than \$100,000.00 for all damages arising from each accident or occupational disease.
 2. Comprehensive General Liability Insurance covering:
 - a. Operations- Premises Liability:
Including, but not limited to, Bodily Injury, including death at any time resulting therefrom, to any person or Property Damage resulting from execution of the work provided for in this contract, or due to or arising in any manner from any act of omission or negligence of the Contractor and any Subcontractor, their respective employees or agents.

b. Contractor's Protective Liability:
Including, but not limited to, Bodily Injury, including death at any time, resulting therefrom to any person, or Property Damage arising from acts or omissions of any subcontractor, their employees or agents.

c. Products-- Completed Operation Liability:
Including, but not limited to, Bodily Injury, including death at any time, resulting therefrom to any person, or Property Damage because of goods, products, materials or equipment used or installed under this contract, or because of completed operation, which may become evident within one year after acceptance of the building, including damage to the building or its contents.

d. Contractual Liability:

Each and every policy for liability insurance, carried by each Contractor and Subcontractor, as required by this section shall specifically include Contractual Liability coverage with respect to Section F of this Division.

e. Special Requirements:

The insurance required under Paragraph (2) of this Section shall specifically include the following special hazards:

Property Damage caused by conditions otherwise subject to exclusions "x, c, u," Explosion, Collapse or Underground Damage.

Broad Form Property Damage endorsement, which has reference to property in the "care, custody, or control" of the insured.

"Occurrence" Bodily Injury coverage in lieu of "caused by accident."

"Occurrence" Property Damage coverage in lieu of "caused by accident."

f. Limits of Liability:

The insurance under Paragraph (2) of this Section shall be written in the following limits of liability, as a minimum:

Bodily injury

\$1,000,000 Each Person
\$3,000,000 Each Occurrence
\$500,000 Aggregate Products

Property Damage

\$1,000,000 Each Occurrence
\$2,000,000 General Aggregate
\$1,000,000 Aggregate Protective
\$1,000,000 Aggregate Contractual

3. Comprehensive Automobile Liability covering:
 - a. All owned, hired, or non-owned vehicles including the loading or unloading thereof.
 - b. Special Requirements: The insurance required under paragraph (3) of this section shall specifically include the following special hazards:

"Occurrence" Bodily Injury in lieu of "caused by accident."

"Occurrence" Property Damage in lieu of "caused by accident."

The insurance under Paragraph (3) of this section shall be written in the following limits of liability as a minimum:

<u>Automobile Bodily Injury</u>	<u>Automobile Property Damage</u>
\$1,000,000 Each Person	\$1,000,000 Each Occurrence
\$3,000,000 Each Occurrence	

\$5,000,000 Excess/Umbrella Liability

F. Hold Harmless Agreement:

1. The Contractor shall indemnify and hold harmless the Owner and the Architect and their agents and employees from and against all claims, damages, losses and expenses including attorney's fees arising out of or resulting from the performance of the work, provided that any such claim, damage, loss or expense (a) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting therefrom and (b) is caused in whole or part by any negligent act or omission of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.
2. In any and all claims against the Owner or the Architect or any of their agents or employees by any employee of the Contractor, Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Hold Harmless agreement shall not be limited in any way by any limitation on the amount payable by or for the Contractor or any Subcontractor under workman's compensation acts, disability benefit acts or other employee benefit acts.
3. The obligations of the Contractor under this Hold Harmless Agreement shall not extend to any claim, damage, loss or expense arising out of professional services performed by the Architect, his agents, or employees, including (a) the preparation of maps, plans, opinions, reports, surveys, designs or specifications, and (b) supervisory, inspection or engineering services.

PART 7 - ARTICLE 11.3: PROPERTY INSURANCE (Purchased by the General Contractor)

7.01 A. Change the first sentence of paragraph 11.3.1 to read: The contractor shall purchase....

B. Change the second sentence of Paragraph 11.3.1 to read:

11.3.1 "This insurance shall include the interests of the Owner, the Contractor, the Subcontractor and Sub-Subcontractors in the work and shall insure against the perils of fire, extended coverage, vandalism, malicious mischief and theft."

C. Add the following subparagraph:

"11.3.1.1 If by the terms of this insurance any mandatory deductibles are required, or if the Owner should elect to increase the mandatory deductible amounts or purchase this insurance with voluntary deductible amounts, the Owner shall be responsible for payment of the amount of the deductible in the event of a paid claim."

11.3.6 Revise a portion on the first sentence in Subparagraph to read as follows: "...and

(2) the Architect, his consultants, and separation contractors, if any..."

D. Add the following Article to the General Conditions of the Contract for Construction:

PART 8 - ARTICLE 15: EQUAL OPPORTUNITY

8.01 15.1 Employment Policies

15.1.1 The Contractor and all Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin or age. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex, national origin or age. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates or pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

15.1.2 The Contractor and all Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sect, national origin or age.

PART 9 - ARTICLE 16: CHARACTER OF WORKERS, METHODS, AND EQUIPMENT

- 161 The Contractor shall, at all times, employ sufficient and equipment for prosecuting the work to full completion in the manner and time required by the contract, drawings, and specifications. Suitable number of foremen and supervisors shall be available on the job to insure proper prosecution and coordination of the work. All workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform the work satisfactorily.
- 162 Any person employed by the Contractor or by any subcontractor who, in the opinion of the Owner and Architect, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the Architect, be removed forthwith by the Contractor or Subcontractor employing such person, and shall not be employed again in any portion of the work.
- 163 Should the Contractor fail to remove such person or persons or fail to furnish suitable and sufficient personnel for the proper prosecution of the work, the Architect may suspend the work by written notice until compliance with such orders.
- 164 After the beginning of work on the site, the Contractor may not remove his Superintendent from the project without the prior written approval of the Owner.

END OF SECTION

Section 00815 - Supplemental General Conditions
Part Two

- 1) General Contractors and Sub-contractors are hereby notified that they are encouraged, to the greatest extent practicable, to purchase American-made equipment and products with funding provided under this Award.

End of Section

Division I – General Requirements

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 SUMMARY OF WORK

- A. Work covers construction of the new Senior Center located on property address: 222 Corbin Center Drive, Corbin, KY 40701.
- B. Related requirements specified elsewhere:
 - 1. Submittals- Section 01300
 - 2. Temporary Facilities- Section 01500
 - 3. Project Closeout - Section 01700
- C. Contractor's Duties:
 - 1. Except as specifically noted, provide and pay for:
 - a. Labor, materials, tools, and equipment.
 - b. Permits.
 - c. Fees.
 - d. Licenses.
 - e. Taxes.
 - 2. Give required notices.
 - 3. Comply with codes, ordinances, rules, regulations, orders, and other legal requirements of public authorities which bear on performance of work.
 - 4. Promptly submit written notice to Architect of observed variance of Contract Documents from legal requirements.
 - 5. Contractor shall verify all grades, lines, levels, and dimensions indicated on the drawings and shall report any inconsistencies before commencing work.
 - 6. Each Sub Contractor shall be responsible for the layout for their specific phase of work.

1.02 CONTRACT (OWNER AND GENERAL CONTRACTOR)

- A. Construction work shall be under a single lump sum contract, which shall include all general construction, steel, concrete, mechanical, electrical, plumbing and site work, etc.

1.03 CONTRACTORS' USE OF PREMISES

A. Confine operations at site to areas permitted by:

General Contractor can store material in the existing building and use existing utilities.

1. Law.
2. Ordinances.
3. Permits.
4. Contract Documents.
5. Owner.

B. Do not unreasonably encumber site with materials or equipment.

C. Do not load structure with weight that will endanger structure.

D. Assume full responsibility for protection and safekeeping of products stored on site.

E. Move any stored products which interfere with operations of the Owner.

END OF SECTION

SECTION 01027 - APPLICATIONS FOR PAYMENT REQUIREMENTS OF CONTRACTOR

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Procedures of Contractor for preparation and submittal of applications for payment.

1.02 RELATED SECTIONS

- A. Document 00500 - Agreement: Contract Sum amounts of progress payments and retainages.
- B. Section 00800 - Supplementary Conditions: Progress payments and final payment.
- C. Section 01028 - Modification Requirements: Procedures for changes to the Work.
- D. Section 01300 - Submittals: Submittal procedures.
- E. Section 01700 - Contract Closeout - Final Payment

1.03 FORMAT

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

1.04 PREPARATION OF APPLICATIONS

- A. Present required information in typewritten form on specified AIA Documents.
- B. Execute certification by signature of authorized officer.
- C. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored Products.

- D. List each authorized Change Order as an extension on AIA G703 Continuation Sheet, listing Change Order number and dollar amount as for an original item of Work.
- E. Prepare Application for Final Payment as specified in Section 01700.
- F. Submit partial release of liens waiver for all work completed to date with each payment application.
- G. Submit up-to-date (revised) construction schedule.

1.05 SUBMITTAL PROCEDURES

- A. Submit three copies of each Application for Payment.
- B. Submit an updated construction schedule with each Application for Payment.
- C. Payment Period: Submit at intervals stipulated in the Agreement.
- D. Submit with transmittal letter as specified for Submittals in Section 01300.

1.06 DETAILED COST BREAKDOWN

- A. Upon award of contract, Contractor will have seven working days to generate a finalized cost breakdown of the project.

1.07 SUBSTANTIATING DATA

- A. When Architect/Engineer requires substantiating information, Contractor shall submit data justifying dollar amounts in question.
- B. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

Not Applicable.

END OF SECTION

SECTION 01028 - MODIFICATION REQUIREMENTS OF CONTRACTOR

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Submittals.
- B. Documentation of change in Contract Sum and Contract Time.
- C. Change procedures.
- D. Construction Change Directive.
- E. Stipulated Sum change order.
- F. Execution of change orders.
- G. Correlation of Contractor submittals.

1.02 SUBMITTALS

- A. Submit name of the individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. Change Order Forms: AIA G701 Change Order.

1.03 DOCUMENTATION OF CHANGE IN CONTRACT SUM AND CONTRACT TIME

- A. Maintain detailed records of work performed. Provide full information required for evaluation of proposed changes, and to substantiate costs of changes in the Work.
- B. Document each quotation for a change in cost or time with sufficient data to allow evaluation of the quotation.
- C. Provide additional data to support computations:
 - 1. Quantities of products, labor, and equipment.
 - 2. Taxes, insurance, and bonds.
 - 3. Overhead and profit.
 - 4. Justification for any change in Contract Time.
 - 5. Credit for deletions from Contract, similarly documented.
- D. Support each claim for additional costs, and for work performed, with additional information:
 - 1. Origin and date of claim.
 - 2. Dates and times work was performed, and by whom.
 - 3. Time records and wage rates paid.
 - 4. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

1.04 CHANGE PROCEDURES

- A. The Architect/Engineer will advise of minor changes in the Work not involving an adjustment to Contract Sum/Price or Contract Time as authorized by AIA A201, 2007 Edition, Paragraph 7.4 by issuing supplemental instructions on AIA Form G710.
- B. The Architect/Engineer may issue a Proposal Request 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. Contractor will prepare and submit an estimate within seven (7) days.

1.05 CONSTRUCTION CHANGE DIRECTIVE

- A. 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.
- B. The document will describe changes in the Work, and will designate method of determining any change in Contract Sum or Contract Time.
- C. Contractor shall include in his costs any and all costs associated with contract documents modification required by the Architect/Engineer as a part of modifications.
- D. Promptly execute the change in Work.

1.06 STIPULATED SUM CHANGE ORDER

- A. Based on Proposal Request and Contractor's fixed price quotation.

1.07 CHANGE ORDER

- A. Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- B. Architect/Engineer will determine the change allowable in Contract Sum and Contract Time as provided in the Contract Documents pending Owner approval.
- C. Maintain detailed records of work performed.
- D. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

1.08 EXECUTION OF CHANGE ORDERS

- A. Execution of Change Orders: Architect/Engineer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

1.09 CORRELATION OF CONTRACTOR SUBMITTALS

- A. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- B. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- C. Promptly enter changes in Project Record Documents.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01041 - PROJECT COORDINATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Project coordination.
- B. Construction mobilization.
- C. Schedules.
- D. Submittals.
- E. Coordination drawings.
- F. Closeout procedures.

1.02 RELATED SECTIONS

- A. Section 00800 - Supplementary Conditions
- B. Section 01011 - Summary of Project: Work sequence.
- C. Section 01700 - Contract Closeout: Contract Closeout Procedures.

1.03 CONSTRUCTION MOBILIZATION

- A. Comply with procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- B. Comply with instructions for use of temporary utilities and construction facilities.
- C. Coordinate field engineering and layout work.

1.04 SCHEDULES

- A. Submit preliminary progress schedule in accordance with Section 01310.
- B. After review, revise and resubmit schedule to comply with revised Project schedule. Submit revised or up-to-date schedule with each application for payment.
- C. During progress of work revise and resubmit as directed.

1.05 SUBMITTALS

- A. Provide submittals for review and transmittal to Architect/Engineer.
- B. Submit applications for payment on AIA G702 forms for review, and for transmittal to Architect/Engineer.
- C. Submit requests for interpretation of Contract Documents, and obtain instructions through the Architect/Engineer.
- D. Process requests for substitutions, and change orders.
- E. Deliver closeout submittals for review and preliminary inspection reports, for transmittal to Architect/Engineer.

1.06 COORDINATION DRAWINGS

- A. Provide information required by Architect/Engineer for preparation of coordination drawings.
- B. Review drawings prior to submission to Architect/Engineer.

1.07 CLOSEOUT PROCEDURES

- A. Notify Architect/Engineer when Work is considered ready for Substantial Completion.
- B. Comply with Architect/Engineer's instructions to correct items of work listed in executed Certificates of Substantial Completion and for access to Owner occupied areas.
- C. Notify Architect/Engineer when Work is considered finally complete.
- D. Comply with instructions for completion of items of Work determined by Architect/Engineer's final inspection.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01045 - CUTTING AND PATCHING REQUIREMENTS OF CONTRACTOR

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements and limitations for cutting and patching of Work, including:
 - 1. Cutting, fitting, or patching that may be required to complete the work or make its several parts fit together properly.
 - 2. Uncovering work to provide for installation of ill-timed work.
 - 3. Removing and replacing defective work.
 - 4. Removing and replacing work not conforming to requirements of the Contract Documents.
 - 5. General Contractor shall be responsible for cutting and patching of construction as required to facilitate work, including work by his mechanical and electrical subcontractors. He shall assign proper trades normally associated with the materials being cut and patched to perform work.

1.02 RELATED SECTIONS

- A. Section 01010 - Summary of Work.
- B. Section 01300 - Submittals.
- C. Section 01620 - Product Delivery, Storage and Handling.
- D. Individual Product Specification Sections:
 - 1. Cutting and patching incidental to work of the section.
 - 2. Advance notification to other sections of openings required in work of those sections.

1.03 SUBMITTALS

- A. Submit written request in advance of cutting or alteration which affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate contractor.

B. Include in request:

1. Identification of Project.
2. Location and description of affected Work.
3. Necessity for cutting or alteration.
4. Description of proposed Work and Products to be used.
5. Alternatives to cutting and patching.
6. Effect on work of Owner or separate contractor.
7. Written permission of affected separate contractor.
8. Date and time work will be executed.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Primary Products: Those required for original installation.
- B. Product Substitution: For any proposed change in materials, submit request for substitution.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
- B. After uncovering existing Work, assess conditions affecting performance of work.
- C. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- B. Provide protection from elements for areas which may be exposed by uncovering work.
- C. Maintain excavations free of water.

3.03 CUTTING

- A. Execute cutting and fitting including excavation and fill to complete the Work.
- B. Uncover work to install improperly sequenced work.
- C. Remove and replace defective or non-conforming work.
- D. Provide openings in the Work for penetration of mechanical and electrical work.
- E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

3.04 PATCHING

- A. Execute patching to complement adjacent Work.
- B. Fit Products together to integrate with other Work.
- C. Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
- D. Employ original installer to perform patching for weather exposed and moisture resistant elements, and sight-exposed surfaces.
- 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 resistant material 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. When possible, do not cut-and-patch work which is exposed in occupied spaces of building, in a manner resulting in reductions of visual qualities or resulting substantial evidence of cut-and-patch work, both as judged solely by Architect. Remove and replace work judged by Architect to be cut-and-patched in a visually unsatisfactory or otherwise objectionable manner.

END OF SECTION

SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Submittal procedures.
- B. Shop Drawings.
- C. Test reports.
- D. Certificates.
- E. Erection drawings.

1.02 REFERENCES

- A. AGC (Associated General Contractors of America) publication "The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry".

1.03 SUBMITTAL PROCEDURES FOR SHOP DRAWINGS

- A. All shop drawings must be reviewed by the General Contractor before submitting them to the Architect.
- B. Transmit each submittal with accepted form, containing the following:
 - 1. Date
 - 2. Project title
 - 3. Contractor's name and address
 - 4. Notification of any deviations from the contract documents.
 - 5. Identify project as "Powell County Senior Citizens Center"
 - 6. Other pertinent data as required.
- C. Identify Project, Contractor, Subcontractor, Manufacturer or supplier; pertinent drawing and detail number, and specification section number, as appropriate.
 - 1. Provide identification of product or material size, type, finish and color as appropriate.
 - 2. Field dimensions, clearly identified as such.
 - 3. All working and erection dimensions, views, as required to indicate fully all construction and fabrication methods, profiles and materials.
- D. On all shop drawings apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

1.04 CERTIFICATES

- A. When specified in individual specifications sections, submit certification by the manufacturer, installation/application/subcontractor, or the Contractor to Architect/Engineer, in quantities specified for Product Data.
- B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect/Engineer.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01310 - CONSTRUCTION PROGRESS SCHEDULES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Format.
- B. Content.
- C. Revisions to schedules.
- D. Submittals.

1.02 RELATED SECTIONS

- A. Section 01011 - Summary of Work.
- B. Section 01027 - Applications for Payment: Application for payment.
- C. Section 01300 - Submittals: Shop drawings.

1.03 REFERENCES

- A. AGC (Associated General Contractors of America) publication "The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry".

1.04 FORMAT

- A. Prepare schedules starting with Notice to Proceed date through substantial completion, as a horizontal bar chart or Gantt chart with separate bar for each major portion of Work or operation, identifying first work day of each week.
- B. Sequence of Listings: The chronological order of the start of each item of Work.
- C. Scale and Spacing: To provide space for notations and revisions.
- D. Sheet Size: Maximum 30" x 42" OR multiples of 8½" x 11".

1.05 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Identify work of separate stages and other logically grouped activities.
- D. Provide sub-schedules for each stage of Work.
- E. Provide sub-schedules to define critical portions of the entire schedule.
- F. Include conferences and progress meetings in schedule.
- G. Show accumulated percentage of completion of each item, and total percentage of Work completed, to coincide with schedule of values in each application for payment.

- H. Provide separate schedule of submittal dates for shop drawings, product data, and samples, including Owner furnished products and dates reviewed submittals will be required from Architect/Engineer. Indicate decision dates for selection of finishes.
- I. Include scheduling for fabrication of structural steel.
- J. Include scheduling of erection sequence of building structural steel, precast walls and delivery to site.
- K. Include scheduling of erection sequence of building precast walls and delivery to site.

1.06 REVISIONS TO SCHEDULES

- A. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
- B. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
- C. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect including the effect of changes on schedules of separate contractors.

1.07 SUBMITTALS

- A. Submit initial schedules within 15 days after date of Owner-Contractor Agreement. After review, resubmit required revised data within seven days.
- B. Submit revised Progress Schedules with each Application for Payment.
- C. Submit the number of opaque reproductions which Contractor requires, plus two copies which will be retained by Architect/Engineer.

1.08 DISTRIBUTION

- A. Distribute copies of reviewed schedules to Project site file, Subcontractors, suppliers, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01400 - QUALITY CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Quality assurance - control of installation.
- B. Tolerances
- C. Mock-up.
- D. Manufacturers' field services.

1.02 RELATED SECTIONS

- A. Section 01300 - Submittals: Submission of manufacturers' instructions and certificates.
- B. Section 01410 - Testing Services.
- C. Section 01620 - Product Delivery, Storage and Handling.
- D. Section 01650 - Starting of Systems

1.03 QUALITY ASSURANCE - CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer 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. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
- G. Perform Work by persons qualified to product required and specified quality.

1.04 TOLERANCES

- A. Monitor fabrication and installation tolerance control of Products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Adjust Products to appropriate dimensions; position before securing Products in place.

1.05 MOCK-UP

- A. Tests will be performed under provisions identified in this section and identified in the respective Product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups shall be a comparison standard for the remaining Work.
- D. Where mock-up has been accepted by Architect/Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so.

1.06 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 and additional products as specified, 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.

PART 2 - PRODUCTS

Not Used.

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. Examine and verify specific conditions described in individual specification sections.
- C. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS REQUIREMENTS OF CONTRACTOR

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control.
- B. Construction Facilities: Access roads, parking and progress cleaning.

1.02 RELATED SECTIONS

- A. Section 01510 - Temporary Utilities.
- B. Section 01540 - Security.
- C. Section 01550 - Access Roads and Parking Areas.
- D. Section 01580 - Project Identification and Signs.
- E. Section 01700 - Project Closeout: Final cleaning.

1.03 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.

1.04 WATER CONTROL

- A. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.05 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.

1.06 PROGRESS CLEANING AND WASTE REMOVAL

- 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.
- E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01580 - PROJECT IDENTIFICATION AND SIGNS REQUIREMENTS OF CONTRACTOR

PART 1 - GENERAL

There will be one (1) sign for this project.

1.01 SECTION INCLUDES

- A. Project identification sign.

1.02 RELATED SECTIONS

- A. Section 01010 - Summary of Work.

1.03 QUALITY ASSURANCE

- A. Design sign and structure to withstand 60 miles/hr wind velocity.
- B. Sign Painter: Experienced as a professional sign painter for minimum three years.
- C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.04 SUBMITTALS

- A. Section 01300 - Submittals: Shop drawings.
- B. Show content, layout, lettering, color, foundation, structure, sizes, and grades of members.

PART 2 - PRODUCTS

2.01 SIGN MATERIALS

- A. Structure and Framing: New wood, structurally adequate.
- B. Sign surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch thick, standard large sizes to minimize joints.
- C. Rough Hardware: Galvanized.
- D. Paint and Primers: Exterior quality, two coats; sign background of color as selected.
- E. Lettering: Exterior quality paint, contrasting colors as selected.

2.02 PROJECT IDENTIFICATION SIGN

- A. One painted sign of construction, design, and content shown on Drawings, location designated.

- B. Content:
 - 1. Project title, logo and name of Owner as indicated on Contract Documents.
 - 2. Names and titles of authorities.
 - 3. Names and titles of Architect/Engineer and Consultants.
 - 4. Name of Prime Contractor and major Subcontractors.
- C. Graphic Design, Colors, Style of Lettering: Designated by Architect/Engineer and approved by Owner.

2.03 PROJECT INFORMATIONAL SIGNS

- A. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering to provide legibility at 100-foot distance.
- B. Provide at each field office, and directional signs to direct traffic into and within site. Relocate as Work progress requires.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install project identification sign within 30 days after date fixed by Owner-Contractor Agreement.
- B. Erect at designated location.
- C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
- D. Install sign surface plumb and level, with butt joints. Anchor securely.
- E. Paint exposed surfaces of sign, supports, and framing.

3.02 MAINTENANCE

- A. Maintain signs and supports clean, repair deterioration and damage.

3.03 REMOVAL

- A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION

Construction Sign

**Corbin Center Addition
Corbin, Kentucky**

**Owner: City of Corbin
Corbin, KY 40701**

**Engineer: MSE of Kentucky, Inc.
Lexington, KY 40503
859-223-5694**

Contractor:



SECTION 01620 - PRODUCT DELIVERY, STORAGE & PROTECTION

PART 1 - GENERAL

1.01 APPLICABILITY

- A. This Section applies to all products furnished under this Agreement. Shipments of equipment or materials to be used by the Contractor or its subcontractors shall be delivered to the site only during regular working hours. All shipping papers and shipments shall be addressed and consigned to the Contractor giving the name of the Project with address. Under no circumstances will Owner accept shipments directed to it or the Architect/Engineer unless otherwise specified.

1.02 DELIVERY

- A. Products shall not be delivered to the Owner or the Architect/Engineer.
- B. Products shall not be delivered to the project site until related shop drawings have been reviewed by the Architect/Engineer.
- C. Products shall not be delivered to the project site until appropriate storage facilities are in place (on-site storage space is very limited).
- D. Products shall be delivered to the site in manufacturer's original, unopened, labeled containers.
- E. The Contractor shall not drop, roll or skid products off delivery vehicles. Hand carry or use suitable materials-handling equipment.

1.03 STORAGE AND PROTECTION

- A. General:
 - 1. The Contractor shall store and protect products in accordance with the manufacturer's recommendations and the requirements specified herein. No on-site existing storage facilities are available for use by the Contractor. All on-site facilities for storage shall be furnished by the Contractor.
 - 2. The Contractor shall not block or restrict the use of public right-of way, access roads or private property with stored materials.
 - 3. The Contractor shall not store products where they will interfere with operations of the Owner.
 - 4. The Contractor shall protect all products from damage or deterioration by weather.
 - 5. The Contractor shall not store any products directly on the ground.

6. The Contractor shall not store any products in drainage ditches or areas where water may stand.
7. The Contractor shall label containers to identify materials inside using the terminology found in these Specifications.

B. Uncovered Storage:

1. The following types of materials may be stored out of doors without cover:
 - a. Masonry units
 - b. Reinforcing steel
 - c. Piping
 - d. Precast concrete items
 - e. Castings
2. The above-mentioned materials shall be stored on wood blocking.

C. Fully Protected Storage:

1. The Contractor shall store all products not named above in buildings or trailers which have a concrete or wooden floor, a roof; and fully enclosed walls on all sides.
2. The Contractor shall provide heated storage space for materials which would be damaged by freezing.
3. The Contractor shall protect mechanical and electrical equipment from being contaminated by dust and dirt.
4. The Contractor shall maintain temperature and humidity at levels recommended by manufacturer(s) for electrical and electronic equipment.

END OF SECTION

SECTION 01650 - STARTING OF SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Starting systems.
- B. Demonstration and instructions.
- C. Testing, adjusting, and balancing.

1.02 RELATED SECTIONS

- A. Section 01400 - Quality Control: Manufacturers field reports.
- B. Section 01700 - Contract Closeout: System operation and maintenance data and extra materials.

1.03 STARTING SYSTEMS

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

1.04 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of Products to Owner's personnel prior to date of Substantial Completion.
- B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
 - 1. Warranty period to begin at start-up of season.
- C. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.
- D. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time at designated location.
- E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- F. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01700 - PROJECT CLOSEOUT REQUIREMENTS OF CONTRACTOR

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Adjusting.
- D. Project record documents.
- E. Operation and maintenance data.
- F. Spare parts and maintenance products.
- G. Warranties and bonds.

1.02 RELATED SECTIONS

- A. Section 01650 - Starting of Systems: System start-up, testing, adjusting, and balancing.

1.03 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer's review.
- B. Provide submittals to Architect/Engineer that are required by governing or other authorities.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- D. Deliver all close-out documents to the Architect within forty-five (45) days of the date of Substantial Completion. Indemnify the Architect for failure to perform this requirement including legal fees incurred by the Architect in enforcing this requirement. Failure to deliver all required close-out documents to the Architect within forty-five (45) days from sign-off of AIA Document G704, "Certificate of Substantial Completion," shall invoke costs of the Architect's services to be borne by the Contractor.
- E. Submit Certificate of Substantial Completion: AIA Document G704, 2017 Edition.
- F. Submit Contractor's Affidavit of Payment of Debts and Claims: AIA Document G706, 1994 Edition.

- G. Submit Contractor's Affidavit of Release of Liens: AIA Document G706A, 1994 Edition.
- H. Submit certification prior to submission of final application for payment attesting those certain products meet required manufacturer's approval.

1.04 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment. Use experienced workmen or professional cleaners for final cleaning.
- 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 weekly (or more often as required by accumulation). Remove waste materials, rubbish and debris from the site and legally dispose of at public or private dumping areas off-site at least once a week. Site to be approved by Owner.
- H. Each subcontractor has the responsibility for protecting equipment and finishes at the job site from damages resulting from work under his control, for all cleaning required as a result of his failure to protect equipment and finishes, and for removal of protective covers.
- I. Safety Standards: Maintain project in accordance with the OSHA safety standards, as stipulated under the Occupational Safety and Health Act of 1970 and printed May 29, 1971 in the Federal Register.
- J. Fire Protection: Store volatile waste in covered metal containers and remove from premises daily.
- K. Pollution Control: Conduct cleanup and disposal operations to comply with local ordinances and anti-pollution laws.
 - 1. Disposal of volatile fluid wastes (such as mineral spirits, oil, or paint thinner) in storm or sanitary sewer systems or into streams or waterways is not permitted.

- L. Vacuum clean interior building areas when ready to receive finish painting and continue vacuum cleaning on an as-needed basis until building is ready for acceptance or occupancy.
- M. Repair, patch and touch-up marred surfaces to match adjacent finishes. Coordinate with requirements specified under the various sections of these specifications.
- N. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly-painted surfaces.

1.05 ADJUSTING

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

1.06 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents in clean, dry, legible condition; 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, adjusting, maintenance and operation.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress. Label each document "Project Record."
- E. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
- F. Record Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured depths of foundations in relation to finish first floor datum.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 4. Field changes of dimension and detail.

5. Details not on original Contract drawings.
 6. Review applied changes to C.A.D. drawings.
- G. Submit documents to Architect/Engineer prior to claim for final Application for Payment.
1. The Contractor shall submit to the Architect one set of "Record" drawings which accurately reflect the actual installation of any and all materials, piping, conduit, etc., which were not installed exactly in accordance with the contract drawings.
 2. Contractor shall submit to the Architect two (2) (corrected) final record copies of shop drawings marked "for job use" which reflect all changes required in previous submittals including these marked "Approved as Noted," or similarly revised by the Engineer.

1.07 OPERATION AND MAINTENANCE DATA

- A. Submit data bound in 8½ x 11-inch (A4) text pages, three D side ring binders with durable plastic covers.
- B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS."
- C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- D. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, typed on white paper, in three parts as follows:
 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
 3. Part 3: Project documents and certificates, including the following:
 - a. Shop drawings and product data.
 - b. Air and water balance reports.
 - c. Certificates.
 - d. Originals of warranties.

- E. Submit 1 draft copy of completed volumes 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect/Engineer comments. Revise content of all document sets as required prior to final submission.
- F. Submit three (3) sets of revised final volumes to Architect/Engineer within thirty (30) days of Architect/Engineer review.

1.08 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Provide spare parts, maintenance, and extra Products in quantities specified in individual specification sections.
- B. Deliver to Project site and place in location as directed by Owner; obtain receipt prior to final payment.

1.09 WARRANTIES AND BONDS

- A. Provide notarized copies.
- B. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.
- C. Provide Table of Contents and assemble in three D side ring binder with durable plastic cover.
- D. Submit one (1) original and two (2) copies prior to final Application for Payment. All such documents shall indicate the name and location of the project and the name of the purchaser.
- E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

Division II – Site Work

SECTION 02010 - SOILS INVESTIGATION

Refer to the Geotechnical Report for this project.

END OF SECTION

SECTION 02200 - EARTH AND ROCK WORK

PART 1 - GENERAL

1.01 Work Included

- A. This section includes all labor, materials, equipment, and related items to complete all earth and rock work.
- B. The extent of earth and rock work is shown on drawings. The following work is included:
 - 1. Strip top soil and vegetation from the work area.
 - 2. Perform earthwork to achieve the required grades.
 - 3. Establish and maintain horizontal and vertical ground control throughout the work.
 - 4. Locate and clearly mark all utilities on or adjacent to the site.

1.02 Related Work Specified Elsewhere

- A. Section 02100 - Erosion Control
- B. Section 02110 - Site Clearing
- C. Section 02936 - Seeding

1.03 Excavation Classification

- A. All mass, structural, and trench excavation shall be considered unclassified. No adjustments will be allowed to the contract price for rock encountered during mass or structural excavation.

1.04 Quality Assurance

- A. Codes and Standards: Perform earth and rock work in compliance with applicable requirements of governing authorities having jurisdiction. Applicable references include the following:

ASTM D422 Particle Size Analysis of Soils.

ASTM D423 Test for Liquid Limit of Soils.

ASTM D424 Test for Plastic Limit and Plasticity Index of Soils.

ASTM D698 Laboratory Compaction Characteristics of Soil Using Standard Effort

ASTM D3017 Moisture content of Soil Aggregates in Place by Nuclear Methods (Shallow Depth).

- B. Testing and Inspection Service: A testing laboratory will be employed to perform soil testing and inspection services for quality control testing during earth and rock work operations. Testing laboratory employed is to observe, test and report to the Engineer that the compaction requirements specified herein have been obtained.

1.05 Submittals

- A. Test Reports-Excavating: Coordinate and schedule in a timely manner the following quality related items. The following reports shall be submitted directly to the Engineer from the testing services, with copy to the Contractor:
- Test reports on borrow material.
 - Field density test reports of sufficient number to verify compaction of structural fill.
 - One optimum moisture-density curve for each type of soil encountered. Determine particle size, liquid limit, plastic limit, plasticity index and maximum density of each type of soil.
 - Observe proof-rolling.

1.06 Job Conditions

- A. Site Information. Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that the Owner will not be responsible for interpretations or conclusions drawn by the Contractor. The data is made available for the convenience of the Contractor and is not guaranteed to represent all condition that may be encountered. No claim for extra compensation, or for extension of time, will be allowed on account of subsurface conditions inconsistent with the data shown. Additional test borings and other site examination and exploratory operations may be made by Contractor at no cost to Owner. Notify Owner prior to making any subsurface exploration.
- B. Groundwater. Groundwater may be encountered during the excavation. Control the ground water to a level at least three feet below the top of the subgrade.
- C. Explosives. Blasting shall only be conducted by licensed blasters and shall be in accordance with state and local requirements, and after conducting a thorough pre-blast survey.
- D. Protection of Persons and Property. Barricade open excavations occurring as part of this work and post with warning lights.
- E. Bench Marks and Monuments. Maintain carefully all bench marks, monuments and other reference points. If disturbed or destroyed, replace as directed at no cost to the owner.
- F. Notify the Engineer 48 hours prior to the beginning of any excavation work.

PART 2 - PRODUCTS

2.01 Materials

- A. Satisfactory soil. Satisfactory soils are materials complying with Unified Soil Classification System (USCS), ASTM D 2487-93, soil classification group SP, SM, SC, ML, MH and CL.

PART 3 - EXECUTION

3.01 Excavation

- A. Excavation consists of removal and disposal of material encountered when establishing required finish grade elevations. For the purpose of this contract, mass, structural and trench excavation of all materials shall be considered unclassified. Adjustments for rock or similar materials will not be considered.
- B. Unauthorized excavation. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer.

Unauthorized excavation, as well as remedial work directed by Engineer, shall be at Contractor's expense.

Backfill and compact unauthorized excavations, as specified for authorized excavations of same classification, unless otherwise directed by Engineer.

- C. Additional Excavation. When excavation has reached required subgrade elevations, notify Engineer who will make an inspection of conditions.

If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by Engineer.

Removal of unsuitable bearing material and its replacement as directed will be paid on basis of contract conditions relative to changes in work.

- D. Stability of Excavations. Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restriction or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- E. Shoring and Bracing. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross-braces, in good serviceable condition.

Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction.

Maintain shoring and bracing in excavations, regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

- F. Dewatering. Prevent surface water and subsurface or ground water from flowing into excavations and flooding project site and surrounding area.

Do not allow water to accumulate in excavations. Remove water to prevent softening of excavation bottoms and soil changes detrimental to stability of subgrades. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

Convey water removed from excavations and rain water to collecting or run-off areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches. Site grading should be maintained during construction so that positive drainage of the site is promoted at all times.

- G. Material Storage. Stockpile satisfactory excavated materials, where directed by Engineer, 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.

Dispose of excess soil material and waste materials as herein specified.

- H. Cold Weather Protection. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F (1 degree C).
- I. Proofrolling. After excavation and before any fill placement, entire subgrade shall be proof-rolled with a loaded pneumatic tired vehicle, such as a dual axle dump truck with a gross weight of 16 to 20 tons, or similar equipment. Remove any soft, organic, or highly plastic soil encountered during proof-rolling and replace it with properly compacted fill.

3.02 Compaction

- A. General. Control soil compaction during construction, providing minimum percentage of density specified for each area classification.
- B. Lift Thickness. Soil used for structural fill construction should be placed in layers no greater than 10 inches in loose placement for heavy equipment placement, or 5 inches for hand operated whacker or vibratory plate placement.
- C. Percentage of Maximum Density Requirements. Compact soil as required by the Geotechnical Report to the required percentage of the maximum dry density.
- D. Moisture Control. Maintain soil moisture to required range of optimum moisture content. Where soil must be moisture conditioned before compaction, uniformly apply water to prevent free water from appearing on surface during or subsequent to compaction operations. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by disking, harrowing or pulverizing until moisture content is reduced to a satisfactory value.

3.03 Backfill and Fill

- A. General. Place acceptable soil material in layers to required subgrade elevations.
- B. Backfill excavations as promptly as work permits, but not until acceptance of construction below finish grade and removal of trash and debris.

- C. Ground Surface Preparation. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
- D. Placement and Compaction. Place backfill and fill materials in layers to provide lift thickness.

3.04 Grading

Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

3.05 Field Quality Control

- A. Quality Control Testing During Construction. Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed. It shall be the Contractor's responsibility to notify the testing agency at least 24 hours prior to beginning any work which requires testing.
- B. If in opinion of Engineer, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no additional expense to the Owner.

3.06 Maintenance

- A. Protection of Graded Areas. Protect newly graded areas from traffic and erosion. Keep free of trash and debris. Repair and reestablish grades in settled, eroded and rutted areas to specified tolerances.
- B. Reconditioning Compacted Areas. Where completed compacted areas are disturbed by subsequent construction operations or weather, scarify surface, reshape and compact to required density prior to further construction.
- C. Settling. Where settling is measurable or observable at excavated areas during general project warranty period, add backfill material, compact, and replace surface treatment. Restore appearance, quality and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.
- D. Desiccation. Where desiccation cracks are observable, remove and replace soil to restore appearance, quality and condition of surface.

3.07 Disposal of Excess and Waste Materials

Stockpile excess excavated material at a location near the site designated by the Engineer.

End of Section

SECTION 02250 - SOIL TREATMENT

PART 1 - GENERAL

1.01 Work Included

- A. Soil treatment below slabs-on-grade for subterranean insects.
- B. Soil treatment at interior and exterior foundation perimeter, for subterranean insects.

1.02 References

- A. EPA - Federal Insecticide, Fungicide and Rodenticide Act.

1.03 Quality Assurance

- A. Applicator: Company specializing in soil treatment for termite control with five years documented experience.
- B. Materials: Provide certification that toxicants conform to requirements of authority having jurisdiction.
- C. Material Packaging: Manufacturer's labels and seals identifying content.

1.04 Regulatory Requirements

- A. Conform to Federal, State and Local requirements for application licensing and authority to use toxicant chemicals.
- B. Treatment for termites to be provided by using a registered product, mixed and applied by a licensed professional in accordance with the manufacturer's instruction located on the label.

1.05 Product Data

- A. Submit product data.
- B. Indicate toxicants to be used, composition by percentage, dilution schedule, and intended application rate.
- C. Submit manufacturer's installation instructions.

1.06 Project Record Documents

- A. Accurately record moisture content of soil before treatment, date and rate of application, areas of application, diary of meter readings and corresponding soil coverage.

1.07 Warranty

- A. Provide five year warranty for material and installation.
- B. Warranty: Cover against invasion or propagation of subterranean termites, damage to building or building contents caused by termites, repairs to building or building contents so caused.
- C. Inspect work annually and report in writing to Owner.
- D. Owner reserves right to renew warranty for an additional five years.

PART 2 - PRODUCTS

2.01 Acceptable Manufacturers

- A. Terminix
- B. Orkin
- C. All-Rite Pest Control
- D. Approved equal

2.02 Materials

- A. Toxicant chemicals: As recommended by the manufacturer for the intended use.

PART 3 - EXECUTION

3.01 Inspection

- A. Verify the soil surfaces as unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.
- B. Beginning of application assumes acceptance of soil conditions as suitable.

3.02 Application

- A. Apply toxicant in accordance with manufacturer's instructions.
- B. Apply extra treatment to structure penetrations, pipe, ducts, and other soil penetrations.
- C. Coordinate soil treatment at foundation perimeter with finish grading and landscaping work to avoid disturbance of treated soil. Re-treat disturbed treated soil.

3.03 Re-treatment

- A. If inspection identifies the presence of termites, re-treat soil and re-test.
- B. Use same toxicant as for original treatment.

END OF SECTION

Division III – Concrete

SECTION 03310 - CONCRETE WORK

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Extent of concrete work is shown on drawings.
- B. Related Work:
 - 1. Documents affecting work of this Section include, but are not limited to, General Conditions, Supplementary Conditions, and Division 1 of these Specifications.

1.02 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:
 - 1. ACI 301 "Specifications for Structural Concrete for Buildings"
 - 2. ACI 318 "Building Code Requirements for Reinforced Concrete"
 - 3. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."
- B. Concrete Testing Services
 - 1. Engage a testing laboratory acceptable to Architect/ Engineer to perform material evaluation tests and to design concrete mixes.
 - 2. Owner will engage testing laboratory to perform sampling and testing during placement of concrete.
 - 3. Owner will engage a testing laboratory to conduct tests of compression test specimens.
 - 4. Materials and installed work may require testing and retesting as directed by Architect/ Engineer, at any time during progress of work. Allow free access to material stockpiles and facilities. Re-testing of rejected materials and installed work shall be done at Contractor's expense.

1.03 SUBMITTALS

- A. Product Data: Submit data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, joint systems, curing compounds, and others as requested by Architect/ Engineer.
- B. Shop Drawings - Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required at openings through concrete structures.
- C. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test as specified.

- D. Material Certificates: Provide materials certificates in lieu of materials laboratory test reports when permitted by Architect/ Engineer. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection. Use plywood complying with U. S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
- B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
- C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

2.02 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A615, Grade 60, deformed.
- B. Welded Wire Fabric: ASTM A185, welded steel wire fabric.
- C. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications, unless otherwise acceptable.
1. For exposed-to-view concrete surfaces: Where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

2.03 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150, Type I, unless otherwise acceptable to Architect/ Engineer. Use one brand of cement throughout project, unless otherwise acceptable to Architect/ Engineer.

- B. Fly Ash: ASTM C618, Type C or Type F. Loss on ignition shall not exceed 3½%. Limit use of fly ash to not exceed 25% of total cementitious material content by weight. Higher limits are acceptable for CLSM.
- C. Normal Weight Aggregates: ASTM C33, and as herein specified. Provide aggregates from a single source for exposed concrete.
 - 1. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.
- D. Water: Drinkable.
- E. Admixtures: The amount of water soluble chloride ions added to the mix by the admixtures shall not exceed 0.3% by weight of cement. Provide admixture manufacturer's written certification of weight of added chloride ions per ounce for each admixture.
 - 1. Air-Entraining Admixture: ASTM C260.
 - 2. Water-Reducing Admixture: ASTM C494, Type A
 - 3. Mid-Range Water-Reducing Admixture (MRWR): ASTM C494, Type A or Type F
 - 4. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C494 Type E
 - 5. Water-Reducing, Retarding Admixture: ASTM C494, Type D

2.04 RELATED MATERIALS

- A. Moisture Barrier: Provide moisture barrier cover over prepared base material where indicated. Use only materials which are resistant to decay when tested in accordance with ASTM E154, as follows:
 - 1. Polyethylene sheet not less than 10 mils thick.
- B. Non-Shrink Grout: CRD-C 621, factory pre-mixed grout.
- C. Liquid Membrane-Forming Curing Compound: Liquid type membrane-forming curing compound complying with ASTM C309, Type I, Class A with % solids not less than 19%. Moisture loss not more than 0.03 gr./sq. cm. when applied at 300 square ft./gal.
- D. Bonding Compound: Polyvinyl acetate or acrylic base, rewettable type.
- E. Isolation joint (expansion joint):
 - 1. Provide preformed strips, non-extruding and resilient bituminous type, of thickness indicated, complying with ASTM D1751.

2. If sealants specified in Section 07920 are used in the joints built under this Section, Contractor will provide a filler complying with ASTM D1752.

2.05 PROPORTIONING AND DESIGN OF MIXES

- A. Mix designs shall be prepared by personnel with KRMCA Level II Certification or equal. Prepare design mixes for each type and strength of concrete as follows:
 1. Prepare concrete mixes, other than slab on grade concrete in accordance with ACI 301 Section 4.2.3
 2. Prepare slab on grade concrete mixes in accordance with ACI 302 Section 5.2.4 (Method B).
- B. Submit written reports to Architect/ Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Architect/ Engineer.
- C. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:
 1. 3500 psi 28-day compressive strength
 2. 3000 psi 28-day compressive strength
 3. 1000 psi 28-day compressive strength - CLSM
 4. 500 psi 28-day compressive strength - CLSM
 5. 100 psi 28-day compressive strength - CLSM
- D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner, and as accepted by Architect/ Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect/ Engineer before using in work.
- E. Admixtures:
 1. Use water-reducing admixture or mid range water-reducing admixture in concrete as required for placement and workability. The use of a water-reducing admixture is required for slabs on grade.
 2. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F. (10 degrees C.).
 3. Use air-entraining admixture in exterior exposed concrete. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus-or-minus 1½% within following limits:

- a. Concrete structures and slabs exposed to freezing and thawing or de-icer chemicals
 - 5.5% 1-1/2" maximum aggregate.
 - 6.0% 1" maximum aggregate.
 - 6.0% 3/4" maximum aggregate.
 - 4. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.
- F. Water-Cement Ratio: Water-Cement ratio shall not exceed 0.53.
- G. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
- 1. Ramps, slabs, and sloping surfaces: 4 inches.
 - 2. Concrete containing a mid-range water-reducing admixture (MRWR): Not more than 6 inches after addition of MRWR to site verified 2 inch to 3 inch slump concrete.
 - 3. Other Concrete: 4 inches.
- H. Concrete Mixes:
- 1. Ready-Mix Concrete: Comply with requirements of ASTM C94 and as herein specified. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required.
- I. Controlled Low Strength Material (CLSM):
- 1. Controlled Low Strength Material (flowable fill): A low strength mixture consisting of portland cement, sand, class F fly ash and water.
 - 2. Design mixes shall comply with the recommendations of the Kentucky Ready-Mix Concrete Association.

PART 3 - EXECUTION

3.01 FORMS

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.
- B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- C. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and

provide back-up at joints to prevent leakage of cement paste.

- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.
- E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.
- F. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- G. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is 1" inside concrete and will not leave holes larger than 1" diameter in concrete surface.
- H. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.
- I. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

3.02 PLACING REINFORCEMENT

- A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
- C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
- D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at

least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.03 JOINTS

- A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to Architect/ Engineer.
- B. Provide keyways at least 1/1-2" deep in construction joints in walls; keyways in construction joints in slabs to follow ACI recommendations for keyed construction joints.
- C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise noted.
- D. Isolation (Expansion) Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade at points of contact between slabs on grade and vertical surfaces, such as column pedestals, foundation walls, grade beams and elsewhere as indicated.
 - 1. Joint Filler and sealant materials are specified in Division 7 sections of these specifications.
- E. Contraction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels of patterns as shown.
 - 1. Contraction joints shall be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
 - 2. Joint sealant material is specified in Division 7 sections of these specifications.

3.04 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.
- B. Position and secure in place all embed items before placing concrete in forms.

3.05 PREPARATION OF FORM SURFACES

- A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.
- B. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.
- C. Thin form-coating compounds only with thinning agent of type and in amount and

under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

- D. Coat steel forms with a non-staining, rust-preventive form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.06 CONCRETE PLACEMENT

- A. Preplacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.
- B. Coordinate the installation of joint materials, perimeter insulation and moisture barriers with placement of forms and reinforcing steel.
- C. General: Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete" and as herein specified.
- D. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.
- E. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
- F. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with recommended practices.
- G. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- H. Maintain reinforcing in proper position during concrete placement operations.

- I. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.
1. When air temperature has fallen to or is expected to fall below 40 degrees F (4 degrees C.), uniformly heat water and/or aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F (10 degrees C), and not more than 80 degrees F. (27 degrees C) at point of placement.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.
- J. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F (32 degrees C). Mixing water may be chilled or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
 3. Fog spray forms, reinforcing steel and subgrade just before concrete is placed.
 4. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

3.07 FINISH OF FORMED SURFACES

- A. Rough Form Finish: For formed concrete surfaces not exposed to view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed to view or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, painting or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.
- C. Smooth Rubbed Finish: Provide smooth rubbed finish to scheduled concrete surfaces,

which have received smooth form finish treatment, not later than one day after form removal.

1. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.

- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strikeoff smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.08 MONOLITHIC SLAB FINISHES

- A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified.

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or by hand-floating if area is small or inaccessible to power units. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

- B. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed to view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint or other thin film finish coating system.

1. After floating, begin first trowel finish operation using a power-driven trowel.
2. Begin final troweling when surface produces a ringing sound as trowel is moved over surface.
3. Consolidate concrete surface by final troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to the following tolerances:
Overall flatness and levelness: Ff 24, Fl 18
Minimum flatness and levelness: Ff 18, Fl 12
4. Grind smooth surface defects which would telegraph through applied floor covering system.

- C. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.

- D. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps and elsewhere as indicated.

1. Immediately after trowel finishing, slightly roughen concrete surface by brooming

with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect/ Engineer before application.

3.09 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
 - 1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing.
 - 2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
- B. Curing Methods: Perform curing of concrete by moist curing, moisture-retaining cover curing, or curing and sealing compound as herein specified.
 - 1. Moist curing: Provide moist curing by covering concrete surface with absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent covers.
 - 2. Moisture-retaining cover curing: Provide moisture-retaining cover curing by covering concrete surfaces and edges with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing and sealing compound: Provide curing and sealing compound to interior slabs and to exterior slabs, walks, and curbs, as follows: Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Re-coat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - 4. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting and other coatings and finish materials, unless otherwise acceptable to Architect/ Engineer.
- C. Curing Formed Surfaces: Cure formed concrete surfaces, by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing methods specified above, as applicable.
- D. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of curing and sealing compound unless otherwise noted.

1. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover unless otherwise directed.

3.10 REMOVAL OF FORMS

- A. Formwork not supporting weight of concrete, such as sides of walls, piers, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F. (10 degrees C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

3.11 REUSE OF FORMS

- A. Clean and repair surfaces of forms to be reused in work. Split, frayed, de laminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect/ Engineer.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
- B. Grout base plates and foundations as indicated, using specified non-shrink grout. Use non-metallic grout for exposed conditions, unless otherwise indicated.
- C. Reinforced Masonry: Provide concrete grout for reinforced masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

3.13 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect/ Engineer.
 1. Cut out honeycomb, rock pockets, and voids over 1/4" in any dimension, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.
- B. For exposed to view surfaces: Blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding

with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

- C. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect/ Engineer. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.
- D. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
- E. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.
- F. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.015" wide, spalling, pop-outs, honeycomb, rock pockets and other objectionable conditions.
- G. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.
- H. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Fill areas with concrete repair mortar. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- I. Repair isolated random cracks and single holes not over 1" in diameter with concrete repair mortar. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix repair mortar in accordance with manufacturers printed instructions. Place repair mortar after bonding compound has dried. Finish to match existing concrete. Keep patched area continuously moist for not less than 72 hours.
- J. Perform structural repairs with prior approval of Architect/ Engineer for method and procedure, using specified epoxy adhesive and mortar.
- K. Repair methods not specified above may be used, subject to acceptance of Architect/ Engineer.

3.14 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. The owner will engage a testing laboratory to perform and report compressive strength

tests. All concrete sampling and testing shall be performed by an ACI certified level 1 technician.

- B. Sampling and testing for quality control during placement of concrete will include the following:
1. Sampling Fresh Concrete: ASTM C172.
 2. Slump: ASTM C143: one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 3. Air Content: ASTM C173, volumetric method for lightweight or normal weight concrete; ASTM C231 pressure method for normal weight concrete; one for each day's pour of each type of concrete.
 4. Concrete Temperature: Test hourly when air temperature is 40 degrees F (4 degrees C) and below, and when 80 degrees F (27 degrees C) and above; and each time a set of compression test specimens is made.
 5. Compression Test Specimen: ASTM C31; one set of 3 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
 6. Compressive Strength Tests: ASTM C39; one set for each day's pour exceeding 5 cubic yards plus additional sets for each 100 cubic yards over and above the first 50 cubic yards of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
- C. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive by more than 500 psi.
- D. Test results will be reported in writing to Architect/ Engineer and Owner within 24 hours that tests are made. Reports of compressive strength tests will contain the project identification name and number, date of concrete placement, slump and temperature at time of sampling, name of concrete testing service, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but will not be used as the sole basis for acceptance or rejection.
- F. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by the Architect/ Engineer. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Contractor shall pay for such tests

conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTION

Division IV – Masonry

SECTION 04100 - MORTARED MASONRY GROUT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Mortar and grout for masonry.

1.02 RELATED SECTIONS

- A. Section 01400 - Quality Control.
- B. Section 01410 - Testing Laboratory Services: Testing laboratory services.
- C. Section 04200 - Unit Masonry System: Installation of mortar [and grout].

1.03 REFERENCES

- A. ACI 530 - Building Code Requirements for Masonry Structures.
- B. ACI 530.1 - Specifications For Masonry Structures.
- C. ASTM C91 - Masonry Cement.
- D. ASTM C94- Ready-Mixed Concrete.
- E. ASTM C144 - Aggregate for Masonry Mortar.
- F. ASTM C150 - Portland Cement.
- G. ASTM C270 - Mortar for Unit Masonry.
- H. ASTM C404- Aggregates for Masonry.Grout.
- I. ASTM C476 - Grout for Masonry.
- J. ASTM C780 - Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- K. ASTM C1019 - Method of Sampling and Testing Grout.
- L. ASTM C1072 - Method for Measurement of Masonry Flexural Bond Strength.
- M. ASTM C1142 - Ready-Mixed Mortar for Unit Masonry.

- N. ASTM E447 - Test Methods for Compressive Strength of Masonry Prisms.
- O. ASTM E518 - Test Method for Flexural Bond Strength of Masonry.
- P. IMIAC (International Masonry Industry All-Weather Council) - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site under provisions of Section 01620.
- B. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.05 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.
- B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Portland Cement: ASTM C150, Type I gray.
- B. Mortar Aggregate: ASTM C 144, standard masonry type.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Grout Aggregate: ASTM C404.
- E. Water: Clean and potable.
- F. Bonding Agent: Epoxy type.

2.02 MORTAR MIXES

- A. Ready Mixed Mortar: ASTM C1 142, Type RN.
- B. Mortar For Non-Load Bearing Walls and Partitions: ASTM C270, Type N using the Property specification.

2.03 MORTAR MIXING

- A. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.
- B. Maintain sand uniformly damp immediately before the mixing process.
- C. Do not use anti-freeze compounds to lower the freezing point of mortar.
- D. If water is lost by evaporation, re-temper only within two hours of mixing.
- E. Use mortar within two hours after mixing at temperatures of 90 degrees F. or two-and-one-half hours at temperatures under 40 degrees F.

2.04 GROUT MIXES

- A. Bond Beams and Lintels: 3,000 psi strength at 28 days; 8-10 inches; premixed type in accordance with ASTM C94; mixed in accordance with ASTM C476 Fine grout.

2.5 GROUT MIXING

- A. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 Fine grout.
- B. Add admixtures in accordance with manufacturer's instructions; mix uniformly.
- C. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Request inspection of spaces to be grouted.

3.02 PREPARATION

- A. Apply bonding agent to existing concrete surfaces.
- B. Plug clean-out holes with block masonry units. Brace masonry for wet grout pressure.

3.03 INSTALLATION

- A. Install mortar and grout in accordance with premix mortar manufacturer's instructions.
- B. Work grout into masonry cores and cavities to eliminate voids at door frames and opening.
- C. Do not install grout in lifts greater than 16 inches two CMU courses without consolidating grout by rodding.
- D. Do not displace reinforcement while placing grout.
- E. Remove excess mortar from grout spaces.

3.04 FIELD QUALITY CONTROL

- A. Field testing will be performed under provisions of Section 01400.
- B. Test and evaluate mortar in accordance with ASTM C780.
- C. Test and evaluate grout in accordance with ASTM C1019.

END OF SECTION

SECTION 04200 - UNIT MASONRY

PART 1 - GENERAL

- A. This Section includes all labor, materials, equipment, and related items required for the work of unit masonry as shown on the Drawings and as specified.

PART 2 - PRODUCT HANDLING

- A. Store all masonry units on screeds and under cover to properly protect from the elements until ready for use. Dirty, cracked, chipped, or otherwise damaged masonry units shall not be used.

PART 3 - ENVIRONMENTAL CONDITIONS

- A. Masonry shall not be laid in freezing weather unless suitable means are used to heat the materials and protect the work from cold and frost, and to insure that the mortar will properly harden without freezing.

PART 4 - PROTECTION

- A. The Contractor shall protect exposed masonry materials of every kind against staining, and the tops of all walls shall be kept covered with non-staining waterproof covering at the end of each work day and at any time the work thereon is not in progress. When starting or resuming work at a new level, the top surface of the work in place shall be cleaned of all loose mortar and foreign materials and in drying weather thoroughly wetted with clean water. Then resume laying.

PART 5 - MATERIALS

- A. Masonry Units:

1. Face brick shall conform to ASTM C216, Grade SE, type FBS, (7 5/8" x 2-1/4" x 3-5/8" bed depth), solid or cored. See elevation for type.
 - a. Provide all special matching face brick units for applications where indicated by the details or required, including sill units. Units shall conform to details and dimensions shown on the Drawings and finished surfaces shall be indistinguishable from those of face brick specified above.
2. Concrete block for general use throughout the project shall be hollow, load-bearing concrete masonry units complying with ASTM C90, Grade N-1, shall have nominal 8" x 16 face, or as shown, shall have a compressive strength of not less than 800 p.s.i. for individual units and an average of 1,000 for five units.
 - a. Exterior CMU shall be waterproof with waterproof mortar.
 - b. All aggregates for concrete masonry units shall conform to ASTM C331, and shall

be expanded shale produced by the rotary kiln process.

- c. All units shall be made with Portland cement complying with ASTM C150, and weighing not more than 100 lbs. per cubic foot.
 - d. All units shall be square, true, and have sharp arriser. They shall be of consistent texture, and shall be dimensionally stable with regard to height, width, and lengths. All units shall be free of organic impurities that will cause rusting, staining, or pop-outs, and shall contain no combustible matter.
 - e. Steam Curing. All concrete blocks shall be steamed in an atmosphere of 100 degrees F. for a period of 4 to 6 hours. Steam curing shall commence after masonry units have been allowed to "set" for a period of 1-1/2 to 2 hours. After steam curing, allow kiln temperature to drop slowly before removing blocks from kiln. Blocks shall be stored for a period of 30 days and protected from the weather during this period before delivery to site.
3. Fire rated concrete block for use in interior shafts shall conform to general specifications for other concrete block set forth above, and shall conform to Underwriter's Laboratories D-2 classification for two-fire rating.
- a. Manufacturer of concrete block units shall provide U.L. standard certificate certifying that materials furnished meet classification specified to the Architect for approval prior to delivery of units to the site.,

B. Masonry Wall Reinforcement:

- 1. Provide all prefabricated internal or external corners required by installation.

C. Anchors and ties shall be of corrosion resistant metal equal in strength, size and numbers to conform with requirements of American standard A41.1 titled American Standard Building Code Requirements for Masonry.

- 1. Brick wall ties. crimped wall ties for anchorage of face brick to backing in metal stud frame shall be crimped galvanized metal 22 gauge, 7/8" wide x 7" long.
- 2. Truss type reinforcement for horizontal reinforcing at concrete masonry partitions. Reinforcement shall be Dur-O-Wall Truss No. 9 gauge cross rod or approved equal. All components of anchor to ave a hot dipped galvanized finish. Place joint reinforcement directly on masonry and place mortar over wire to form bed joint.

D. Damproofing material for treatment of exterior brick surfaces shall be colorless 5 percent solution of silicone resins especially formulated to render masonry surfaces water repellent, and shall be Sonneborn "Hydrocide S-X Hycon", or as manufactured by Sika, Toch Bros.

PART 6 - SAMPLE WALL

- A. Before laying any wall construction, the Contractor shall build sample composite of concrete block, 5 feet wide x 4 feet high, for approval of the Owner and Architect. Approved wall shall be standard for wall construction and for brick and block. Sample wall shall demonstrate acceptable workmanship for bond specified.

PART 7 - LAYING BRICK

- A. Lay all face brick in exterior wall construction using Type N mortar furnished under work of Section 04100.
1. All brick shall be thoroughly wet before laying, except in freezing weather. All bed and head joints shall be completely filled with mortar. Fill all head joints with a heavy buttering or mortar on one side of the brick, press the brick down into the bed joint and push the brick into place so that the mortar squeezes out from the top and sides of the head joint. Mortar should correspondingly cover the entire side of a brick before placing with next brick. Attempting to fill joints by slushing or dashing will not be permitted. Partial filling of joints by buttering or spotting the vertical edges of the brick with mortar cut from the extruded bed joint will not be permitted. Where closures are required, the opening should be filled with mortar so that insertion of the closure will extrude mortar, both laterally and vertically. All brick work shall be plumb, true to line, courses level and properly anchored to back-up, abutting masonry and concrete as follows:
 - a. Where composite wall construction is indicated, face brick shall be bonded to backup by installation of continuous masonry wall reinforcement, spaced 16" o.c. vertically, extending through both brick and backup as shown in the Drawings.
 2. Face Brick Bond. The bond for brick laid in walls shall be running bond with tooled joints throughout. Coursing shall be accurately spaced and laid out in such manner that the bond is kept plumb throughout variations in the width of vertical joints shall be inconspicuous and made only as necessary to maintain the bond. Improper layout of bond will be rejected. Intersecting and abutting walls and corners shall be bonded together by interlocking alternate courses of brick. No brick smaller than 3-3/4" long shall be used as a jamb closure, and all cuts required shall be made with a masonry saw.
 3. Face Joints. All face joints in brick shall be for horizontal joints as shown on the drawings, and for vertical or head joints may be from 5/16" to 7/16" to adjust bond and minimize cutting at openings. In exposed wall faces, joints shall be cut flush, and as the mortar takes its initial set, shall be tooled with 1/2 inch diameter round tool 6" longer than the length of the masonry unit. Tooling shall compact the mortar tightly against the masonry units on both sides of the joints. Head joints shall be tooled first. Joints must be tooled smooth, even and uniform. At completion of work, all holes in joints of exposed masonry must be filled. Rake joints 3/8" deep at jambs of brick abutting other materials and at other joints shown to be caulked by others under work of Section 07900; except that caulked control joints shall be treated as specified below.

4. Control Joints. Provide continuous 3/8" wide vertical control joints in exterior face brick where indicated by cutting half-brick closures in alternate courses, omitting mortar continuously in the joint. Control joints shall fall at normal head joint locations and shall be absolutely plumb so as to be inconspicuous in the finish work. Caulking of control joints is specified under Section 07900.
5. Weeps. Provide weep holes in exterior brick wall surfaces in all joints containing through wall membrane flashing at spacing shown on the Drawings. Weeps shall be made by using Quadro vents, top and bottom.
- B. Workmanship. The Contractor is cautioned that the Architect will demand first class workmanship. All brick masonry shall be performed by experienced masons. Any chipped, cracked, or otherwise damaged or defective work will be rejected.

PART 8 - LAYING CONCRETE BLOCK

- A. Lay all concrete block in exterior and interior wall construction where indicated, using Type N mortar furnished under work of Section 04100, except that Type S mortar shall be used in laying concrete block below grade.
- B. All bed and head joints shall be completely filled with mortar. Bed joints shall be filled by spreading a thick bed of mortar. Fill head joints with a heavy buttering of mortar on one side (each flange) of block, press the block down into the bed joint, and push the block into place so that the mortar squeezes out from the top and sides of the head joint. Mortar should correspondingly cover the end flange of the block before placing the next block. Attempting to fill joints by slushing or dashing will not be permitted. Partial filling of joints with mortar cut from the extruded bed joint will not be permitted. Where closures are required, fill with mortar so that the intersection of the closure will extrude mortar, both laterally and vertically. Extend walls and partitions to heights indicated, building in around joist bearings, etc. as shown or required. Cut units as required to properly course in plan and vertical section as shown on the Drawings or as directed by the Architect. All cuts shall be accurately made with masonry saw.
 1. Anchorages of concrete block to various backup material shall be as specified under Article 8 above for brick.
- C. Joints and Bond. All concrete masonry units shall be laid in running bond. Joints in concrete block work shall be 3/8" wide for both head and bed joints. Joints in masonry scheduled to receive separate finish or where concealed in the work shall be cut flush. Rake joints 3/8" deep at control joints, where masonry abuts concrete surfaces, etc., and otherwise where shown on the Drawings, for caulking by others under work of Section 07900.
- D. Reinforcement. Concrete masonry walls and partitions shall be reinforced continuously in every other course, (16" o.c. vertically) using masonry wall reinforcement of types as hereinbefore specified. Reinforcement shall be seated in the mortar bed by lifting cross ties as work progresses. Lay internal and external corners and intersections as required for the completed job.

- E. Chases for pipes, conduits, etc. shall be plumb and smooth on the inside, with offsets formed where required, kept free of obstructions and cleaned out on completion. There shall be at least 8" of masonry between chases and the jambs of openings.
- F. Build units accurately to metal door frames, building in anchors furnished with frames. Slush solid with mortar at jambs and head.
- G. Coordinate work with other trades, building in all items shown to be installed in concrete block work such as lintels, anchors, sleeves, etc. Prepare openings as shown or required for proper installation of mechanical, electrical, and other items.
- H. Cleaning. Extreme care shall be exercised during laying to protect units from mortar droppings, etc. Upon completion of work, all exposed concrete block shall be properly cleaned with a stiff bristle brush to remove all excess mortar, dirt and stains. Do not use acid.
- I. Workmanship. The contractor is cautioned that the Architect will demand first class workmanship. All concrete masonry work shall be performed by experienced masons. Any chipped, cracked or otherwise damaged or defective work will be rejected.

PART 10 - THROUGH-WALL MEMBRANE FLASHING

- A. Install York seal 40 mil self-adhering flashing or equal through-wall membrane flashing continuously in horizontal joints of exterior walls, at window openings, etc. where shown on the Drawings. Installation shall be in strict accordance with manufacturer's printed instruction. Flashings shall extend generally from within 1/2" of exterior wall face through the wall as detailed.
 - 1. Where laps occur, lap sheets at least 6" and seal with cold setting cement. Roll to insure full adhesion.
 - 2. At obstructions, carry flashing up 6" and secure with cold setting cement.
 - 3. Where ties or anchors, conduit, etc. penetrate through sheet, punctures shall be made minimum size possible and mastic troweled around place to thoroughly seal the puncture.
 - 4. At lintels and shelf angles, flashings shall extend minimum of 6" beyond ends of lintels.

End of Section

SECTION 04720 - MANUFACTURED STONE UNITS

PART 1 - GENERAL

1.01 Description of work

Pressure formed severe weathering calcium silicate cast stone masonry unit.

1.02 Related Sections

Section 04100 mortar

Section 04200 unit masonry

1.03 Submittals

Product data: Submit manufacturers detail technical data for material, fabrication and installation.

Shop Drawings: Submit shop drawings for fabrication and layout of calcium silicate masonry units. Indicate dimensions, profiles, locations, and tolerances. Shop drawings shall provide for the following:

- A. The shop drawings shall show the setting mark of each stone type and its location on the structure. The stone when delivered shall bear the same corresponding setting mark on an unexposed surface.

Samples: Submit one block of each profile indicated on the drawings in the color specified. Models shall be approved by the architect before any work is executed therefrom.

1.04 Quality Assurance:

The manufacturer shall have a minimum of five years continuous operation, having experience, adequate facilities and capacity to furnish the quality, sizes and quantity of cast stone required without delaying the progress of the work and whose products have been used and exposed to the weather with satisfactory results.

1.05 Delivery, Storage and Handling:

- A. Rejection of Defective Stone. Inform Architect and Stone Manufacturing Corporation upon receipt of any unit showing flaws or imperfections greater than tolerances at the storage yard or building site for their review.
- B. The architect may reject the piece or approve its refabrication.
- C. Remove rejected units from the site immediately.
- D. Delivery. Delivery units to site as required for installation, to meet construction schedule, and to locations as directed.

E. Handling.

1. Pack and load units for shipment and unloading at site in a manner to prevent damage.
2. Use no material for blocking or packaging which would stain or discolor exposed surfaces of the units.
3. Isolate units from contact with ground and other materials until final grading is complete to prevent staining.
4. Lift units with proper and sufficiently long slings or forks with protection provided so they are not damaged.
5. Protect edges and corners to prevent damage.

F. Storage.

1. Stack units on timbers or platform at least 3" above grade.
2. Provide necessary means to prevent staining of units during storage.
3. Place polyethylene or other plastic film between wood and other finished surfaces of units when stored for an extended period of time.
4. Do not use salt to thaw ice formed on surfaces of units.

G. Adjustment and Cleaning.

1. Wash down and brush walls to remove mortar and stains. Use only non-acid detergents and water with fiber brushes.
2. Should specified cleaning methods be insufficient, proceed with other methods only with approval.
3. Do not use wire brushes for cleaning. When using high pressure water, care must be taken not to damage the masonry unit.

H. Protection.

1. Protect corners and edges of masonry units that are vulnerable to damage by continuing construction. Protect them by means of wood or other rugged materials secured in a manner that will not damage or stain finished surfaces.
2. Remove protection when risk of damage is no longer present and without damage to masonry.

PART 2 - PRODUCT

2.01 Manufacturer:

Citadel Building Stone and Renaissance® Masonry unit by Arriscraft International

Head Office: P.O. Box 3190
Cambridge, Ontario
Canada N3H 4S8
(519)-653-3275

U.S. Office: P.O. Box 606
Lombard, Illinois
USA 60148

As Represented by: Ken Cox
Clay Ingalls
(606)-252-0836

Substitutions: Must be pre-approved before bid time and must conform to the specification. Substitution must also show individual test results showing compliance with physical properties. All test data must be stamped by an independent testing lab.

2.02 Materials: A dense, severe weathering, calcium silicate masonry unit, pressure formed and autoclaved.

- A. For size see Elevations A-2.1.
- B. Citadel Building Stone shall be traditional Grey.
- C. Color is stone white; finish smooth face for Renaissance Masonry Units.
- D. Location of units and profiles shall be as indicated on drawing elevations.

2.03 Tolerances.

- A. Flaws or imperfections in the face of the masonry unit must not exceed 1/16".
- B. Fabricate masonry units within the following tolerances:

Length of unit: $\pm 1/16"$

Height of unit: $\pm 1/16"$

2.04 Deviation from Square:

- A. With measurement taken using longest edge of base: $\pm 1/16"$

2.05 Non-Critical Unit Thickness: $\pm 1/2"$

2.06 Critical Unit Thickness: $\pm 1/16"$

2.07 Color and finish:

- A. The manufacturer shall submit to the Architect for selection and approval, samples of the Cast Stone specified which will be typical of the general range of color and finish to be furnished.
- B. The samples shall be approved by the Architect before the manufacturer shall be required to proceed with the work.
- C. Color and texture of Cast Stone shall be generally equal to the approved sample when viewed in direct daylight at a 10 foot distance.
- D. The range of total acceptable color (lightness, color saturation and hue) variation shall not exceed CIELAB 3.0 provided that the difference in hue alone does not exceed CIELAB 1.0 as defined by the International Commission on Illumination, 1976 Standards.

2.08 Mortar Type:

- A. Portland cement, masonry lime, and sand mortar is to be used when setting Renaissance Masonry Units. Proportion by volume should be 1:1:6 (Portland cement/lime/sand).

PART 3 - INSTALLATION

A. General:

All product installation is to be completed using proper and approved masonry techniques as listed in the Municipal, State and National Building Codes and as recommended by the manufacturer of the stone units.

End of Section

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: Extent of Structural Steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.
- B. Related Work:
 - 1. Documents affecting work of this Section include but are not necessarily limited to General Conditions, Supplementary Conditions, and Division 1 of these Specifications.

1.02 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provision of following except as otherwise indicated.
 - 1. AISC "Code of Standard Practice"
 - 2. AISC "Specification for Structural Steel Buildings"
 - 3. AISI "Specification for the Design of Cold-Formed Steel Structural Members"
 - 4. AISC "Specification for Structural Joints using ASTM A325 or A490 Bolts"
 - 5. American Welding Society (AWS) D1.1 "Structural Welding Code -Steel".
- B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".
 - 1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.
- C. The fabricator shall maintain an agreement with an approved independent agency to conduct periodic in-plant inspections at the fabricator's plant to assure conformance to the requirements of the inspection agency's approved quality control program.
- D. Materials and fabrication procedures are subject to inspection and tests in mill, shop and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
- E. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site without causing delay in the work.

1.03 SUBMITTALS

- A. Shop Drawings: Submit shop drawings including complete details and schedules for fabrication and assembly of structural steel members.
 - 1. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS A2.1 and A2.4 symbols, and show size, length, and type of

each weld.

2. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.
- B. Certificates of Compliance: Furnish manufacturer's certificate of compliance for the following:
1. Bolts, nuts, washers
 2. Weld filler materials
- C. Mill test reports: Furnish certified mill test reports for all structural steel materials.
- D. In-Plant Inspections: Furnish certification from an approved independent inspection agency of inspections in conformance with these specifications.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to site at such intervals to insure uninterrupted progress of work.
- B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
1. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All wide flange structural steel to be ASTM A992, Grade 50. All other structural steel shapes, plates and bars to be ASTM A36 unless noted otherwise on the drawings.
- B. Cold-Formed steel tubing: ASTM A500, Grade B.
- C. Cold-Formed shapes: ASTM A242 Grade 50
- D. Steel pipe: ASTM A53, Type E or S, Grade B; or ASTM A501.
- E. Headed Stud-Type Shear Connectors: ASTM A108, Grade 1015 or 1020, cold finished carbon steel; with dimensions complying with AISC Specifications.
- F. Anchor Bolts: ASTM A307, non-headed type unless otherwise indicated.

- G. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular low-carbon steel bolts and nuts.
- H. High Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
 - 1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A325.
 - 2. Quenched and tempered alloy steel bolts, nuts and washers, complying with ASTM A490.
 - 3. Direct tension indicator washers may be used at Contractor's option.
- I. Electrodes for Welding: Comply with AWS Code.
- J. Structural Steel Primer Paint: SSPC - Paint 13.

2.02 FABRICATION

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.
 - 1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
- B. Connections: Weld or bolt shop connections as indicated.
 - 1. Bolt field connections, except where welded connections or other connections are indicated.
 - 2. Provide high-strength threaded fasteners for principal bolted connections, except where unfinished bolts are indicated.
 - 3. Provide unfinished threaded fasteners for only bolted connections of secondary framing members to primary members (including purlins, girts, and other framing members taking only nominal stresses) and for temporary bracing to facilitate erection.
- C. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A325 or A490

Bolts". Bolts shall be installed with hardened washers under the element turned in tightening bolts to facilitate verification inspection.

D. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods which will produce true alignment of axis without warp.

E. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings.

1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

F. Header Units: Provide header units to support tail joists at openings in floor or roof system unless otherwise indicated.

2.03 SHOP PAINTING

A. General: Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on exposed portions and initial 2" of embedded areas only.

B. Do not paint surfaces which are to be welded or high-strength bolted with friction-type connections.

C. Do not paint surfaces which are scheduled to receive sprayed-on fireproofing.

D. Apply 2 coats of paint to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

E. Painting: Provide a one-coat shop applied paint system complying with Steel Structures Painting Council (SSPC) Paint System Guide No. 7.00.

PART 3 - EXECUTION

3.01 ERECTION

A. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure within specified AISC tolerances.
 2. Splice members only where indicated and accepted on shop drawings.
 3. Do not enlarge unfair holes in members by burning or by use of drift pins. Ream holes that must be enlarged to admit bolts.
 4. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in structural framing unless acceptable to Architect/ Engineer. Finish gas-cut sections equal to a sheared appearance when permitted.
 5. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.
- B. Anchors: Furnish bearing plates and other devices to be built into concrete and masonry construction.
1. Provide unfinished threaded fasteners for anchor bolts unless otherwise noted.
 2. Refer to Division 3 sections for installation of anchors set in concrete.
 3. Refer to Division 4 sections for installation of anchors set in masonry.

3.02 QUALITY CONTROL

- A. A tension calibrator furnished by the erector will be required at the jobsite to be utilized in the tightening of slip-critical bolted joints.
- B. Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.
- C. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with requirements and specifically state any deviations therefrom.
- D. Provide access for testing agency to places where structural steel work is being fabricated produced, or erected so that required inspection and testing can be accomplished.
- E. Testing agency may inspect structural steel at plant before shipment; however, Architect/ Engineer reserves right, at any time before final acceptance, to reject material not complying with specified requirements.
- F. Correct deficiencies in structural steel work which inspections and laboratory test reports

have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to re-confirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

END OF SECTION

Division V – Metals

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: Extent of Structural Steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.
- B. Related Work:
 - 1. Documents affecting work of this Section include but are not necessarily limited to General Conditions, Supplementary Conditions, and Division 1 of these Specifications.

1.02 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provision of following except as otherwise indicated.
 - 1. AISC "Code of Standard Practice"
 - 2. AISC "Specification for Structural Steel Buildings"
 - 3. AISI "Specification for the Design of Cold-Formed Steel Structural Members"
 - 4. AISC "Specification for Structural Joints using ASTM A325 or A490 Bolts"
 - 5. American Welding Society (AWS) D1.1 "Structural Welding Code -Steel".
- B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".
 - 1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.
- C. The fabricator shall maintain an agreement with an approved independent agency to conduct periodic in-plant inspections at the fabricator's plant to assure conformance to the requirements of the inspection agency's approved quality control program.
- D. Materials and fabrication procedures are subject to inspection and tests in mill, shop and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
- E. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site without causing delay in the work.

1.03 SUBMITTALS

- A. Shop Drawings: Submit shop drawings including complete details and schedules for fabrication and assembly of structural steel members.
 - 1. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS A2.1 and A2.4 symbols, and show size, length, and type of

each weld.

2. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.
- B. Certificates of Compliance: Furnish manufacturer's certificate of compliance for the following:
1. Bolts, nuts, washers
 2. Weld filler materials
- C. Mill test reports: Furnish certified mill test reports for all structural steel materials.
- D. In-Plant Inspections: Furnish certification from an approved independent inspection agency of inspections in conformance with these specifications.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to site at such intervals to insure uninterrupted progress of work.
- B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
1. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All wide flange structural steel to be ASTM A992, Grade 50. All other structural steel shapes, plates and bars to be ASTM A36 unless noted otherwise on the drawings.
- B. Cold-Formed steel tubing: ASTM A500, Grade B.
- C. Cold-Formed shapes: ASTM A242 Grade 50
- D. Steel pipe: ASTM A53, Type E or S, Grade B; or ASTM A501.
- E. Headed Stud-Type Shear Connectors: ASTM A108, Grade 1015 or 1020, cold finished carbon steel; with dimensions complying with AISC Specifications.
- F. Anchor Bolts: ASTM A307, non-headed type unless otherwise indicated.

- G. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular low-carbon steel bolts and nuts.
- H. High Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
 - 1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A325.
 - 2. Quenched and tempered alloy steel bolts, nuts and washers, complying with ASTM A490.
 - 3. Direct tension indicator washers may be used at Contractor's option.
- I. Electrodes for Welding: Comply with AWS Code.
- J. Structural Steel Primer Paint: SSPC - Paint 13.

2.02 FABRICATION

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.
 - 1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
- B. Connections: Weld or bolt shop connections as indicated.
 - 1. Bolt field connections, except where welded connections or other connections are indicated.
 - 2. Provide high-strength threaded fasteners for principal bolted connections, except where unfinished bolts are indicated.
 - 3. Provide unfinished threaded fasteners for only bolted connections of secondary framing members to primary members (including purlins, girts, and other framing members taking only nominal stresses) and for temporary bracing to facilitate erection.
- C. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A325 or A490

Bolts". Bolts shall be installed with hardened washers under the element turned in tightening bolts to facilitate verification inspection.

D. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods which will produce true alignment of axis without warp.

E. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings.

1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

F. Header Units: Provide header units to support tail joists at openings in floor or roof system unless otherwise indicated.

2.03 SHOP PAINTING

A. General: Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on exposed portions and initial 2" of embedded areas only.

B. Do not paint surfaces which are to be welded or high-strength bolted with friction-type connections.

C. Do not paint surfaces which are scheduled to receive sprayed-on fireproofing.

D. Apply 2 coats of paint to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

E. Painting: Provide a one-coat shop applied paint system complying with Steel Structures Painting Council (SSPC) Paint System Guide No. 7.00.

PART 3 - EXECUTION

3.01 ERECTION

A. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure within specified AISC tolerances.
 2. Splice members only where indicated and accepted on shop drawings.
 3. Do not enlarge unfair holes in members by burning or by use of drift pins. Ream holes that must be enlarged to admit bolts.
 4. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in structural framing unless acceptable to Architect/ Engineer. Finish gas-cut sections equal to a sheared appearance when permitted.
 5. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.
- B. Anchors: Furnish bearing plates and other devices to be built into concrete and masonry construction.
1. Provide unfinished threaded fasteners for anchor bolts unless otherwise noted.
 2. Refer to Division 3 sections for installation of anchors set in concrete.
 3. Refer to Division 4 sections for installation of anchors set in masonry.

3.02 QUALITY CONTROL

- A. A tension calibrator furnished by the erector will be required at the jobsite to be utilized in the tightening of slip-critical bolted joints.
- B. Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.
- C. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with requirements and specifically state any deviations therefrom.
- D. Provide access for testing agency to places where structural steel work is being fabricated produced, or erected so that required inspection and testing can be accomplished.
- E. Testing agency may inspect structural steel at plant before shipment; however, Architect/ Engineer reserves right, at any time before final acceptance, to reject material not complying with specified requirements.
- F. Correct deficiencies in structural steel work which inspections and laboratory test reports

have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to re-confirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

END OF SECTION

SECTION 05210 - STEEL JOISTS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: Extent of steel joists is shown on drawings including basic layout and type of joists required.
- B. Related Work:
 - 1. Documents affecting work of this Section include but are not necessarily limited to, General Conditions, Supplementary Conditions and Division 1 of these Specifications.

1.02 QUALITY ASSURANCE

- A. Provide joists fabricated in compliance with the following, and as herein specified.
 - 1. Steel Joist Institute (SJI) "Standard Specifications for Open Web Steel Joists, K Series"
- B. Qualification of Field Welding: Qualify Welding processes and welding operators in accordance with American Welding Society "Structural Welding Code", AWS D1.1.
- C. Inspection: Inspect joists in accordance with applicable SJI specifications.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications and installation instructions for each type of joist and all accessories. Include manufacturer's certifications that joists comply with applicable SJI Specifications.
- B. Shop Drawings: Submit detailed drawings showing layout of joist units, special connections, joining and accessories. Include mark, number, type, location and spacing of joists and bridging.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle steel joists as recommended in SJI Technical Digest No. 9 "Handling and Erection of steel joists". Handle and store joists in a manner to avoid deforming members and to avoid excessive stresses.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel: Comply with applicable SJI Specifications.

- B. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular hexagon type, low carbon steel.
- C. High-Strength Threaded Fasteners: ASTM A325 or A490 heavy hexagon structural bolts with nuts and hardened washers.
- D. Steel Prime Paint: Comply with applicable SJI Specifications.

2.02 FABRICATION

- A. General: Fabricate steel joists in accordance with applicable SJI Specifications.
- B. Joist Seat Rollover Capacity: Joist seats shall be designed and fabricated to furnish a minimum ultimate rollover capacity of 5000 pounds and a minimum rollover capacity at service loads at .25 inches deflection of 1650 pounds. Rollover capacity to be based on application of load at end of joist extension.
- C. Extended Ends: Provide extended ends on joists where shown, complying with manufacturer's standards and requirements of applicable SJI Specifications.
- D. Bridging: Provide horizontal or diagonal type bridging for joists, complying with applicable SJI Specifications.
 - 1. Provide bridging anchors for ends of bridging lines terminating at walls or beams.
- E. Header Units: Header units to support tail joists at openings in floor and roof systems shall be provided in Section 5120 unless otherwise indicated.
- F. Shop Painting: Remove loose scale, slag, rust, and other foreign materials from fabricated joists and accessories before application of shop paint.
 - 1. Apply one shop coat of steel prime paint to joists and accessories by spray, dipping, or other methods to provide a continuous dry paint film thickness of not less than 0.50 mil.

PART 3 - EXECUTION

3.01 ERECTION

- A. Place and secure steel joists in accordance with applicable SJI Specifications, final shop drawings, and as herein specified.
- B. Anchors: Bearing plates and other devices to be built into concrete and masonry construction shall be provided in Section 5120.
- C. Placing Joists: Do not start placement of steel joists until supporting work is in place and secured. Place joists on supporting work, adjust and align in accurate locations and spacing before permanently fastening.
 - 1. Provide temporary bridging, connections, and anchors to ensure lateral stability

during construction.

2. Where "open web" joist lengths are 40 feet and longer, install a center row of bolted bridging to provide lateral stability before slackening of hoisting lines.
- D. Bridging: Install bridging simultaneously with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams.
- E. Fastening Joists:
1. Field weld joists to supporting steel framework in accordance with SJI Specifications and as noted on the drawings. Coordinate welding sequence and procedure with placing of members.
 2. Bolt joists to supporting steel framework in accordance with SJI Specifications and as noted on the drawings. Provide high-strength threaded fasteners for bolted connections of steel joists to steel columns and at other locations where shown, installed in accordance with AISC "Specifications for Structural Joints Using ASTM A325 or A490 Bolts". Bolts shall be installed with hardened washers under the element turned in tightening bolts to facilitate verification inspection.

3.02 TOUCH-UP PAINTING

- A. After joist installation, paint field bolt heads and nuts and welded areas, abraded or rusty surfaces on joists and steel supporting members. Wire brush surfaces and clean with solvent before painting. Use same type of paint as used for shop painting.

3.03 QUALITY CONTROL

- A. Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.
- B. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with requirements and specifically state any deviations therefrom.
- C. Provide access for testing agency to places where work is being fabricated, produced, or erected, so that required inspection and testing can be accomplished.
- D. Testing agency may inspect work and materials at plant before shipment; however, Architect/ Engineer reserves right, at any time before final acceptance, to reject material not complying with specified requirements.
- E. Correct deficiencies in work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to re-confirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

END OF SECTION

SECTION 05300 - METAL DECKING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Extent of metal decking is indicated on drawings, including basic layout and type of deck units required.
- B. Related Work:
 - 1. Documents affecting work of this Section include but are not limited to, General Conditions, Supplementary Conditions and Division 1 of these Specifications.

1.02 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following codes and standards, except as otherwise indicated or specified:
 - 1. AISI "Specification for the Design of Cold-Formed Steel Structural Members"
 - 2. AWS D1.3 "Structural Welding Code - Sheet Steel"
 - 3. SDI "Design Manual for Floor Decks and Roof Decks"
- B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with "Welder Qualification" procedures of AWS D1.1.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications and installation instructions for each type of decking and accessories. Include manufacturer's certification as may be required to show compliance with these specifications.
- B. Shop Drawings: Submit detailed drawings showing layout and types of deck panels, anchorage details, and conditions requiring supplementary framing, sump pans, special jointing or other accessories.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel for Painted Metal Deck Units: ASTM A611, Grade C.
- B. Miscellaneous Steel Shapes: ASTM A36.
- C. Sheet Metal Accessories: ASTM A526, commercial quality, galvanized.
- D. Galvanizing: ASTM A525, Grade 60.
- E. Galvanizing Repair Paint: High zinc-dust content paint for repair of damaged

galvanized surfaces complying with Military Specifications MIL-P-21035 (Ships).

- F. Paint: Manufacturer's baked-on, rust-inhibitive paint, for application to metal surfaces which have been chemically cleaned and phosphate chemical treated.

2.02 FABRICATION

- A. General: Form deck units in lengths to span 3 or more supports with flush, telescoped or nested 2" laps at ends and interlocking or nested side laps, unless otherwise indicated.
- B. Roof Deck Units: Provide deck configurations complying with SDI "Roof Deck Specifications", of metal thickness, depth and width as shown.
- C. Roof Sump Pans: Fabricate from single piece of 0.071" minimum (14 gauge) galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain, unless otherwise shown. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3" wide. Recess pans not less than 1-1/2" below roof deck surface, unless otherwise shown or required by deck configuration. Holes for drains will be cut in the field.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Install deck units and accessories in accordance with manufacturer's recommendations and final shop drawings, and as specified herein.
1. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.
 2. Place deck units in straight alignment for entire length of run.
 3. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.
 4. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
 5. Do not use floor deck units for storage or working platforms until permanently secured.
- B. Fastening Deck Units:
1. Fasten roof deck units to steel supporting members by not less than 5/8" diameter fusion welds or elongated welds of equal strength, spacing where required for lateral force resistance. In addition secure deck to each supporting member in ribs where side laps occur.
 2. Comply with AWS requirements and procedures for manual shielded metal arc

welding appearance and quality of welds, and methods used in correcting welding work. Use welding washers where recommended by deck manufacturer.

3. Mechanically fasten side laps of adjacent deck units at supports and at midpoint between supports at intervals not exceeding 36" o.c., using self-tapping No. 12 or larger machine screws.
 4. Uplift Loading: Install and anchor roof deck units to resist gross uplift loading of 45 lbs. per square foot at eave overhang and 30 lbs. per square foot for other roof areas.
- C. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking as shown.
- D. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other work shown.
- E. Roof Sump Pans: Place over openings provided in roof decking and weld to top decking surface. Space welds not more than 12" o.c. with at least one weld at each corner. Cut opening in roof sump bottom to accommodate drain size indicated.

3.02 TOUCH-UP PAINTING

- A. After decking installation, wire brush, clean and paint scarred areas, welds and rust spots on top and bottom surfaces of decking units and supporting steel members.
1. Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.
 2. Touch-up painted surfaces with same type of shop paint used on adjacent surfaces.
 3. In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.

END OF SECTION

SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 Summary

A. Section Includes:

1. Exterior and interior nonload-bearing stud framed walls and curtainwalls.

B. Products Supplied But Not Installed Under This Section:

1. Anchor Bolts.

C. Related Sections:

1. 05120 - Structural building frame
2. 04200 - Masonry veneer
3. 07210 - Building Insulation
4. 09110 - Non-Load-Bearing Wall Framing
5. 09250 - Gypsum Board

1.02 System Requirements

A. Performance Requirements:

1. Size components to withstand design loads as shown on Drawings, and following deflection limits:
 - a. Exterior Non-Load-Bearing Curtainwall: horizontal deflection of 1/600 of wall height.

1.03 Submittals

A. Reference Section 01300 - Submittal Procedures; submit following items:

1. Product Data.
2. Shop Drawings: Show wall sections coordinated with Drawings showing framing, accessories, anchorage, and connection details.
3. Quality Assurance/Control Submittals:
 - a. Qualifications: Proof of manufacturer, installer, and welder qualifications.
 - b. Structural Design Calculations.
 - c. Certificates:
 - 1) Mill certificates signed by framing member/accessory manufacturer certifying compliance with material requirements.
 - 2) Welder certificates.

- d. Manufacturer's Installation Instructions for framing members and framing accessories.

B. Closeout Submittals: Reference Section 01700 - Closeout Submittals; submit following items:

- 1. Record Drawings.

1.04 Quality Assurance

A. Overall Standards:

- 1. Calculate structural properties of cold-formed metal framing and accessories in accordance with AISI "Specification for the Design of Cold-Formed Steel Structural Members."
- 2. Provide structural design calculations sealed and signed by a Professional Engineer licensed in the state where the Project is located.
- 3. Welding Standards: Comply with AWS D1.1 "Structural Welding Code-Steel," and AWS D1.3 "Structural Welding Code-Sheet Steel."

B. Qualifications:

- 1. Manufacturers' Qualifications: Minimum five years experience in producing products of the type specified.
- 2. Installer Qualifications: Minimum three years experience in installation of the type of products specified.
- 3. Welder Qualifications: Current AWS Certificates for welding processes required.

1.05 Delivery, Storage, and Handling

- A. Reference Section 01620 - Product Storage and Handling Requirements.
- B. Follow manufacturer's instructions.

PART 2 - PRODUCTS

2.01 Manufacturers

- C. Studs, Tracks, Joists, Trusses: Any manufacturer complying with requirements specified herein.

2.02 Framing Members

- A. Studs: ASTM A 653/653 M steel, galvanized, channel shaped with lipped flanges, punched web, size as shown on Drawings.
- B. Tracks: ASTM A 653/653 M steel, same designation, coating, and thickness as studs except as otherwise noted, channel shaped, solid web, depth compatible with studs, size, thickness and grade as required by structural design calculations.

2.03 Framing Accessories

- A. Material: ASTM A 653 steel; SS Grade 50 (340), Class 1, 50 ksi (340 MPa) minimum yield strength, 65 ksi (450 MPa) minimum tensile strength, G60 (Z180) hot-dipped galvanized coating, except as otherwise noted.
- B. Stamp manufacturer's name on each accessory item.
- C. Provide screws with accessories designated for screw attachment.
- D. Connector Devices:
 - 1. Vertical Deflection Clips: VertiClip®, including step bushings. Rigid attachment to structure and screw attachment to stud web using step-bushings to permit frictionless vertical movement. 68 mils minimum thickness, size as noted.
 - 2. Drift System Clips: DriftClip™, including step bushings. 68 mils (1.72 mm) minimum thickness, size as required by structural design calculations.
 - a. Screw attachment to stud web using step-bushings to permit frictionless vertical movement.
 - b. Screw attachment to structure using step-bushings to permit frictionless movement in the plane of the wall.
 - 3. Rigid Clip Angles: StiffClip™. Rigid attachment to structure and stud web.
 - 4. Floor Ties: Floor to floor strap ties, 2 inches thick. Screw attachment to stud flanges. Length as required by structural design calculations.
 - 5. Hip Angle-135 degree: Rigid attachment to webs of hip framing members. Length and thickness as required by structural design calculations.
 - 6. Roof Ties: Fabricate for screw attachment to joist web and top track/stud flanges. Size and thickness as required by structural design calculations.

E. Bridging:

1. Cold rolled Channel: 1-1/2 by 1/2 inch by 56 mil thick.
 - a. Bridging Clip: BridgeClip®. Provide attachment through stud punch-out clamping onto stud web and wrapping around bridging channel. Provide holes for screw attachment to stud web and channel.
2. Flat Strap. Width and thickness as required by structural design calculations. Rigid attachment to stud flange.
3. Solid Bridging: Channel shaped bridging with lipped flanges and integral formed clips. Screw attachment to stud. 33 mils minimum thickness, size as required by structural design calculations.
4. Cross Bridging: Fabricate members for specific joist depth and spacing with one screw to each joist flange and one to each joist web. Provide bridging sized to joist depth and spacing, 36 mils minimum thickness, as required by structural design calculations.

F. Miscellaneous Items:

1. Joist Hangers: Rigid attachment to structure and joist web, 68 mils (1.72 mm) thick. Provide hanger type and size as required by structural design calculations.
2. Joist Plate: Hole reinforcing plates designed for screw attachment to joist or stud webs. Provide size and thickness as required by structural design calculations.
3. Web Stiffeners: Channel shaped stiffener. Screw attachment to joist or stud webs. Provide size and thickness as required by structural design calculations.

2.04 Fasteners

- A. Screws: Corrosion resistant coated, self-drilling, pan or hex washer head. Provide screw type and size as required by structural design calculations, or as recommended by The STEEL Network for the specific condition and thickness of materials being joined.
- B. Anchor Bolts and Studs: ASTM A 307, Grade A, carbon steel, with hex-head carbon steel nuts and flat steel washers. Hot-dip zinc coated in accordance with ASTM A 153. Provide bolt or stud type and size as required by structural design calculations.
- C. Expansion Anchors: Federal Specification FF-S-325, Group II, Type 4, Class 1. Provide bolts listed or approved by one or more of the following and of diameter and length as required by structural design calculations.

1. International Conference of Building Officials.
- D. Powder Actuated Fasteners: Federal Specification FF-P-395b. Manufacturer from AISI 1062 or 1065 steel, austempered to a minimum core hardness of 50 to 54 HRC and zinc plated in accordance with ASTM B 633. Provide fasteners listed or approved by one or more of the following and of type, diameter and length as required by structural design calculations:
 1. International Conference of Building Officials.

2.05 Miscellaneous Materials

- A. Galvanizing Repair Compound: SSPC-Paint 20, spray-can applicator.

2.06 Fabrication

- A. Shop Assembly: Fabricate assemblies to size and configuration required; fitted and connected to meet design requirements.
 1. Assemble in largest practical sections for delivery to site.
 2. Reinforce and brace assemblies to withstand handling stresses.

PART 3 - EXECUTION

3.01 Examination

- A. Examine substrates upon which work will be installed.
- B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.
- C. Commencement of work by installer is acceptance of substrate.

3.02 General Installation

- A. Install cold-formed metal framing plumb, square, true to line and securely fastened as required by structural design calculations.
- B. Following manufacturer's installation instructions. If installation instructions conflict with these specifications or Drawings, adhere to specifications or Drawings.
- C. Cut members by shearing or sawing.

- D. Install members in single piece lengths except that tracks may be spliced, butt-welded, or each length anchored to a common building frame element.
- E. Install insulation in framing spaces of insulated assemblies made inaccessible after erection.
- F. Repairs and Touch-Up: Clean damaged surfaces and coatings. Touch-up field welds and damaged galvanized surfaces with galvanizing repair compound.
- G. Tolerances:
 - 1. Variation from plumb, level, and true to line: 1/8 inch in 10 feet (1:960).
 - 2. Member Spacing: Not more than 1/8 inch (3 mm) plus or minus from spacing indicated.

3.03 Framing Member Installation

- A. Studs:
 - 1. Secure bottom and top tracks in place as required by structural design calculations.
 - 2. Install studs at spacing as shown on Drawings, at each side of openings, and not more than 2 inches from abutting walls.
 - a. Frame corners with three studs.
 - b. Frame wall openings wider than stud spacing with double stud at each jamb.
 - 3. Install supplementary framing or blocking to support work attached to framing. Where type of support is not shown, comply with industry standards.

3.04 Framing Accessory Installation

- A. Install accessories as required by structural design calculations. Provide appropriate fasteners in all predrilled holes backed by another framing member.
 - 1. Bridging Clip for Cold Rolled Channel Bridging: Secure to stud web by inserting tabs through web slots and with 2 screws. Secure to channel with one screw.

3.05 Cleaning

- A. Reference Section 01740-Cleaning.

End of Section

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.01 Related Documents

- A. Drawings and general provisions of Contract, including Supplementary Conditions and Division - 1 specification sections, apply to Work of this Section.

1.02 Description of Work

- A. Definition: Metal fabrications include items made from iron shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere.
- B. Types of work in this section include metal fabrications for:
 - 1. Rough Hardware.
 - 2. Loose bearing and leveling plates.
 - 3. Loose steel lintels.
 - 4. Steel pipe railings.
 - 5. Steel ladders.
 - 6. Miscellaneous framing and supports.
 - 7. Steel tread plates.
- C. The Drawings and Specifications cover the major requirements only. The supplying of fastenings, accessory features, and other items not mentioned specifically, but which are necessary to make a complete installation shall be included.
- D. Comply with provisions of Section 01028 - Modification Requirements.

1.03 System Performances

- A. Structural Performances: Provide assemblies which, when installed, comply with the following minimum requirements for structural performance, unless otherwise indicated.
 - 1. Treads and Platforms of Steel Stairs: Capable of withstanding a uniform load of 100 lb. per sq. ft. or a concentrated load of 300 lbf so located as to produce maximum stress conditions.
 - 2. Handrails and Toprails: Capable of withstanding the following loads applied as indicated when tested per ASTM E 935.
 - a. Concentrated loads of 200 lbf applied at any point in any direction.
 - b. Uniform load of 50 lb. per linear ft. applied simultaneously in both vertical and horizontal directions.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.

1.04 Quality Assurance

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.
- B. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units reassembly and coordinated installation.

1.05 Submittals

- A. Product Data:
 - 1. Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.
- B. Shop Drawings:
 - 1. Submit shop drawings for fabrication and erection of miscellaneous metal fabrications not completely shown by manufacturer's product data. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others.
 - 2. Where material of fabrications are indicated to comply with certain requirements for design loadings, include structural computations, material properties and other information needed for structural analysis.

1.06 Delivery, Storage and Handling

- A. Comply with pertinent provisions of Section 01620.

PART 2 - PRODUCTS

2.01 Materials

- A. Metals:
 - 1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
 - 2. Steel Plates: Shapes and Bars: ASTM A 36.
 - 3. Steel Tubing: Cold formed ASTM A 500; or hot-rolled, ASTM A 501.
 - 4. Structural Steel Sheet: Hot-rolled, ASTM A 570; or cold-rolled ASTM A 611, Class 1; of grade required for design loading.

5. Galvanized Structural Steel Sheet: ASTM A 446, of grade required for design loading. Coating designation as indicated, or if not indicated, G90.
6. Steel Pipe: ASTM A 53; Type and grade (if applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (schedule 40), unless otherwise indicated.
7. Steel Bar Grating: ASTM A569 or ASTM A36.
8. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
9. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.
10. Gray Iron Castings: ASTM A48, Class 30.
11. Malleable Iron Castings: ASTM A47, Grade as selected by Fabricator.

B. Grout:

1. Non-Metallic Non-Shrink Grout: Pre-mixed factory packages, nonstaining, non-corrosive, non-gaseous grout complying with CE CRD-C588. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

C. Fasteners:

1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.
2. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade E.
3. Machine Screws: Cadmium plated steel, FS FF-S-92.
4. Wood Screws: Flat head carbon steel, FS FF-S-111.
5. Plain Washers: Round, carbon steel, FS FF-W-92.
6. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
7. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.
8. Lock Washers: Helical spring type carbon steel, FS FF-W-84.
9. Lag Bolts: Square head type, FS FF-B-561.

D. Paint:

1. Metal Primer Paint: Red lead mixed pigment, alkyd varnish, linseed oil paint, FS TT-P-86, Type II; or red lead iron oxide, alkyd paint, Steel Structures Painting Council (SSPC) Paint 2-64; or basic lead silica chromate base iron oxide, alkyd paint, FS TT-P-615, Type II.
2. Primer selected must be compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Division 9.
3. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, complying with the Military Specifications MIL-P-21035 (Ships).

2.02 Fabrication, General

A. Workmanship:

1. Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions shown or accepted on shop drawings, using proven details of fabrications and support. Use type of materials shown or specified for components of work.
2. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise shown. Form bent metal corners to smallest radius possible without causing grain or otherwise impairing work.
3. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.
4. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown or, if not shown, Phillips flat-head (countersunk) screws or bolts.
5. Provide for anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
6. Cut, reinforce, drill and tap miscellaneous work as indicated to receive finish hardware and similar items.

B. Galvanizing:

1. Provide a zinc coating for those items shown or specified to be galvanized, as follows:
 - a. ASTM A 153 for galvanizing iron and steel hardware.
 - b. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8" thick and heavier.
 - c. ASTM A 386 for galvanizing assembled steel products.
2. Fabricate joints which will be exposed to weather in a manner to exclude water or

provide weep holes where water may accumulate.

C. Shop Painting:

1. Shop paint miscellaneous metal work, except members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, and galvanized surfaces, unless otherwise indicated.
2. Remove scale, rust and other deleterious materials before applying shop coat. Clean off heavy rust and loose mill scale in accordance with SSPC SP-2 "Hand Tool Cleaning," or SSPC SP-3 "Power Tool Cleaning," or SSPC SP-7 "Brush-Off Blast Cleaning".
3. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning".
4. Immediately after surface preparation, brush or spray on primer in accordance with manufacturer's instructions, and at a rate to provide uniform dry film thickness of 2.0 mils for each coat. Using painting methods which will result in full coverage of joints, corners, edges and exposed surfaces.
5. Apply one shop coat to fabricated metal items, except apply 2 coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

2.03 Miscellaneous Metal Fabrication

A. Rough Hardware:

1. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures.
2. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

B. Loose Bearing and Leveling Plates:

1. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete constructions, made flat, free from wraps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for groutings as required. Galvanize after fabrication.

C. Loose Steel Lintels:

1. Provide loose structural steel lintels for openings and recesses in masonry walls and partitions as shown. Weld adjoining members together to form a single unit where indicated. Provide not less than 8" bearing at each side of openings, unless otherwise indicated.

2. Galvanize loose steel lintels to be installed in exterior walls.
- D. Miscellaneous Framing and Supports:
1. Provide miscellaneous steel framing and supports which are not a part of structural steel framework, as required to complete work.
 2. Fabricate miscellaneous units to sizes, shapes and profiles shown or, if not shown, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.
 3. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
 - a. Except as otherwise shown, space anchors 24" o.c. and provide minimum anchor units of 1¼" x ¼" x 8" steel straps.
 4. Galvanize exterior miscellaneous frames and supports.
- E. Steel Pipe Railings and Handrails:
1. Fabricate steel pipe railings and handrails to design, dimensions, and details indicated. Provide railings and handrails members formed of pipe of sizes and wall thickness indicated, or if not shown, as required to support design loading.
 2. Interconnect railing and handrail members by butt welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.
 - a. At tee and cross intersections provide coped joints.
 - b. At bends interconnect pipe by means of prefabricated elbow fittings or flush radius bends, as applicable of radiuses indicated.
 - c. Form bends by use of prefabricated elbow fittings and radius bends or by bending pipe, at fabricator's option.
 3. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of pipe throughout entire bend without buckling, twisting or otherwise deforming exposed surfaces of pipe.
 4. Provide wall returns at ends of wall-mounted handrails, except where otherwise indicated.
 5. Close exposed ends of pipe by welding 3/16" thick steel plate in place or by use of prefabricated fittings.
 6. Brackets, Flanges, Fittings and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings and anchors for interconnections of pipe and

attachment of railings and handrails to other work. Furnish inserts and other anchorage for connecting railings and handrails to concrete or masonry work.

F. Ladders:

1. Fabricate ladder for the locations as shown, with dimensions, spacings, details and anchorages as indicated. Comply with the requirements of ANSI A 14.3, except as otherwise indicated.
 - a. Provide $\frac{1}{2}$ " x $2\frac{1}{2}$ " continuous structural steel flat bar side rails with eased edges, spaced 18" apart.
 - b. Provide $\frac{3}{4}$ " diameter solid structural steel bar rungs, spaced 12" o.c.
2. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.
3. Support each ladder at top and bottom and at intermediate points spaced not more than 5'-0" o.c. Use welded or bolted steel brackets, designed for adequate support and anchorage, and to hold the ladder clear of the wall surface with a minimum of 7" clearance from wall to centerline of rungs. Extend rails 42" above rung at upper level.
4. Galvanize exterior ladders, brackets and fasteners.

H. Miscellaneous Steel Trim:

1. Provide shapes and sizes for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes and plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination assembly and installation with other work.

PART 3 - EXECUTION

3.01 Preparation

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrications might delay work.
- B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.02 Installation

A. General:

1. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from

established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry, or similar construction.

2. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
3. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

B. Setting Loose Plates:

1. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
2. Set loose leveling and bearing plates on wedges, or other adjustable devices: After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with the edge of the bearing plate before packing with grout. Use non-metallic, non-shrink grout unless otherwise indicated.

C. Steel Pipe Railings and Handrails:

1. Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building constructions as follows.
2. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1½" clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required for design loading. Secure wall brackets and wall return fittings to building construction as follows:
 - a. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
 - b. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
 - c. For hollow masonry anchorage, use toggle bolts having square heads.

3.03 Adjust and Clean

- A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply to brush or spray to provide a minimum dry film thickness of 2.0 mils.

- B. For galvanized surfaces: Clean field welds, bolted connections and abraded areas and apply 2 coats of galvanizing repair paint.

END OF SECTION

Division VI – Wood and Plastic

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.01 Related Documents

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 Description of Work

- A. Definition: Rough carpentry includes carpentry work not specified as part of other sections and which is generally not exposed, except as otherwise indicated.
- B. Types of Work in this Section include rough carpentry for:
 - 1. Wood grounds, nailers and blocking.
 - 2. Wood furring.
 - 3. Plywood backing panels.
- C. Architectural woodwork is specified in another section within Division 6.
- D. Comply with provisions of Section 01028 - Modification Requirements.

1.03 Submittals

- A. Wood Treatment Data: Submit chemical treatment manufacturer's instructions for handling, storing, installation and finishing of treated material.
 - 1. Preservative Treatment: For each type specified, include certification by treating plant stating type of preservative retained and conformance with applicable standards.
 - 2. For water-borne treatment, include statement that moisture content of treated materials was reduced to levels indicated prior to shipment to project site.
 - 3. Fire-Retardant Treatment: Include certification by treating plant that treatment material complies with specified standard and other requirements.

1.04 Product Handling

- A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including black polyethylene and similar material.
 - 1. For lumber and plywood pressure treated with waterborne chemicals, sticker

between each course to provide air circulation.

1.05 Project Conditions

- A. Coordination: Fit carpentry work to other work, scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow attachment of other work.

PART 2 - PRODUCTS

2.01 Lumber General

- A. Lumber standards: Manufacture lumber to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.
- B. Inspection Agencies: Inspection agencies and the abbreviations used to reference with lumber grades and species include the following:
 - 1. NLGA - National Lumber Grades Authority
 - 2. SPIB - Southern Pine Inspection Bureau
 - 3. WGLIB - West Coast Lumber Inspection Bureau
 - 4. WWPA - Western Wood Products Association
- C. Grade Stamps: Factory - mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
- D. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.
 - 1. Provide dressed lumber, S4S, unless otherwise indicated.
 - 2. Provide seasoned lumber with 19% maximum moisture content at time of dressing and shipment for sizes 2" or less in nominal thickness, unless otherwise indicated.

2.02 Dimension Lumber

- A. Provide wood for support or attachment of other work including bucks, nailers, blocking, furring, grounds, stripping and similar members. Provide lumber of sizes indicated, worked into shapes shown, and as follows:
 - 1. Moisture content: 19% maximum for lumber items not specified to receive wood preservative treatment.

- B. Grade: Standard Grade light framing size lumber of Spruce-Pine-Fir graded under WWPFA, or Southern Pine graded under S.P.B. rules.

2.03 Plywood

- A. Trademark: Factory-mark each construction panel with APA trademark evidencing compliance with grade requirements.
- B. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant treated plywood panels with grade designation, APA C-D PLUGGED INT with exterior glue, in thickness indicated, or, if not otherwise indicated, not less than $\frac{3}{4}$ ".

2.04 Miscellaneous

- A. Fasteners and Anchorages: Provide size, type, material, and finish as indicated and as recommended by applicable standards, complying with applicable Federal Specifications for nails, screws, bolts, nuts, washers, and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommend nails. Supplement fasteners for fascia framing with Simpson or Teco galvanized metal connectors as required.
 - 1. Where rough carpentry work is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating (ASTM A153).
- B. Building Paper: ASTM D226, Type I; asphalt saturated felt, non-perforated, 15 lb. type.

2.05 Wood Treatment by Pressure Process

- A. Preservative Treatment: Where lumber or plywood is indicated as "Trt-Wd" or "Treated," or is specified herein to be treated, comply with applicable requirements of AWPFA Standards C2 (Lumber and C9 Plywood) and of AWPB Standards listed below. Mark each treated item with the AWPB Quality Mark Requirements.
 - 1. Pressure-treat above-ground items with water-borne preservatives to comply with AWPB LP-2. After treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19% and 15%. Treat indicated items and the following:
 - a. Wood nailers, curbs, blocking stripping, and similar members in connection with roofing and flashing.
 - b. Wood blocking, furring, stripping and similar concealed members in contact with masonry or concrete.

- B. Complete fabrication of treated items, prior to treatment, where possible. If cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment and to comply with AWWPA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.
- C. Fire-Retardant Treatment: Where fire retardant treated wood ("FRTW") is indicated, pressure impregnate lumber and plywood with fire-retardant chemicals to comply with AWWPA C20 and C27, respectively, for treatment type indicated below; identify "FRTW" lumber with appropriate classification marking of Underwriters Laboratories, Inc., U.S. Testing, Timber Products Inspection or other testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. FRTW wood shall be wood used on front wood trusses with FRTW 5/8" plywood sheathing.
 - 2. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.
 - 3. All exterior and interior lumber and plywood shall be fire-resistant treated.

PART 3 - EXECUTION

3.01 Installation, General

- A. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.
- B. Set carpentry work to required levels and lines, with members plumb and true and accurately cut and fitted.
- C. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards.
- D. Use common wire nails, except as otherwise indicated. Use finishing nails for finish work. Select fasteners of size 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 of wood; predrill as required.

3.02 Wood Grounds, Nailers, and Blocking

- A. Provide wherever shown and where required for screening or attachment of other work. Form to shapes as shown and cut as required for true and level of work to be attached. Coordinate location with other work involved.
- B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise shown. Build into masonry during installation of masonry work. Where possible, anchor to form work before concrete placement.

3.03 Plywood Panels

- A. *General: Comply with applicable recommendations contained in Form No. E 30D "APA Design/Construction Guide - Residential & Commercial," for types of construction panels and applications indicated.*

END OF SECTION

SECTION 06200 - FINISH CARPENTRY

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Finish carpentry items, other than shop prefabricated casework.
- B. Hardware and attachment accessories.

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Section 06400 - Architectural Woodwork.

1.03 RELATED SECTIONS

- A. Section 06400 - Architectural Woodwork: Plastic laminate window stools.
- B. Section 06100 - Wood Blocking.

1.04 REFERENCES

- A. ANSI A135.4 - Basic Hardboard.
- B. ANSI A208.1 - Mat Formed Wood Particleboard.
- C. ASTM E84 - Test Method for Surface Burring Characteristics of Building Materials.
- D. AWI - Quality Standards.
- E. AWP (American Wood Preservers Association) C2 - Lumber, Timbers, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes.
- F. AWP (American Wood Preservers Association) C20 - Structural Lumber Fire Retardant Treatment by Pressure Process.
- G. BHMA A156.9 - Cabinet Hardware.
- H. FS MMM-A-130 - Adhesive, Contact.
- I. HPMA (Hardwood Plywood Manufacturer's Association) HP - American Standard for Hardwood and Decorative Plywood.
- J. NEMA (National Electric Manufacturers Association) LD3 - High Pressure Decorative Laminates.
- K. NHLA (National Hardwood Lumber Association).
- L. NWWDA (National Wood Window and Door Association) I.S.4 - Water Repellent

Preservative Treatment for Millwork.

M. PS 1 - Construction and Industrial Plywood.

N. PS 20 - American Softwood Lumber Standard.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with AWI Custom.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01620.

B. Protect work from moisture damage.

1.07 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.08 COORDINATION

A. Coordinate work under provisions of Section 01039.

B. Coordinate the work with plumbing and electrical rough-in, installation of associated and adjacent components.

PART 2 - PRODUCTS

2.01 LUMBER MATERIALS

A. Hardwood Lumber: Use poplar when specified to be stained. Stain to match Architect's sample (same sample used for doors), maximum moisture content of 6 percent; with flat grain, of quality suitable for transparent finish.

2.02 PLASTIC LAMINATE MATERIALS

A. Plastic Laminate: NEMA LD 3, GP-50 General Purpose type; color, pattern, and surface texture as selected to match receptionist cabinetry.

2.03 FASTENERS

A. Fasteners: Of size and type to suit application.

B. Concealed Joint Fasteners: Threaded steel.

2.04 ACCESSORIES

- A. Lumber for Shimming and Blocking: Softwood lumber of Pine species.
- B. Wood Filler: Base and tint to match surface finish material and color.

2.06 FABRICATION

- A. Fabricate to AWI Custom standards.
- B. Shop assemble work for delivery to site, permitting passage through building openings.
- C. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- 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 laminate backing sheet to reverse side of plastic laminate finished surfaces.

2.07 FINISHING

- A. Sand work smooth and set exposed fasteners.
- B. Apply wood filler in exposed fastener indentations.
- C. On items to receive transparent finishes, use wood filler which matches surrounding surfaces and of types recommended for applied finishes.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

- A. Install work in accordance with AWI Custom Quality Standard.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (1 mm). Do not use additional overlay trim to conceal larger gaps.
- D. Clean and advise Contractor of final protection and maintained conditions.

END OF SECTION

SECTION 06400 - PLASTIC LAMINATE CASEWORK AND COUNTERTOP'S

PART 1 - DESCRIPTION

- A. Furnish and install plastic laminate casework and countertops as shown on the drawings and specified herein.
- B. Work included:
 - 1. Casework - plastic laminate faced.
 - 2. Plastic laminate covered countertops for wood and laminate casework.
 - 3. Plastic laminate covered shelves.
 - 4. Standard hardware and accessories.
 - 5. Plastic laminate window stools throughout building at exterior windows as detailed.
- C. Related work specified elsewhere:
 - 1. Rough carpentry: Section 6100
 - 2. Finish carpentry: Section 6200
 - 3. Gypsum Drywall: Section 9250
 - 4. Resilient base: Section 9650
 - 5. Mechanical work: Division 15
 - 6. Electrical work: Division 16
 - 7. Metal casework: Section 11600

PART 2 - QUALITY ASSURANCE

- A. Custom plastic laminate faced casework shall match in design, material, finish and detail the stock plastic laminated casework. The materials, workmanship and installation of all casework provided under this section shall be the responsibility of this contractor.
 - 1. The contractor providing the work described herein, may be a custom casework contractor with a casework manufacturer as a subcontractor/supplier; or a stock casework with a custom casework manufacturer as a subcontractor/supplier.
- B. Any casework manufacturers requesting approval shall provide to architect, all information and specifications of the products they wish to use in bidding, ten days prior to bid date. Approval will be contingent upon whether the products meet the required specifications.
- C. The architect reserves the right to disapprove any subcontracting fabricator proposed for this project. The casework contractor shall submit to the architect, prior to fabrication, a letter signed by a responsible officer of the fabricator indicating satisfactory evidence of having completed comparable work for the past five years on similar projects utilizing equipment, methods and workmanship meeting the standards specified in this section.
- D. If requested by the architect, manufacturers requesting approval shall submit full size production line samples of the following units at least ten days prior to bid opening.
 - 1. One cabinet base unit, 36" wide with door and drawer, complete with laminate top to fit.

E. Reference standards:

1. Architectural Woodworking Institute (AWI) "Quality Standards".
2. National Electrical Manufacturers Association (NEMA) "LD 1 thru LD3" High Pressure Decorative Laminates.
3. Federal Specifications (FS) "LLL-H-00810: Building Board (Hardboard), Hard Pressed, Vegetable Fiber".
4. American National Standard (ANSI) A208.1-79 "Mat-Formed Wood Particleboard".
5. Commercial Standards (CS) "C.S. 35: Adhesives".

PART 3 - SUBMITTALS

- A. Certifications: Letter of subcontractor's qualifications and experience within the past five years and references of work completed.
- B. Color Selection: Complete range of color, textures and patterns of the proposed plastic laminate manufacturer, based upon the preliminary color selections listed hereinafter, with architect's approval. Final approval shall be contingent upon providing colors, textures and patterns matching preliminary selections.
- C. Shop Drawings: Submit shop drawings of items specified herein. Indicate: plan views, elevations, sections and details of each item; location in the building of each item; conditions in relation to adjacent materials and construction; methods of assembling sections; location and installation requirement size(s); shape and thickness of materials, joints and notations of special features; sink locations; and drawings required to illustrate deviations from the contract requirements.
- D. Rough in drawings: submit separate utility rough in drawings which indicate points of connection to each utility involved. Reference dimensions from building components.

PART 4 - PRODUCTS DELIVERY, HANDLING AND STORAGE

- A. Schedule casework for fabrication and delivery to avoid delay in work progress. Delivery to job site shall not be earlier than one month before casework can be installed. Verify delivery date with general trades contractor.
- B. Receive, unload, check, store, protect and distribute materials specified in this section.
- C. Store materials to maintain the moisture content of the wood members between 6% and 15%. Store in areas or rooms with temperatures at 70°F ± 10°F.
- D. Store under cover in a ventilated building not exposed to extreme temperature and humidity changes. Do not store or install casework until concrete, masonry and plaster work is dry.

PART 5 - JOB CONDITIONS

- A. Prior to fabrications of items of casework which are dependent upon building dimensions, take accurate field measurements of location of walls, drop soffits, columns, piers and other applicable building elements. Major discrepancies between dimensions given on the drawings and field dimensions shall be brought to the attention of the general trade's contractor. Compensate for minor dimensional changes so that fabricated items can be delivered to the job, and can be scribed to fit properly.

- B. In no instance shall any casework be stored or installed in any area unless the area is broom clean, closed in and possessing a relative humidity below 50% at 70°F.

PART 6 - WARRANTY

- A. Warranty in writing that defects due to use of improper materials or workmanship in casework provided under this contract for the period of one year from the date of substantial completion of the work, shall be rectified promptly by the casework contractor at his own expense upon notification of condition.

PART 7 - GENERAL

- A. Casework, both stock and custom shall be plastic laminate construction consisting of high-pressure decorative laminate bonded to 3/4" thick particle board.
 - 1. Fabrication shall comply with applicable requirements for "Custom grade" as indicated in Section 400 of the AWI architectural woodwork quality standards and guide specifications.
- B. Cabinet units shall be assembled at the mill, insofar as access openings to installation location will permit. Where items must be built into sections, design the units so they can be assembled at the site into one integral item, with exposed joints flush, tight and uniform. Similar adjoining doors and drawers shall be in alignment and each door and drawer shall operate smoothly, without bind or excessive play.
- C. Casework units shall be complete with bases, shelves, counter and work tops, finish and operating hardware, drawer accessories and miscellaneous accessories as indicated on the drawings and specified herein.
- D. Coordination work:
 - 1. Division 9: Provide physical openings for recessed casework.
 - 2. Section 6100: Provide grounds and blocking necessary for attachment and support of wall mounted casework.
 - 3. Plumbing Prime Contractor: provide lay-in sinks, faucets and fittings; templates for cutouts for installation; provide supply and waste lines including traps to rough in points based on information supplied by the casework contractor; and provide final connections.
 - a. Division 15: Provide stainless steel sinks with integral with tops and backsplashes, include tailpieces, drains and strainers.
 - 4. Electrical prime contractor: provide electrical fixtures and equipment noted on drawings including related boxes, conduit and conductors. Provide electrical components complete, terminating through the back of the casework unit either with a junction box or a 2" conduit stub. Allow conductors to protrude 8" to permit final connection by Division 16.

5. Division 16: Locate rough-ins based on information given on casework rough-in drawings and be responsible for work necessary to make final connections.
6. Division 9650: Apply resilient base to casework after casework has been installed.
7. Division 5500: Provide steel support braces.

E. Definitions shall conform to the following:

1. Exposed portions are those visible from a normal point of view when doors and drawers are closed. Interiors of open cabinets, and open shelving are considered exposed.
2. Semi-exposed portions are those areas not considered exposed, but which are visible from a normal point of view when solid doors and drawers are open. Backs of hinged doors, drawer parts except the exposed exterior front, and shelving in the storage areas are considered semi exposed.
3. Concealed portions include sleepers, web frames, dust panels and other surfaces not visible after installation.

PART 8 - MATERIALS

A. Particle board: 45 lbs. Minimum density and of balance construction, with moisture content less than 8%. Particle board shall conform to ANSI A208.1 and meet or exceed CS-236-66, FS LLL-B-800A and ASTM D1037-78.

1. Surfaces shall be smooth with all chips, shavings or flakes well scoured so that there shall be no visible telegraphing of the core face through the plastic laminate.
2. Square and rectangular cutouts shall have radiused corners not less than ½".
3. At cut edges, exposed or not and where cutouts occur, the edges shall be completely sealed to prevent moisture absorption. Cutouts for pipes shall be round.
4. Meet the following performance requirements: Submit compliance data from the manufacturer prior to fabrication.
 - a. Screw holding face: 371 lbs.
 - b. Modulus of rupture: 2400 psi
 - c. Modulus of elasticity: 450,000 psi
 - d. Internal bond: 90 psi
 - e. Surface hardware: 90 psi

B. Edging: Flat edge design for cabinet body in color matched laminate or PVC. Color as selected by architect.

C. Plastic Laminate: High pressure decorative laminate surfacing material meeting the minimum NEMA Standards for abrasion resistance, heat resistance, stain resistance, moisture resistance, dimensional stability and general rules for fabrication and installation.

1. Plastic laminate materials shall be as selected by the Architect from full product line of national manufacturers such as Formica, Wilsonart, Pionite, Nevamar, Arborite, or an approved equal.
2. Exposed horizontal work surfaces: NEMA GP50, PF (Post-forming) satin surface.
3. Exposed vertical work surfaces: NEMA GP 28 laminate.
4. Semi exposed surfaces: 10 mil polyester laminate in conformance to ASTM D1300, factory bonded at 200 psi at 300°F, minimum. Color shall be manufacturers white.
5. Backing sheet: NEMA BK20 and shall be used where laminate covered work is not restrained from warping or twisting by the method of attachment or by supports. Minimum standard of AWI Custom work shall apply.
6. Bonding adhesive: Water resistant type and as recommended by the approved plastic laminate manufacturer. Plastic laminate shall be applied to the core in the shop, using commercial methods, application and presses.
7. Sealant used for sealing particle board or plywood edges shall be HYBOND 80 by Pierce Stevens Corporation, Safecoat Seal by Dwell Smart, or an approved equal

D. Assembly adhesives used in assembly, installation and other applications, shall be one of the following or an approved equal:

1. HYBOND 80
2. HYBOND WHITE
3. CANPLAST 100

E. Provide hardware as follows: This is not intended to be a complete listing, but as a guide to establish quality:

1. Hinges shall be cast steel cup and hinge concealed hinges #75M5550 by BLUM
 - a. Hinges shall have independent three-way adjustment of doors.
 - b. One pair of hinges per door of 30" or less, one- and one-half pair of hinges per door of 48" and one hinge for every 12" of door over 48".

- c. Each hinge shall be removable by means of a clip mechanism lever attached to the hinge.
 - d. Hinges shall be mounted into corresponding hinge plates.
 - e. Hinges shall have 125 ° free movement of swing and be self-closing within two inches of close.
 - f. Hinges shall have a lifetime warranty against defects from workmanship and materials.
 - g. Hinges shall be installed into door panels by means of a pre-drilled hole and press fitted into panel substrate.
2. Pulls for all doors and drawer fronts shall be manufacturers standard bent wire pull, brushed chrome finish, three-inch centers. Nomenclature for this ABP865-26D by AMEROCK, Yale Locks, or an approved equal.
 3. Drawer slides shall be side mounted, bottom supported, 4-point suspension slides with nylon roller bearing and epoxy coating.
 4. All file drawers shall have either Pendaflex, Decor, file followers, or an approved equal.
 5. All shelf clips shall be BLUM nylon covered steel pin (5mm) that will mount into pre-drilled end panels for a support of at least 250 lbs; Yale, or an approved equal.
 6. Locks, noted on drawings, shall be cam tumbler by NATIONAL LOCK, Yale, or an approved equal.
 7. Clothes rods and mounting flanges shall be Knape-Voght #770 and #734, Hardware Decor, or an approved equal.
 8. Optional sliding doors are mounted on steel tracks and use ball bearing sheaves mounted in the doors.
 9. Grommets shall be spring loaded closure type in assorted sizes.

PART 9 - CONSTRUCTION

- A. All cabinets shall be of 3/4" thick MCP by Domtar, 3/4" thick solid wood by Wellborn or an approved equal, finished ends and dowel pinned to tops, bottoms or backs, shall be laminated with plastic laminate and edged with matching PVC.

1. End panels shall consist of a single panel of MCP drilled and dowel pinned to tops, bottoms or braces by way of fluted hardwood dowel pins nested in white glue.
 2. All cabinet boxes shall be case clamped for a minimum of seven minutes in a Holzer case clamp to insure squareness.
 3. End panels shall be drilled for shelves, bottoms, tops and braces using the 32mm drilling system. All components will be drilled in corresponding patterns.
 4. End panels shall be rabbited at the rear for acceptance of 3/8" thick MCP back. The back will be mounted using mechanical fasteners. The back shall be removable.
 5. End panels shall have integral toe kicks and shall have a front of 3/4" MCP mechanically fastened to the end panels.
- B. Doors shall be of 1 1/16" thick laminated panel products with the front face laminated in the architect's color selection. The semi-exposed side shall be covered by white HPL plastic laminate. The edges shall be covered by PVC or self-edged.
- C. Drawers shall be constructed of 1/2" thick MCP, rabbited, glued and mechanically fastened for a strong bond. Bottoms shall be of 3/8" thick MCP mechanically fastened to the drawer box frame. Top edges shall be covered in white PVC edging. Drawer fronts are same construction as doors. Drawer fronts shall be removable from drawer box for easy alignment. Drawers shall have epoxy coated, nylon roller bearing, side mounted, bottom supported slides by BLUM.
- D. Shelves shall be of 3/4" thick MCP and edged with matching PVC edging. Shelves shall not be constructed over 42" in length.
- E. Braces shall be of 3/4" thick MCP and shall span the width of the cabinet box. Braces shall be edged on visible sides with PVC edging. On sink or range base cabinets the front brace shall be mounted vertically and shall be laminated to match the cabinet exterior.
- F. Backs shall be of 3/8" thick MCP and be rabbited in and mechanically fastened to the end panels.
- G. Wall cabinets shall be of 3/4" thick MCP and shall be dowel pinned in the same manner as the bases. Wall backs are 3/8" thick rabbited and mechanically fastened to end panels.

- H. Finished backs shall be of 3/4" MCP laminated with plastic laminate on face and edged with PVC.
- I. Top supports shall be of 3/4" MCP laminated on both sides and edged with PVC or plastic laminate.

PART 10 - COUNTERTOPS

- A. Countertops and backsplash shall be custom made with square, self-edge and shall be constructed of 3/4" thick medium density fiberboard (MDF) or 45# density particleboard (CS 236-66: Type 1, Grade B, Class 2) covered on all exposed surfaces with horizontal grade 10/HGS, .050" thickness, high pressure laminate as manufactured by a nationally known laminate company.
 - 1. Colors and patterns of plastic laminate shall be as selected by the Architect from full product line of national manufacturers such as Formica, Wilsonart, Pionite, Nevamar and Arborite, or an approved equal.
 - 2. Provide cutouts properly sized and located in tops for sinks and rims by others.
 - 3. Provide end splash, flush with all edges of countertop, where countertop abuts wall surfaces.

PART 11 - BRACING

Where countertops have no casework below for support, bracing or "cleats" shall be constructed 1½" x 1½" x length and covered by GP 28 plastic laminate on all exposed sides. These cleats shall be mounted at walls with mechanical fasteners to support the weight of the countertop.

PART 12 - WINDOW STOOLS

Plastic laminated window stools shall be 22mm moisture-resistant chipboard, Class E1, according to DIN EN 312/5, finished on top, bottom and sides with horizontal grade (HP) high pressure laminate as manufactured by a nationally known laminate company, using moisture-resistant adhesives. Provide sealant to back exposed edge of window stools, and caulk continuously between window and the laminate stool.

Colors and patterns of plastic laminate shall be as selected by the Architect from full product line of national manufacturers such as Formica, Wilsonart, Pionite, Nevamar and Arborite, or an approved equal.

PART 13 - COORDINATION

- B. Coordinate work of this section with related work of other sections as necessary to obtain proper installation of all items.
- C. Verify site dimensions of cabinet location in buildings prior to fabrication.
- D. Do not install casework until all concrete, masonry and plaster work is dry.

PART 14 - INSTALLATION

- A. Installation shall consist of assembling to form complete units, placing, leveling, scribing, trimming and anchoring.
 - 1. Filler between wall and casework shall not exceed 1" unless noted otherwise and shall be recessed 1/16" + from the face of casework.
 - 2. Plastic-laminate covered ceiling enclosures shall be flush with the face of the doors and 1/8" proud on the sides of exposed ends or backs.
- B. Fasten items to building construction as detailed or as otherwise required to provide a secure, permanent installation.
- C. Where fastening spacings or sizes are not shown, use spacings and sizes of bolts, screws, etc., which will develop the full strength of the members being fastened. Thus, failure due to over stress must occur in the members before occurring in the fastenings.
 - 1. Fastening to concrete shall be by anchor bolts embedded in masonry or by self-drilling masonry anchor.
 - 2. Fastening to masonry shall be of similar manner.
 - 3. Fastening to plaster or drywall construction shall be into wood studs or blocking placed there early in the construction. Toggle bolts may be used only in such cases where no blocking can be found, but fasteners must still penetrate solid wall supports for a secure installation.

PART 15 - PROTECTION

Upon installation of casework and countertops, all installed materials shall be covered with appropriate protection from further construction. The General Contractor will be responsible for repairing or replacing any product damaged by subsequent construction and finish work, with no additional cost to the Owner.

End of Section

Division VII – Thermal and Moisture Protection

SECTION 07200 - BUILDING INSULATION

PART 1 - SCOPE

- A. This Section includes all labor, materials, equipment and related items required to complete the work of building insulation as shown on the drawings and as specified.

PART 2 - SUBMITTALS

- A. Certificates of Compliance with applicable Federal Specifications shall be submitted to the architect for approval prior to delivery of any building insulation to the project. "R" values of insulation proposed to be furnished shall be included in certifications.
- B. Samples in duplicate of each type of building insulation shall be submitted to the architect for approval if requested.

PART 3 - MATERIALS

- A. Batt insulation shall be semi-rigid, spun glass fiber blankets enclosed on one side with strong asphalted paper vapor barrier which also forms nailing flanges. Blankets shall be as wide as required to fit into stud, by longest available lengths.
 - 1. Blankets for installation in exterior wall space shall be nominal 6" thick, Fiberglass batt faced (FSK-25)(Class A), having minimum material thermal resistance (R) of 21.
- B. Sound attenuation blankets for areas where noted shall comply with requirements of ASTM C665-84, Type I. Same shall be 3" "Thermofiber", as manufactured by United States Gypsum; 3" "Thermal-Acoustical Batts", as manufactured by Johns-Manville; 3½" "Noise Barrier Batt Insulation", as manufactured by Owens/Corning; or an approved equal.

- C. Sheet vapor retarders. Wrap the building with Tyvek® stucco wrap water-resistant barrier by DuPont or similar product by other manufacturers.

PART 4 - INSTALLATION

- A. Batt insulation shall be installed in stud, in strict accordance with manufacturer's installation instructions, securely fastened to framing members by nailing or stapling, with paper vapor barriers to inside face of stud. Insulation shall have full coverage in spaces involved, with tightly fitted butt joints where necessary and free from voids.
 - 1. Install insulation to the outside of any water piping occurring in exterior walls. In these cases, no insulation shall occur between water piping and wall finish.
- B. Install Vapor Retarder (DuPont Tyvek® stucco wrap water-resistant barrier or approved equal) on the outside face of the exterior gypsum sheathing.

END OF SECTION

SECTION 07212 - BOARD INSULATION

PART 1 - GENERAL

1.01 Work Included

- A. Board insulation at foundation.

1.02 Related Work

- A. Section 04330 - Reinforcement Unit Masonry System

1.03 References

- A. FS HH-I-524 - Insulation Board, Thermal (Polystyrene).

1.04 System Description

- A. Materials of this Section shall provide a continuous thermal barrier at building exterior wall.

PART 2 - PRODUCTS

2.01 Acceptable Insulation Manufacturers

- A. Styrofoam Brand
- B. AMOCO
- C. Foamular - R
- D. Substitutions: Under provisions of Section 01600, 01630.

2.02 Insulation Materials

- A. Insulation Extruded Cellular Polystyrene 2" x 24"; thermal resistance "R" per inch of 5.0; minimum compressive strength of 30 psi water absorption by volume in accordance with ANSI/ASTM D2842 0.3 percent square.

2.03 Acceptable Adhesive Manufacturers

- A. Max Bond, by H.B. Fuller Company
- B. Liquid Nails, LN 601, Macco Adhesives
- C. Foam Adhesive by Franklin Int.

2.04 Adhesive Materials

- A. Adhesive Type recommended by insulation manufacturer for application.

PART 3 - EXECUTION

3.01 Preparation

- A. Verify substrate and adjacent materials and insulation boards are dry and ready to receive insulation and adhesive.
- B. Verify substrate surface is flat, free of honeycomb, fins, irregularities, materials that will impede adhesive bond.
- C. Verify insulation boards are unbroken, free of damage.

3.02 Installation - Perimeter Insulation

End of Section

SECTION 07270 - FIRESTOPPING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide all material, labor, equipment and services necessary to provide firestopping as follows:
 - 1. Through-penetration firestopping in fire rated construction.
 - 2. Construction-gap firestopping at connections in the same or different materials in fire rated construction.
 - 3. Construction-gap firestopping occurring within fire rated wall, floor or floor-ceiling assemblies.
 - 4. Construction-gap firestopping occurring at the top of fire rated walls.
 - 5. Through-penetration smoke-stopping in smoke partitions.
 - 6. Construction-gap smoke-stopping in smoke partitions.
- B. Firestopping specified in other Sections of these specifications:
 - 1. Plumbing Penetrations: Section 15
 - 2. Fire dampers and manufactured devices: Section 15
 - 3. Raceway seals and manufactured electrical devices: Section 16
- C. Alternates: Refer to "Description of Alternates" pages for description of alternates affecting work of this Section.

1.02 REFERENCES

- A. Underwriters Laboratories
 - 1. U.L. Fire Resistant Directory
 - a. Through-penetration firestop devices (XHCR)
 - b. Fire resistance ratings (BXUV)
 - c. Through-penetration firestop systems (XHEZ)
 - d. Fill, void or cavity material (XHHW)
- B. American Society for Testing and Materials Standards:
 - 1. ASTM E814-88: Standard Test Method for Fire Tests of Through-Penetration Firestops.

1.03 DEFINITIONS

- A. Assembly: Particular arrangement of materials specific to given type of construction described or detailed in referenced documents.
- B. Barriers: Time rated fire walls, smoke barrier walls, time rated ceiling/floor assemblies and structural floors.
- C. Firestopping: Methods and materials applied in penetrations and unprotected openings to limit spread of heat, fire, gasses and smoke.
- D. Penetration: Opening or foreign material passing through or into barrier or structural floor such that full thickness of rated materials is not obtained.
- E. Construction Gaps: Gaps between adjacent sections of walls, exterior walls, at wall tops between top of wall and ceiling, and structural floors or roof decks; and gaps between adjacent sections of structural floors.
- F. System: Specific products and applications, classified and numbered by Underwriters Laboratories, Inc., to close specific barrier penetrations.
- G. Sleeve: Metal fabrication or pipe section extending through thickness of barrier and used to permanently guard penetration. Sleeves are described as part of penetrating system in other sections and may or may not be required.

1.04 SYSTEM DESCRIPTION

A. Design Requirements:

1. Fire-rated construction: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of -construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps.
2. Smoke barrier construction: Maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction and at all separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

1.05 SUBMITTALS

- A. Comply with all requirement of Section 01300, Submittals.

1.06 QUALITY ASSURANCE

- A. Installer's qualifications: Firm experienced in installation or application of systems similar in complexity to those required for this Project, plus the following:
 1. Acceptable to or licensed by manufacturer, State or local authority where applicable.
 2. At least two (2) years experience with systems.
 3. Successfully completed at least five (5) comparable scale projects using this system.

- B. Local and State regulatory requirements: Submit forms or acceptance for proposed assemblies not conforming to specific UL Firestop System numbers, or UL classified devices.
- C. Materials shall have been tested to provide fire rating at least equal to that of the construction.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Packing and shipping:
 - 1. Deliver products in original unopened packaging with legible manufacturer's identification.
 - 2. Coordinate delivery with scheduled installation date, allow minimum storage at site.
- B. Storage and protection: Store materials in a clean, dry, ventilated location. Protect from soiling, abuse, moisture and freezing when required. Follow manufacturer's instructions.

1.08 PROJECT CONDITIONS

- A. Existing conditions:
 - 1. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
 - 2. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.
- B. Environmental requirements:
 - 1. Furnish adequate ventilation if using solvent.
 - 2. Furnish forced air ventilation during installation if required by manufacturer.
 - 3. Keep flammable materials away from sparks or flame.
 - 4. Provide masking and drop cloths to prevent contamination of adjacent surfaces by firestopping materials.
 - 5. Comply with manufacturing recommendations for temperature and humidity conditions before, during and after installation of firestopping.

1.09 GUARANTEE

- A. Submit copies of written guarantee agreeing to repair or replace joint sealers which fail in joint adhesions, co-adhesion, abrasion resistance, weather resistance, extrusion

resistance, migration resistance, stain resistance, or general durability or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. The guarantee period shall be one (1) year from date of substantial completion.

PART 2 - PRODUCTS

2.01 THROUGH-PENETRATION STOPPING OF FIRE-RATED CONSTRUCTION

- A. Systems or devices listed in the U.L. Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetrant type, annual space requirements and fire rating involved in each separate instance, and that the system is symmetrical for wall applications. Systems or devices must be asbestos-free.
 - 1. Additional requirements: Withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the U.L. system or device, and designed to perform this function.
 - 2. Acceptable manufacturers and products: Those listed in the U.L. Fire Resistance directory for the U.L. System involved and as further defined in the Systems And Applications Schedule.
 - 3. All firestopping products must be from a single manufacturer. All Trades shall use products from the same manufacturer.

2.02 CONSTRUCTION-GAP FIRESTOPPING OF FIRE-RATED CONSTRUCTION

- A. Firestopping at construction gaps between edges of floor slabs and exterior wall construction.
- B. Firestopping at construction gaps between tops of partitions and underside of structural systems.
- C. Firestopping at construction gaps between tops of partitions and underside of ceiling or ceiling assembly.
- D. Firestopping of control joints in fire-rated masonry partitions.
- E. Firestopping expansion joints.
- F. Acceptable manufacturers and products: Those listed in the U.L. Fire Resistance Directory for the U.L. System involved and as further defined in the Systems and Applications Schedule.

2.03 SMOKE-STOPPING AT SMOKE PARTITIONS

- A. Through-penetration smoke-stopping: Any system complying with the requirements for through-penetration Firestopping in fire-rated construction, as specified in The Systems and Applications Schedule is acceptable, provided that the system includes the

specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded.

- B. Construction-gap smoke-stopping: Any system complying with the requirements for construction-gap Firestopping in fire-rated construction, as specified in the Systems and Applications Schedule is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded.

2.04 ACCESSORIES

- A. Fill, void or cavity materials: As classified under category XHHW in the U.L. Fire Resistance Directory.
- B. Forming materials: As classified under category XHKU in the U.L. Fire Resistance Directory.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
 - 1. Verify barrier penetrations are properly sized and in suitable condition for application of materials.
 - 2. Do not proceed until unsatisfactory conditions have been corrected.

3.02 CLEANING SURFACES

- A. Clean surfaces to be in contact with penetration seal materials, of dirt, grease, oil, loose materials, rust or other substances that may affect proper fitting, adhesion or the required fire resistance.

3.03 INSTALLATION

- A. Install penetration seal materials in accordance with printed instructions of the U.L. Fire Resistance Directory and in accordance with manufacturer's instructions.
- B. Seal holes or voids made by penetrations to ensure an effective smoke barrier.
- C. Where floor openings without penetrating items are more than 4" in width and subject to traffic or loading, install firestopping materials capable of supporting same loading as floor.
- D. Protect materials from damage on surfaces subject to traffic.
- E. Place firestopping in annular space around fire dampers before installation of damper's anchoring flanges which are installed in accordance with fire damper manufacturer's recommendations.

- F. Where large openings are created in walls or floors to permit installation of pipes, ducts, cable tray, bus duct or other items, close unused portions of opening with firestopping material tested for the application. See U.L. Fire Resistance Directory.
- G. Install smoke stopping as specified for firestopping.
- H. Where rated walls are constructed with horizontally continuous air space, double width masonry, or double stud frame construction, provide vertical, 12" wide fiber dams for full thickness and height of air cavity at maximum 15' intervals.

3.04 FIELD QUALITY CONTROL

- A. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.
- B. Keep areas of work accessible until inspection by applicable code authorities.
- C. Perform under this Section, patching and repairing of firestopping cause by cutting or penetration by other Trades.

3.05 ADJUSTING AND CLEANING

- A. Clean up spills of liquid components.
- B. Neatly cut and trim materials as required.
- C. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

END OF SECTION

SECTION 07420 - EXTERIOR INSULATION AND FINISH SYSTEM

PART 1 - GENERAL

A. RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. DESCRIPTION OF WORK:

1. This section includes all labor, materials, equipment and related items required to complete the work of Exterior Insulation and Finish System. Work of this section includes the installation of a complete system including Gypsum Board Sheathing, Insulation Board, Vinyl Copolymer Adhesives, Acrylic Copolymer Finishes and associated hangers, fasteners, etc. required for proper and complete installation as shown on the Drawings and specified herein.
2. Excluded from work of this section is the preparation or construction of primary structural components to which system is attached.

C. QUALITY ASSURANCE:

1. Gypsum Panels - shall conform to Federal Specification, Class 2; ASTM C-79
2. Polystyrene Insulation Board - shall comply with Federal Specification HH-I-524B, Type I, Class A.
3. Glass-Fiber Reinforcing - shall comply with MIL-Y-1140C.
4. Portland Cement - shall comply with ASTM C-150, Type 1.

D. MANUFACTURERS:

1. Component Products comprising a total system shall be provided by a single manufacturer.

E. PRODUCT HANDLING:

1. Deliver products to job site in properly marked factory sealed containers. Store in protected tempered environment at not less than 40 degrees F. Protect gypsum panels from exposure to rain or high humidity.

F. WARRANTY:

1. Provide manufacturer's warranty against defective material or workmanship, for a period of three years. Necessary corrections and replacements shall be made at no cost to the Owner during the guarantee period.

PART 2 - PRODUCTS

A. GENERAL:

1. System or products specified herein are based upon standard manufactured components by nationally recognized manufacturers. Where proprietary systems are specified, they are for the purpose of establishing quality standards and are not intended to exclude equivalent systems by other nationally recognized producers.

B. EXTERIOR WALL INSULATION AND FINISH SYSTEM:

1. For the purpose of this specification "Senturion System I" exterior wall insulation and finish system as manufactured by Senergy, Inc., has been specified. Equivalent systems are as manufactured by Dryvit Inc., or approved equal.
2. Insulation Board shall be rigid expanded polystyrene, minimum 3/4" thick x largest practicable size with an average density of 1 pound per cubic foot.
3. Adhesive shall be a vinyl copolymer dispersion with a quartz sand aggregate formulated to be mixed in equal parts with Type 1 Portland cement.
4. Reinforcing fabric shall be balanced open weave fiberglass fabric made from twisted multi-end strands and treated for compatibility with other system components.
5. Surface finish system shall be an acrylic copolymer dispersion of hardening air-cured materials made with quartz sand aggregates and shall be finish, fine, to match the upper area brick on the building. Color shall match the upper brick on the building.

PART 3 - EXECUTION

A. GENERAL:

1. System shall be installed by one installer, certified by the systems manufacturer as experienced in the application process specified herein.
2. Contractor shall examine substrate and enclosures to determine that conditions effecting proper installation are satisfactory. No work shall commence until area to receive finish system is fully enclosed and "weathered-in" to prevent accumulation of moisture on Gypsum Board panels. Commencement of work by the Contractor shall signify his acceptance of conditions effecting the installation whereupon he shall become solely responsible for damage or defects in materials and workmanship.

B. FURRING SYSTEM:

1. Do not bridge building expansion joints with support system, frame both sides of joints with furring and other supports as required.

2. Secure hangers to structural support by connecting directly to structure where possible, otherwise connect to inserts, clips or other anchorage devices or fasteners as necessary. Space hangers as 4'-0" o.c. maximum. Fasten perimeter members into masonry to provide resistance to wind uplift of 30 psf. minimum.
3. Level main runners to a tolerance of 1/4" in 12'-0", measured both lengthwise on each runner and transversely between parallel runners.
4. Wire-tie or clip furring members to structural supports.
5. Space furring members 24" o.c., maximum, except as otherwise required to form a maximum 24" x 24" grid.
6. Install auxiliary framing at termination of grid and at openings for light fixtures and similar work, as required for support of both gypsum base and other work indicated for support thereon.

C. GYPSUM SHEATHING:

1. Install gypsum sheathing on metal stud system.
2. Stagger joints on succeeding courses and interlock at corners.
3. Allow approximately 1/4" expansion joint around perimeter of installation.
4. Apply moisture protection barrier over gypsum sheathing.

D. EXTERIOR INSULATION & FINISH SYSTEM:

1. Installation of system shall begin only after minimum ambient temperature of 40 degrees F. has been obtained and can be maintained for a minimum 24 hours after installation.
2. Inspect gypsum board surface for irregularities before commencing application. Remove and replace damaged or deteriorated gypsum board panels and repair any planar irregularities greater than 1/4". Surface to be covered shall be free of hot spots, releasing agents and other residue.
3. Mix Primus/Adhesive in clean container adding Type 1 Portland cement at a ratio of one-pound Portland cement to one-pound Primus/Adhesive. After adhesive has set or become stiff or unworkable, do not retemper. Discard unsuitable material and prepare new mixtures.
4. Precut insulation board as required to fit openings, projections, etc. Stagger end joints between boards (and between board and gypsum panels). By trowel or

extrusion apply a ribbon of mixed Primus/Adhesive approximately 2" wide by 3/8" thick to the entire perimeter of each board. Apply 4" wide by 3/8" thick ribbons to the interior area approximately 8" on center. Apply pressure over the entire surface of the board to insure uniform contact and high initial grab. Provide supplemental mechanical fasteners as recommended by the system manufacturer to retain board in place until adhesive has set. Abut all joints tightly to insure an overall level surface. Sand or rasp smooth any surface irregularities greater than 1/16". Allow to dry a minimum of 24 hours.

5. At all areas where system abuts other materials or where openings or penetrations occur, apply Primus/Adhesive and wrap with reinforcing mesh along all exposed sides. Hold board back approximately 1/2" from abutting dissimilar surfaces to allow caulking under other sections of the Specifications.
6. Using a stainless steel trowel, apply mixed Primus/Adhesive to the entire surface of the insulation Board to a uniform thickness of approximately 1/16 inch. Immediately place the Reinforcing Mesh against the wet Primus coating and by troweling from the center to the edges, totally embed the mesh into the coating. Reinforcing Mesh shall be continuous and lapped not less than 2-1/2 inches at fabric edges. Avoid wrinkles in embedding the Reinforcing Mesh. The finished thickness of the Primus coating shall be such that the Reinforcing Mesh is fully embedded. Allow to dry a minimum of 24 hours.

E. INSPECTION AND CLEAN-UP:

1. Upon completion of work, inspect finish surfaces for uniform color and texture. Cut out surface irregularities, discolored or otherwise damaged areas and repair in accordance with manufacturer's printed instructions.
2. Clean out joints at intersection of dissimilar materials to receive caulking. Inspect sides and edges of installation for proper coverage.
3. Clean adjacent surfaces, remove waste material and containers from job site and leave in first class condition.

End of Section

SECTION 07533 - MECHANICALLY ATTACHED (CPA) ROOFING SYSTEM

PART 1 - GENERAL

A. Scope

1. Contractor shall prepare existing BUR roof as required for recovery.
2. Contractor shall provide and install 2" minimum Iso recovery board.
3. Contractor shall furnish and install a 50 mil single-ply membrane roofing system that is fabricated of a weft inserted low-shrink, anti-wicking polyester fabric and has a thermoplastic coating of co-polymer alloy (CPA) material laminated to both sides as manufactured by Duro-Last Roofing, Inc.

B. Application

This specially formulated thermoplastic coated membrane classified as CPA in this section consists of a weft inserted polyester scrim (18x14, 100 denier), laminated on both sides with a plasticized blend of vinyl and acrylic polymers which allows installation through the use of continuous 3-1/4 inch securing tabs, factory dielectrically welded every 60 inches on center (prefabricated). Mechanical fasteners and distribution plates are used through the 3-1/4 inch tab eliminating the need for ballast.

C. Physical Properties

The single ply membrane shall allow installation at any time of the year and shall provide: resistance to ultra-violet rays, superb tear and puncture strength, the ability to be impervious to most caustic chemicals and acids, and show no ill effects to heat or cold.

- 1.01 The General Conditions, Supplementary Conditions, and Applicable Provisions of Division (1) Are Hereby Made a Part of this Section as Fully as If Repeated Herein.

A. Requirements of Regulatory Agencies

Membrane and related items shall be classified by Underwriters Laboratories, Inc. as a Class A Sheathing Material for use in construction of Class A coverings and amendments.

B. Roofing Contractor's Qualifications

1. Contractor shall submit work history data showing having had successful warranted installation experience of the system specified, and of being authorized by the roofing system manufacturer to install the specified manufacturer's materials.
2. The contractor shall use adequate amounts of such qualified workmen who are thoroughly trained in the crafts and techniques required to properly install the type of roofing system proposed for use and other work required to complete the work specified and within the specified time.
3. The contractor shall have an experienced, pre-qualified, thoroughly trained superintendent having experience installing the roof system specified, who is familiar with the requirements of this project, on the job at all times when roofing system work is in progress. Training for superintendent shall include certification of completion of manufacturer's in-house training course and on-site training.
4. Requirements of the Membrane Manufacturer
 1. All components of the roofing system shall conform to the current published specifications and details of Duro-Last Roofing, Inc.

2. There shall be no deviation made from this specification without prior written approval of Duro-Last Roofing, Inc. and building owner or his/her duly appointed representative.
3. Any other manufacturer proposing to supply material for this project shall fourteen (14) days prior to bid date, provide financial information regarding their roofing company, i.e. a current D&B report. A manufacturer who has less than \$50,000,000.00 in annual roofing material sales, a net worth of less than \$3,000,000.00 or a history of late payments to creditors will not be permitted to submit their roofing material for use on this project. Manufacturer may be asked to submit an audited document listing the long-term warranty liability commitment of manufacturer.
4. Provide primary flexible sheet factory prefabricated roofing system from a single manufacturer that has successfully manufactured raw materials into specified products for not less than five (5) years. No secondary private labels are acceptable. Provide secondary materials, such as but limited to insulation, gypsum board, vapor barriers, etc. as recommended and approved by manufacturer of primary materials.
5. Products primary and secondary shall be manufactured in the United States of America by a company owned by citizens of the United States.

D. Field Inspection

5. The contractor shall arrange for Duro-Last Roofing, Inc. to provide inspection of the roofing system installation. Upon completion of the installation, an inspection shall be made by a Quality Assurance Specialist of the membrane manufacturer at no extra charge to the building owner or contractor. The inspection is to ascertain that the visible elements of the roofing system have been installed in accordance with the membrane manufacturer's published specifications and details.

E. Defective Work

Should the installation of the roofing system not be approved Duro-Last Roofing, Inc.'s technician, correcting the defective work shall be done by the contractor until the roofing system satisfactorily meets all the specifications and manufacturer's requirements. Corrective work will be done **with no additional expense to the owner.**

F. Guarantees

1. The contractor shall warrant the roof application with respect to workmanship and proper application for two (2) years from the date of acceptance by the membrane manufacturer. Should any leaks covered under the warranty occur during this period, corrective action will be taken by the contractor to repair the roof to the satisfaction of the owner and Duro-Last Roofing, Inc. **All corrective work will be done at no cost to the owner.**
2. The warranty shall be full roofing system repair and/or replacement twenty (20) year warranty covering materials and labor. The warranty shall be a no-dollar limit type and provide for completion of repairs, replacement of membrane or total replacement of the "roofing system" at the then current material and labor prices throughout the life of the warranty. Warranty shall contain no exclusions for ponded water, biological growth, incidental or consequential damages.
3. Warranty shall be issued by the original manufacturer of the roofing membrane. No private label membranes will be accepted.
4. No work shall be done on said roof, including but without limitations, openings made for flues, vents, drains, sign braces, or other equipment fastened to or set on the roof, unless the Contractor or membrane manufacturer is notified first. Contractor or membrane manufacturer shall be given the opportunity to make the necessary roofing application recommendations with respect thereto, and require such recommendations are complied with. Failure to observe this condition shall render the warranty null and void. The contractor or membrane manufacturer shall be paid for time and material

expended in making recommendations or repairs occasioned by the work of others on said roof.

5. Corrective measures on leaks shall be undertaken within seventy-two (72) hours after notification has been received by the Contractor or Duro-Last Roofing, Inc. from the Owner.

G. Weight Requirements

The total weight of the installed roofing system including all accessories, i.e: screws, plates, 2-way breather vents, etc., shall not exceed 25 pounds per square. Insulation weight varies according to R-value desired.

H. Mechanical Attachment

1. Membrane fastening for buildings with maximum height of 40 feet (12m), securement tabs shall be spaced maximum of 60 inches (1.45m) on center and the first tab on the edge of the sheet parallel to the roof edge shall be a maximum 36 inches (.75m). Fastening for buildings that are greater than 40 feet (12m) consult Duro-Last Roofing, Inc. for proper fastening.
2. Deck membrane shall be fastened with approved fasteners, 18 inches on center along bottom of all parapet walls, elevation changes and perimeter edges.
3. Deck membrane shall be fastened around cut-outs with approved fasteners 12 inches on center or a minimum of 1 per round penetration having a diameter of not more than 6 inches.

1.02 SUBMITTALS

A. Required Submittals to the Architect/Owner

1. Written confirmation from Duro-Last Roofing, Inc., Inc. that the installer is an approved applicator.
2. Duro-Last Roofing, Inc.'s literature on the following items:
 - a. Roofing membrane with dielectrically welded seams
 - b. Pre-manufactured parapet flashings
 - c. Pre-manufactured pipe flashing
 - d. Urethane sealant
 - e. P.V.C. weldable drip-edge, gravel/water stop, termination bar
 - f. Breathable 2-way vents
 - g. Self-leveling pourable sealer
 - h. Maintenance & repair instructions
3. 6" long samples of the following:
 - a. Gravel/water stop
 - b. Drip edge
 - c. Termination Bar
 - d. Sample of membrane
 - e. Mechanical fasteners
 - f. Lap splice sample (factory & field)
 - g. Roofing insulation
 - h. Walkway pad
4. Shop drawings (copies of these must be sent to Duro-Last Roofing, Inc.).
5. Pullout Tests: Perform pullout tests and submit engineering results of Duro-Last Roofing, Inc.'s random location pull tests. Duro-Last Roofing, Inc. shall obtain at least one pull resistance test from indicated locations on the drawings. Submit pull test results with drawing indicating the locations of the tests. Engineering results shall demonstrate the Duro-Last Roofing, Inc.'s reasons for selection of anchorage, frequency and the seaming patterns.

6. Membrane Data: Prior to receipt of bids, contractor shall submit all forms and other required data to Duro-Last Roofing, Inc. for pre-approvals. Advise architect in writing of any recommendations made or revisions required by Duro-Last Roofing, Inc. to particular job conditions. In the absence of any comments, the Owner and/or his representative shall assume Duro-Last Roofing, Inc.'s most recently published specifications shall be followed.
7. Samples: Submit samples to the Architect for approval prior to ordering and delivery so as to not delay progress and completion of the work or final inspection.
8. Provide repair procedures to the Owner and/or Owner's representative.

B. Required Submittals to the Building Owner

1. Submit shop drawings for approval. Shop drawings may be required for final inspection of the warranted roof. Shop drawings shall be approved by Duro-Last Roofing, Inc.
2. Shop drawings shall include: outline of the roof and roof size, perimeter and penetration details, special details and section layout, location of factory dielectric and field welds, accessory and material list.

1.03 Product Delivery, Storage and Handling Procedures

- A. Deliver materials in original unopened packaging.
- B. Containers labeled with manufacturer's name, brand name, and identification of various items.
- C. Store materials in a dry area and protect from inclement weather. Damaged materials shall be replaced at contractor's expense.
- D. Do not allow roofing membrane to come in contact or be exposed to any materials that would be detrimental to or cause degradation of the roofing membrane.

1.04 Job Conditions

A. Environmental Conditions

1. In making field heat welds, make sure all welding surfaces are clean and free of moisture or foreign items.
2. Weather precautions: Proceed with roofing work when existing and forecasted weather conditions permit work performance in compliance with Duro-Last Roofing, Inc.'s recommendations.
3. Roofing system shall not be applied when the surrounding air, surface temperature, relative humidity or wind velocity is not within the range acceptable under the Duro-Last Roofing, Inc.'s recommendations.

B. Protection

1. Prior to starting work, protect all work in an approved manner including all paving and faces of building walls. Provide special protection of the face of the building wall adjacent to hoist.
2. Complete the whole roofing section or any portion of the roof in a single day to avoid exposure to rain, dew, or moisture of any kind. If rain threatens during the day or in an emergency, protect the unfinished exposed roofing components and provide temporary water cut-offs around exposed edges and incomplete flashing areas.

3. All hoisting equipment shall bear on solid pad blocking. If on the roof surface, pad shall be large enough to evenly distribute the load to avoid crushing insulation and roof system. Pad shall consist of two separate layers of material to eliminate vibration and movement to directly affect the roofing membrane. Pad shall be of sufficient size to accommodate work tools and weights used around hoisting operations.
4. Repairs: Clean or repair surfaces damaged or soiled by operations under this contract to the satisfaction of the Owner or Owner's representative without additional cost to the Owner. These would include, but not limited to, windows, doors, floors, walls, stairs, elevators, steps, walks, curbs, lawn areas, or other roofs.

PART 2 - PRODUCT

A. Roof Membrane

1. A special formulated, permanent, thermoplastic alloy, bonded to a high tenacity, low shrinkage weft inserted polyester fabric with resistance to ultraviolet rays, microorganisms and impervious to most caustic.
2. Membrane shall be factory dielectrically welded, prefabricated sheets up to 2,500 square feet or as determined by job condition.
3. The new roofing shall be a prefabricated mechanically fastened installation (if required, FM requirements), single-ply reinforced co-polymer alloy (CPA) membrane, 50 mils thick. Manufacturer's physical specifications and minimum performance criteria shall be in accordance with the following schedule.

MINIMUM PERFORMANCE AND PHYSICAL SPECIFICATION REQUIREMENTS FOR MEMBRANE

<u>Physical Property</u>	<u>Test Method Used</u>	<u>Specification Requirements</u>
Thickness Min.	ASTM D-751	.050 inch thick (50 mils)
Tear Strength, Tongue Method 8" x 8" sample	ASTM D-751	130 x 110 lbf
Breaking Strength	ASTM D-751	435 x 350 lbf.
EMMAQUA Exposure	ASTM E938, Desert Sun	>6.9 million Langleys
Elongation	ASTM D-751	35%
Dimensional Stability	ASTM D-1204	<0.1%
Low Temperature Flexibility	ASTM D-2136, 1/8" mandrel	no cracks, -40 degrees F
Dynamic Impact (Puncturing)	Fed. Std. 1013, Method B	350 lbs.
Water Vapor Transmission	ASTM E96 WVT, Procedure B, Method A	>.25 US Perms, 0.086 g/hr//sqm
Accelerated Weathering	Carbon Arc, 6000 Hours	No cracks, crazing, or blistering
Accelerated weathering	ASTM G-5388, 2000 Hrs.	No cracks, crazing, or blistering
UVB-313 Lamp @ 80 degrees C		
Factory Mutual Research	ASTM E-108	Class I I-60 & I-90
Underwriter's Laboratory	UL-790	Class A, B, or C
Scrim: Weft Inserted Polyester		18 x 14, 1000 denier

B. Manufacturer

1. The following CPA manufacturer has been approved for this project. No substitutions by secondary, indirect manufacturers will be allowed:

Duro-Last Roofing, Inc.
525 Morley Drive
Saginaw, MI 48601
(800) 248-0280

2. Other manufacturers requesting approval must submit acceptable information certifying that they are the direct manufacturer from raw material into specified membrane, factory prefabricate the membrane into roofing panels, and meet the performance and financial criteria required.
3. Fire resistance of CPA roofing system shall meet UL Class A. All packaging of membrane and insulation shall bear UL Class A label.
4. Membrane color shall be white.

2.01 MATERIALS

A. Membrane-Related Materials

1. All membrane components, including pipe and curb flashings must be factory prefabricated from the same fabric reinforced material used for the deck membrane.
2. Termination Sealant: Compatible with materials to which membrane is to be bonded, conforming to Federal Specifications TT-598 and TT-S-00230C as furnished by Duro-Last Roofing, Inc.
3. Distribution Plates: Factory Mutual approved stress distribution plates formed from a minimum 24 gauge G-90 C.Q. steel with a galvalume coating for insulation attachment, or 20 gauge G-90-C.Q. steel with galvalume coating or high strength polyblend for membrane attachment.
4. Water Cut-Off Mastic: Compatible with materials with which it is used and furnished by the membrane manufacturer.
5. Pitch Pocket Sealant: Shall be a single component, self-leveling silicone sealant furnished by Duro-Last Roofing, Inc.
6. Fasteners: Compatible with roof deck as furnished by the membrane manufacturer. Fasteners shall be furnished by Duro-Last Roofing, Inc. and be Duro-Guard coated #14 and must pass 30 cycles in the Kesternich Cabinet, DIN #50018-2 Liter. The FM approved fastener is inserted through the hole in the distribution plate and properly secured to the roof deck.
7. Breather Vents: Two-way vents with factory-attached skirt shall be installed at a density of one per 1000 square feet of roof deck area and in accordance with Duro-Last Roofing, Inc.'s specifications. Vents shall be furnished by Duro-Last Roofing, Inc.
8. Terminations/Edge Details: Shall be manufactured from rigid exterior vinyl with slotted holes for securement and furnished by membrane manufacturer. All other terminations/edge details must be approved and warranted by Duro-Last Roofing, Inc.
9. Walkway Pads: Provide Duro-Last Roofing, Inc.'s walkway pads made from the roofing membrane material installed in strict compliance with manufacturer's recommendations. Pads shall be non-skid, maintenance free, and restrained to remain in position. Pad installation minimum 250 LF. Location to be determined in the field. Walkway pads shall be a contrasting color to the roof membrane. Owner and/or Owner's representative shall choose from Duro-Last Roofing, Inc.'s samples.

B. Insulation

1. Board insulation shall be a minimum of 2" thick polyisocyanurate.

C. Tapered Crickets (where required and shown). Crickets shall be formed of tapered material having the same requirements and characteristics as listed in the preceding paragraph.

D. Roofing Nails. Nails shall be galvanized "Stronghold" type: (for use on parapet walls, wood nailers)

E. Nailers & Blocking.

1. Where required, nailers and wood blocking shall be S4S 1500 fc construction grade Douglas fir conforming to standard 15 grading and dressing rules of the West Coast Lumber Inspection Bureau, or other species of wood of equal strength. All lumber shall be grade marked at the mill.
2. All lumber shall be pressure treated by a method approved by the roofing membrane manufacturer: "Wolmanized" or "Osmose K-33" are acceptable.
3. Nailers shall be securely anchored to the deck to resist the minimum force required in Loss Prevention Data Sheet I-49, "Perimeter Flashing," Factory Mutual Systems, June, 1985. The thickness of the nailer shall be such that the top of the nailer is flush with the surface to which the membrane is to be applied.

F. Accessories. Primary accessories shall be factory prefabricated or manufactured by or under the direction of Duro-Last Roofing, Inc. All other shall be furnished and approved by the Duro-Last Roofing, Inc.

PART 3 - EXECUTION

A. Substrate Inspection

1. Inspect all surfaces to receive roofing for any condition that will adversely affect execution, performance, or quality of work.
2. All roof surfaces and all sloped surfaces to drains and outlets shall be checked and approved by the roofing contractor prior to the start of the roofing work.
3. Install roofing material only under satisfactory conditions as specified by Duro-Last Roofing, Inc.
4. Scheduling: Schedule the roofing work in areas and sections in such a manner as to keep the new and existing insulation, roofing materials, and building absolutely dry and watertight during new roofing work.
5. Any damage sustained to the facility or contents as a result of improper scheduling of roofing work shall be the contractor's responsibility.

B. Surface Preparation. Contractor's proposal shall include all costs for the removal of wet or damaged existing roofing insulation and replacement as required, repair of blisters, existing flashings, expansion and control joint covers, and repair or replacement of required treated wood nailers or blocking.

1. The total extent of preparation shall include the above and comply with the Duro-Last Roofing, Inc.'s recommendations.
2. Mechanically secure separation material units to roofing deck independent of membrane attachment

and cover immediately with membrane. Butt units tightly together, limiting joint separation to 1/8 inch, maximum. Meet attachment pattern requirements of Duro-Last Roofing, Inc.

3.01 GENERAL REQUIREMENTS

A. Precautions

1. Do not lay out or expose any insulation on the deck that cannot be covered by membrane on the same day.
2. In making all field heat welds, make sure all edges are clean and free of tar, mastic or other foreign items.
3. Do not expose membrane and accessories to a constant temperature in excess of 110 degrees Fahrenheit.
4. Sealants and adhesives should be applied according to the manufacturer's specifications and all containers shall be disposed of properly.
5. Start securing the membrane at the highest point and work towards the drains.

- A. Protection of Roofing Surfaces. Storing, wheeling, or trucking directly on roof insulation or membrane surface is not recommended. Smooth, clean plywood or plank walkways, runways and platforms shall be provided as necessary.

3.02 INSULATION INSTALLATION

- A. General. The roof insulation shall be installed with approved fasteners and distribution plates placed according to specification. Insulation board having maximum of dimensions of 2 x 4 feet shall require a minimum of 2 fasteners. Insulation boards having maximum of dimensions of 4 x 4 feet shall require a minimum of 4 fasteners. Insulation boards having maximum of dimensions of 4 x 8 feet shall require a minimum of 6 fasteners. Install the fasteners flush with the top surface of the insulation board. The ends of the insulation boards shall be staggered 50% from row to row. Butt each insulation board firmly to the adjacent board. Do not jam insulation boards or allow cracks between insulation boards. Cut boards to allow a maximum 1/4 inch gap away from vertical surfaces. The following FM approved insulation's are approved for use with the membrane cover, fiberglass, urethane/OSB composite, polyisocyanurate or others approved by Duro-Last Roofing, Inc. Contact Duro-Last Roofing, Inc. for specific applications.

3.03 MEMBRANE INSTALLATION

- A. Laying Out. Select the proper factory marked rolled sheet of roofing membrane for an outside corner or high point. Orient the roofing membrane so that the 3 inch wide fastening tabs are perpendicular to the ribs or corrugations of a steel deck or perpendicular to the width of the prestressed concrete "T" slabs, etc. When laying out each tab, pull the membrane tight.
- B. Roof Sections. Unfold first sheet along edge of roof or parapet wall. Position and fasten first tab with plates and screws according to membrane manufacturer specifications. Unfold roofing sheet to the second 3-1/4 inch wide fastening tab. Pull tab tight and secure to deck as herein described, maintaining proper plate and screw frequency, squarely placed. Continue unfolding and fastening roofing membrane until entire sheet is in place. Install the adjacent roofing membrane sheets using the fastening procedure described. Proceed until all sheets are in place, thus forming a monolithic roof cover. Make sure all edges of each sheet of roofing are fastened with the same fastener spacing as tabs or are welded to another sheet that is fastened in this manner.
- C. Field Welding. All field heat seams of the roofing materials shall be 1-1/2 inch wide minimum and be made with a hot air welder. The hot air welder shall be in such a position so that the outside edge and both pieces of material will receive an equal amount of heat and all of which will be closely followed by a

1-5/8 inch wide roller specially designed for this purpose. Make a hands and knees inspection of all field welds with a probe.

- D. Perimeter Nailing. The membrane shall be mechanically fastened at all roof perimeters, parapets, curbs, wall, penetrations, etc. in strict accordance with the Contract Documents and Duro-Last Roofing, Inc.'s specifications and details.
- E. Cut-Outs. Make cut-outs in roofing membrane for protrusions through the roof. Some situations might require that the deck membrane be slit to the section edge for fitting around protrusions. Fasten around cut-outs with approved fasteners, 12 inches on center or a minimum of one per side. The skirts on factory prefabricated accessories when welded to deck will cover these.
- F. Stacks. After membrane has been attached, select proper size of premanufactured round stack for roof vents and pipes. Drop stack flashing over the pipe, lay flat to the roof, and heat weld the skirt to the deck membrane. Using appropriate hand tool, tighten stainless steel band (or stainless steel screw clamp) around top of stack flashing to prevent water penetration, and cut off excess. Using factory approved sealant, liberally seal the top of the stack flashing and steel band.
- G. Custom Curbs/Pitch Pockets. After securing cut-out as stated, heat weld the bottom of the skirt to the deck membrane. If the square or rectangle penetration has a removable top, i.e. roof hatch, skylight, etc., remove the unit and fold the custom curb flashing over the top, secure, then replace unit. If top is not removable, secure the top of the custom curb flashing with termination bar and seal with factory approved sealant. Use this same procedure on existing or new pitch pockets.
- H. Breather Vents. Install a two-way breather vent for every 1,000 square feet of deck area. Factory prefabricated vents with a skirt made from roofing membrane shall be used. For new construction or reroof after tear-off, a 2-1/2 inch diameter hole cut down through the roofing membrane and insulation facer is required. For recover/non-tear-off application a 2-1/2 inch diameter hole is to be cut through the roofing membrane and the facer down to the facer on the existing insulation. Heat weld skirt to the deck membrane so as to position two-way vent directly over the hole. Careful placement of the breather vents must be observed. **DO NOT** locate in valleys, next to roof penetrations, scuppers, roof drains, etc. Equally space the vents throughout the roof area. Do not fasten the vent or the skirt to the roof deck. This two-way breather vent is designed to vent the roofing system only and not the building to which it is installed.
- I. Parapet Walls. Fasten bottom tab of prefabricated parapet wall flashing 12 inches on center with approved fasteners. This fastening sequence will secure both bottom of parapet and edge of deck membrane. Base skirt should extend approximately 6 inches onto the roof. This allows for a 1-1/2 inch wide weld and covering of the fasteners and plates. Heat weld skirt to deck membrane. On all termination bar applications, start fastening at one end and proceed to the other. This will eliminate buckling of the termination bar. Seal behind the parapet wall material and on top of termination bar with factory approved sealant. If parapet wall coping is to be covered, extend covering down 2 inches on exterior face of coping and terminate accordingly.
- J. Roof Drains.
 - 1. Secure cut-out made in deck membrane with four (4) equally spaced fasteners and distribution plates. If drain is flush with deck, use a prefabricated drain boot. Apply factory-approved sealant all around drain approximately 12 inches under deck membrane and install the expanding snap rings.
 - 2. If the roof drain has a secure clamping ring and strainer, unbolt and remove. Clean and apply factory-approved sealant under deck membrane around drain for use as a water block seal after cutting properly sized hole. Secure clamping ring and strainer to drain base over deck membrane. Seal with factory approved sealant between clamping ring and roofing membrane.
- K. Expansion Joints/Valleys
 - 1. Whenever encompassing an elevated mid-roof expansion joint, must use a prefabricated expansion joint section. This section shall allow loose layment over the joint and approved fastening on either

side. A 6 inch skirt on both sides will provide coverage of fasteners and still allow approximately 1½ inch for a heat weld to deck membrane.

2. Valleys are worked in the same manner. Fasten according to specifications, 12 inches on center, and lap deck membrane over fasteners. Heat weld deck membrane to valley section.

3.04 CLEAN-UP

Upon completion of the membrane installation, the contractor shall remove all foreign matter, rubbish and scrap material from the roof. The membrane surface shall be cleaned using cleaners recommended by the membrane manufacturer.

3.05 INSPECTION & WARRANTY

- A. Inspection: Duro-Last Roofing, Inc.'s Quality Assurance Technician, architect and roofing contractor shall conduct all required inspections. Submit all required drawings, details, and completed questionnaires to the roofing manufacturer before obtaining the specified warranty. After an authorized Quality Assurance Technician has inspected the roof for determining acceptability for warranty issuance, any deficiencies on the final inspection report shall be corrected by the contractor/applicator and made ready for reinspection within five (5) working days.
- B. Warranty: Upon receipt of required materials, certifying inspection, and acceptance of the roofing system by Duro-Last Roofing, Inc., the warranty shall be duly executed and issued to the Owner.

3.06 REPAIRS

Future repairs or additions to the roofing system shall be made using the heat welding process. Adhesive bonded or butyl tape repairs shall not be allowed for the life of the roof. Provide repair procedures to the Owner and/or Owner's representative.

3.07 CONSTRUCTION DAMAGE

Upon completion of work, repair or replace as required, all building materials damaged as a result of the roofing operations. Match existing materials as close as possible. Owner and/or Owner's representative will be involved in the selection of matching materials.

END OF SECTION

SECTION 07540 - Polyvinyl-Chloride Roofing

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. PVC thermoplastic membrane with fleece adhered with fleece membrane adhesive, splatter applied.
- B. Fiberglass-faced primed roof board, attached with insulation adhesive.
- C. Polyisocyanurate (flat), attached with insulation adhesive.
- D. Prefabricated flashings, corners, parapets, stacks, vents, and related details.
- E. Fasteners, adhesives, and other accessories required for a complete roofing installation.
- F. Traffic Protection.

1.2 REFERENCES

- A. NRCA - The NRCA Roofing and Waterproofing Manual.
- B. ASCE 7 - Minimum Design Loads For Buildings And Other Structures.
- C. UL - Roofing Materials and Systems Directory, Roofing Systems (TGFU.R10128).
- D. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- E. ASTM D 751 - Standard Test Methods for Coated Fabrics.
- F. ASTM D 4434 - Standard Specification for Poly(Vinyl Chloride) Sheet Roofing.
- G. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings.
- H. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

1.3 SYSTEM DESCRIPTION

- A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.
- C. Physical Properties:
 - G. Roof product must meet the requirements of Type III PVC sheet roofing as defined by ASTM D 4434 and must meet or exceed the following physical properties.
 - H. Thickness: 60 mil (78 mil including fleece), nominal, in accordance with ASTM D 751.
 - I. Thickness Over Scrim: ≥ 32 mil in accordance with ASTM D 751.
 - J. Breaking Strengths: ≥ 554 lbf. (MD) and ≥ 408 lbf. (XMD) in accordance with ASTM D 751, Grab Method.
 - K. Elongation at Break: $\geq 34\%$ (MD) and $\geq 85\%$ (XMD) in accordance with ASTM D 751, Grab Method.
 - L. Heat Aging in accordance with ASTM D 3045: 176 °F for 56 days. No sign of cracking, chipping or crazing. (In accordance with ASTM D 4434).

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- M. Factory Seam Strength: ≥ 322 lbf. in accordance with ASTM D 751, Grab Method.
- N. Tearing Strength: ≥ 50 lbf. (MD) and ≥ 200 lbf. (XMD) in accordance with ASTM D 751, Procedure B.
- O. Low Temperature Bend (Flexibility): Pass at -40 °F in accordance with ASTM D 2136.
- P. Accelerated Weathering: No cracking, checking, crazing, erosion or chalking after 5,000 hours in accordance with ASTM G 154.
- Q. Linear Dimensional Change: $\leq 0.11\%$ (MD) and 0.00% (XMD) in accordance with ASTM D 1204 at 176 ± 2 °F for 6 hours.
- R. Water Absorption: $\leq 2.4\%$ in accordance with ASTM D 570 at 158 °F for 166 hours.
- S. Static Puncture Resistance: ≥ 33 lbs. in accordance with ASTM D 5602.
- T. Dynamic Puncture Resistance: ≥ 14.7 ft-lbf. in accordance with ASTM D 5635.

D. Cool Roof Rating Council (CRRC):

- 1. Membrane must be listed on CRRC website.
 - a. Initial Solar Reflectance: $\geq 87\%$
 - b. Initial Thermal Emittance: $\geq 89\%$
 - c. Initial Solar Reflective Index (SRI): ≥ 110

E. Insulation

- 1. Provide overall thermal resistance for roofing system as follows:
 - a. Minimum Thickness: 6 inch.
- 2. Install using a minimum of two layers.
- 3. Configuration as indicated on the Drawings.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Maintenance requirements.
- C. Shop Drawings: Indicate insulation pattern, overall membrane layout, field seam locations, joint or termination detail conditions, and location of fasteners.
- D. Verification Samples: For each product specified, two samples, representing actual product, color, and finish.
 - 1. 4 inch by 6 inch sample of roofing membrane, of color specified.
 - 2. 4 inch by 6 inch sample of walkway pad.

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3. Termination bar, fascia bar with cover, drip edge and gravel stop if to be used.
4. Each fastener type to be used for installing membrane, insulation/recover board, termination bar and edge details.
- E. Installer Certification: Certification from the roofing system manufacturer that Installer is approved, authorized, or licensed by manufacturer to install roofing system.
- F. Manufacturer's warranties.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with manufacturer's installation instructions.
- B. Manufacturer Qualifications: A manufacturer specializing in the production of PVC membranes systems and utilizing a Quality Control Manual during the production of the membrane roofing system that has been approved by and is inspected by Underwriters Laboratories.
- C. Installer Qualifications: Company specializing in installation of roofing systems similar to those specified in this project and approved by the roofing system manufacturer.
- D. Source Limitations: Obtain components for membrane roofing system from roofing membrane manufacturer.
- E. There shall be no deviations from the roof membrane manufacturer's specifications or the approved shop drawings without the prior written approval of the manufacturer.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable code for roof assembly wind uplift and fire hazard requirements.
- B. Fire Exposure: Provide membrane roofing materials with the following fire-test-response characteristics. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
 1. Exterior Fire-Test Exposure:
 - a. Class A; ASTM E 108, for application and roof slopes indicated.
 2. Fire-Resistance Ratings: Comply with ASTM E 119 for fire-resistance-rated roof assemblies of which roofing system is a part.
 3. Conform to applicable code for roof assembly fire hazard requirements.
- C. Wind Uplift:
 1. Roofing System Design: Provide a roofing system designed to resist uplift pressures calculated according to the current edition of the ASCE-7 Specification *Minimum Design Loads for Buildings And Other Structures*.

1.7 PRE-INSTALLATION MEETING

- A. Convene meeting not less than one week before starting work of this section.
- B. Review methods and procedures related to roof deck construction and roofing system including, but not limited to, the following.

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1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing installer, roofing system manufacturer's representative, deck installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
4. Review structural loading limitations of roof deck during and after roofing.
5. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
6. Review governing regulations and requirements for insurance and certificates if applicable.
7. Review temporary protection requirements for roofing system during and after installation.
8. Review roof observation and repair procedures after roofing installation.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Store roof materials and place equipment in a manner to avoid permanent deflection of deck.
- E. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.9 WARRANTY

- A. Contractor's Warranty: The contractor shall warrant the roof application with respect to workmanship and proper application for two (2) years from the effective date of the warranty issued by the manufacturer.
- B. Manufacturer's Warranty: Must be no-dollar limit type and provide for completion of repairs, replacement of membrane or total replacement of the roofing system at the then-current material and labor prices throughout the life of the warranty. In addition the warranty must meet the following criteria:
 1. Warranty Period: 20 years from date issued by the manufacturer.
 2. No exclusion for damage caused by ponding water.
 3. No exclusion for damage caused by biological growth.
 4. Issued direct from and serviced by the roof membrane manufacturer.
 5. Transferable for the full term of the warranty.

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PART 2 PRODUCTS

2.1 MANUFACTURER

- A. All roofing system components to be provided or approved by roof system manufacturer.
- B. Acceptable Manufacturers:
 - 1. Duro-Last, Inc.
 - 2.
 - 3.

2.2 ROOFING SYSTEM COMPONENTS

- A. Roofing Membrane: PVC thermoplastic membrane with fleece conforming to ASTM D 4434, type III, fabric-reinforced, PVC. Membrane properties as follows:
 - 1. Thickness:
 - a. 60 mil nominal (78 mil including fleece).
 - 2. Exposed Face Color:
 - a. White.
- B. Accessory Materials: Provide accessory materials supplied by or approved for use by roof system manufacturer
 - 1. Sheet Flashing: Manufacturer's standard reinforced PVC sheet flashing.
 - 2. Vapor Barrier: Duro-Guard Sporavap'r.
 - 3. Factory Prefabricated Flashings: manufactured using Manufacturer's standard reinforced PVC membrane.
 - a. Stack Flashings.
 - b. Curb Flashings.
 - c. Inside and Outside Corners.
 - 4. Sealants and Adhesives: Compatible with roofing system and supplied by roof system manufacturer.
 - a. Fleece Membrane Adhesive.
 - b. Low-Rise Foam Insulation Adhesive.
 - c. Caulk.
 - d. Strip Mastic.
 - 5. Slip Sheet: Compatible with roofing system and supplied by roof system manufacturer.
 - 6. Fasteners and Plates: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane and insulation to substrate. Supplied by roof system manufacturer.
 - a. #14 Heavy Duty Fasteners.
 - b. 3 inch Metal Plates.
 - 7. Termination and Edge Details: Supplied by roof system manufacturer.

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- a. Termination Bar.
- 8. Vinyl Coated Metal: 24 gauge, hot-dipped galvanized, grade 90 metal with a minimum of 17 mil of PVC roofing membrane laminated to one side.
- C. Walkways:
 - 1. Provide non-skid, maintenance-free walkway pads in areas of heavy foot traffic and around mechanical equipment.
 - a. Walkway Pad.

2.3 ROOF INSULATION

- A. General:
 - 1. Provide preformed roof insulation boards that comply with requirements and referenced standards, as selected from manufacturer's standard sizes.
 - 2. Provide preformed saddles, crickets, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.
- B. Polyisocyanurate Board Insulation: Complying with ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces. Material as supplied by roof system manufacturer.
 - 1. Polyisocyanurate (flat).

2.4 ROOF INSULATION ACCESSORIES

- A. General: Provide roof insulation accessories approved by the roof membrane manufacturer and as recommended by insulation manufacturer for the intended use.
- B. Insulation Adhesive: Provide insulation adhesive for attaching insulation and/or insulation cover boards in conformance to specified design requirements.
- C. Insulation Cover Board:
 - 1. Glass-mat-faced, water-resistant gypsum substrate conforming to ASTM C 1177/C 1177M, DensDeck® Prime Roof Board as manufactured by Georgia-Pacific Corporation.
 - a. ¼ inch thick.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that the surfaces and site conditions are ready to receive work.
- B. Verify that the deck is supported and secured.
- C. Verify that the deck is clean and smooth, free of depressions, waves, or projections, and properly sloped to drains, valleys, eaves, scuppers or gutters.
- D. Verify that the deck surfaces are dry and free of standing water, ice or snow.
- E. Verify that all roof openings or penetrations through the roof are solidly set.
- F. If substrate preparation is the responsibility of another contractor, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

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- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Surfaces shall be clean, smooth, free of fins, sharp edges, loose and foreign material, oil, grease, and bitumen.

3.3 INSTALLATION

- A. Install insulation in accordance with the roof manufacturer's requirements.
- B. Insulation: Polyisocyanurate (flat).
 - 1. Install insulation in accordance with the roof manufacturer's requirements.
 - 2. Insulation shall be adequately supported to sustain normal foot traffic without damage.
 - 3. Where field trimmed, insulation shall be fitted tightly around roof protrusions with no gaps greater than ¼ inch.
 - 4. No more insulation shall be applied than can be covered with the roof membrane by the end of the day or the onset of inclement weather.
 - 5. If more than one layer of insulation is used, all joints between subsequent layers shall be offset by at least 6 inches.
- C. Insulation Cover Board: Fiberglass-faced primed roof board.
- D. Roof Membrane: 60 mil, PVC thermoplastic membrane with fleece.
 - 1. Use only membrane adhesive acceptable to the roof manufacturer's that meets the applicable design requirements.
 - 2. Cut membrane to fit neatly around all penetrations and roof projections.
 - 3. Unroll roofing membrane and positioned with a minimum 6 inch overlap along the selvage edge. Roll ends must be butted together and membrane of the same mil thickness, without fleece backing, must be used to form the end lap.
 - 4. Apply adhesive in accordance with the roof manufacturer's requirements.
 - 5. Apply adhesive in splatter pattern.
 - 6. Follow guidelines outlined in the adhesive's Product Data Sheet.
 - 7. Read the adhesive's Material Safety Data Sheet (MSDS) prior to using the adhesive.
- E. Seaming:
 - 1. Weld overlapping sheets together using hot air. Minimum weld width is 1-1/2 inches.
 - 2. Check field welded seams for continuity and integrity and repair all imperfections by the end of each work day.
- F. Membrane Termination/Securement: All membrane terminations shall be completed in accordance with the membrane manufacturer's requirements.
 - 1. Provide securement at all membrane terminations at the perimeter of each roof level, roof section, curb flashing, skylight, expansion joint, interior wall, penthouse, and other similar condition.
 - 2. Provide securement at any angle change where the slope or combined slopes exceeds two inches in one horizontal foot.

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- G. Flashings: Complete all flashings and terminations as indicated on the drawings and in accordance with the membrane manufacturer's requirements.
1. Provide securement at all membrane terminations at the perimeter of each roof level, roof section, curb flashing, skylight, expansion joint, interior wall, penthouse, and other similar condition.
 - a. Do not apply flashing over existing thru-wall flashings or weep holes.
 - b. Secure flashing on a vertical surface before the seam between the flashing and the main roof sheet is completed.
 - c. Extend flashing membrane a minimum of 6 inches (152 mm) onto the main roof sheet beyond the mechanical securement.
 - d. Use care to ensure that the flashing does not bridge locations where there is a change in direction (e.g. where the parapet meets the roof deck).
 2. Penetrations:
 - a. Flash all pipes, supports, soil stacks, cold vents, and other penetrations passing through the roofing membrane as indicated on the Drawings and in accordance with the membrane manufacturer's requirements.
 - b. Utilize custom prefabricated flashings supplied by the membrane manufacturer.
 - c. Existing Flashings: Remove when necessary to allow new flashing to terminate directly to the penetration.
 3. Pipe Clusters and Unusual Shapes:
 - a. Clusters of pipes or other penetrations which cannot be sealed with prefabricated membrane flashings shall be sealed by surrounding them with a prefabricated vinyl-coated metal pitch pan and sealant supplied by the membrane manufacturer.
 - b. Vinyl-coated metal pitch pans shall be installed, flashed and filled with sealant in accordance with the membrane manufacturer's requirements.
 - c. Pitch pans shall not be used where prefabricated or field fabricated flashings are possible.
- H. Roof Drains:
1. Coordinate installation of roof drains and vents specified in Section 15146 - Plumbing Specialties.
 2. Remove existing flashing and asphalt at existing drains in preparation for sealant and membrane.
 3. Provide a smooth clean surface on the mating surface between the clamping ring and the drain base.
- I. Edge Details:
1. Provide edge details as indicated on the Drawings. Install in accordance with the membrane manufacturer's requirements.
 2. Join individual sections in accordance with the membrane manufacturer's requirements.
 3. Coordinate installation of metal flashing and counter flashing specified in Section 07620.
 4. Manufactured Roof Specialties: Coordinate installation of copings, counter flashing systems, gutters, downspouts, and roof expansion assemblies specified in Section 07710.
- J. Walkways:

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1. Install walkways in accordance with the membrane manufacturer's requirements.
2. Provide walkways where indicated on the Drawings.
3. Install walkway pads at roof hatches, access doors, rooftop ladders and all other traffic concentration points regardless of traffic frequency. Provided in areas receiving regular traffic to service rooftop units or where a passageway over the surface is required.
4. Do not install walkways over flashings or field seams until manufacturer's warranty inspection has been completed.

K. Water cut-offs:

1. Provide water cut-offs on a daily basis at the completion of work and at the onset of inclement weather.
2. Provide water cut-offs to ensure that water does not flow beneath the completed sections of the new roofing system.
3. Remove water cut-offs prior to the resumption of work.
4. The integrity of the water cut-off is the sole responsibility of the roofing contractor.
5. Any membrane contaminated by the cut-off material shall be cleaned or removed.

3.4 FIELD QUALITY CONTROL

- A. The membrane manufacturer's representative shall provide a comprehensive final inspection after completion of the roof system. All application errors shall be addressed and final punch list completed.

3.5 PROTECTION

- A. Protect installed roofing products from construction operations until completion of project.
- B. Where traffic is anticipated over completed roofing membrane, protect from damage using durable materials that are compatible with membrane.
- C. Repair or replace damaged products after work is completed.

END OF SECTION

SECTION 07730 - ROOF ACCESS RAILING SYSTEM, OSHA COMPLIANT

PART 1 - GENERAL

1.01 SUMMARY

Provide and install permanent bolt-on KeeHatch™ Railing System for safe egress and ingress through roof type access hatches and for protection of roof opening while roof hatch is in use. The KeeHatch™ Railing System meets OSHA Standards #1910.23 and #1910.27.

1.02 WORK INCLUDED

Include all labor, materials, equipment, transportation and services required to complete the installation of the roof accessories as shown on the drawings and/or herein specified.

1.03 SUBMITTALS

Submit manufacturer's catalog cuts for approval prior to order.

1.04 WARRANTY

Provide the Owner with a seven (7) year manufacturer's warranty.
Installer must hold valid "Certified Installer" certificate from David/Randall Associates, Inc. or equal.

PART 2 - MATERIALS

2.01 MANUFACTURER

KeeHatch™ Railing System: by David/Randall Associates, Inc., or equal.
phone: (877)-723-3766, fax: (215) 256-7956,
e-mail www.inforequest@davidrandall.com

2.02 KeeHatch™ Railing System

- A. Furnish and install KeeHatch™ RHSR-SS, 3630 Railing System on all roof hatches, matching proper model with specified roof hatch.
- B. Performance Characteristics:
 - 1. Railing System shall be designed to withstand a 200 pounds test load.
 - 2. Railing System shall consist of a top rail, mid rail, and chain or swinging gate, with the hatch curb acting as the toe plate.
 - 3. Railing system shall extend to a height of at least 42" from the finished roof deck.
 - 4. Railing system shall be free of sharp edges and snag points.

5. Sealant for brackets as per manufacturer's materials and methods recommendations.
6. Product label shall include easy reading "NO HOISTING" warning along with manufacture's identification and patent label.

C. Railing and Brackets:

1. Pipe shall be galvanized, 1 1/4" ID, A53 Grade B seamed pipe or galvanized, 1 5/8" OD A500 seamed tube.
2. Flat bar shall be 2" x 3/8" thickness A36 mild steel or Kee Klamp fittings #161-7, or #162-7.
3. Weld filler shall be metal NR211 E70XX (AWS) if required.

D. Hardware:

1. Railing fittings shall be Kee Klamp® numbers 10-7, 15-7, 26-7, 45-7, 76-7, 77-7, 78-7, 121-7, 162-7, 161-7 as they apply.
2. Chain system shall be 3/16" proof coil ASTM specification, zinc plated with quick link on fixed end.
3. Pipe ends and tops shall be covered or plugged with weather and light resistant material.
4. Bolts and washers shall be 3/8" x 2 1/2" grade Z, zinc plated.

E. Finish: Factory finish shall be galvanized (hot dipped).

PART 3 - EXECUTION

3.01 INSTALLATION

Individuals holding a valid and current Certificate of Installation from David/Randall Associates, Inc shall install KeeHatch™ Railing Systems.

END OF SECTION

SECTION 07900 - JOINT SEALERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division - 1 specification sections, apply to Work of this Section.

1.02 DESCRIPTION OF WORK

- A. The extent of each form and type of joint sealer is indicated on drawings and by provisions of this Section.
- B. The applications for joint sealers as Work of this Section include the following:
 - 1. Concrete pavement and walk joint (self-leveling multi-component urethane).
 - 2. Interior concrete floor joints where coating and sealer is scheduled (flexible epoxy sealant).
 - 3. Interior masonry wall control and expansion joints (multi-component urethane).
 - 4. Exterior and interior perimeter of exterior doors, windows and fixed light frames, and channel frames for overhead doors (multi-component urethane or silicone).
 - 5. Perimeter of toilet room accessories (clear silicone).
 - 6. Perimeter of interior steel door frames (acrylic latex).
 - 7. Perimeter of cabinet and vanity countertops and toilet room accessories (clear silicone).
- C. The applications for joint sealers to be performed as Work of other sections, with this Section cross-referenced for requirements include, but are not limited to, the following:
 - 1. Flashing and other joints associated with roofing and sheet metal work.
 - 2. Perimeter of plumbing fixtures (sinks, urinals, waterclosets, etc.).
 - 3. Sealing of joints in and around gypsum board construction.
- D. Refer to Division-8 sections for glazing requirements; not work of this section.
- E. Refer to sections of Divisions 15 and 16 for joint sealants in mechanical and electrical work.
- F. Comply with provisions of Section 01028 - Modification Requirements.
- G. General Performance: Except as otherwise indicated, joint sealers are required to establish and maintain airtight and waterproof continuous seals on a permanent basis, within recognized limitations of wear and aging as indicated for each application. Failures of installed sealers to comply with this requirement will be recognized as failures of materials and workmanship.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications, handling/installation/ curing instructions, and performance tested data sheets for each elastomeric product required.
 - 1. Certified Tests: With product data submit certified test reports for elastomeric sealants on aged performances as specified including hardness, stain resistance, adhesion, cohesion, or tensile strength, elongation, low-temperature flexibility, compression set, modulus of elasticity, water absorption, and resistance (aging, weight loss, deterioration) to heat and exposures to ozone and ultraviolet.

1.04 JOB CONDITIONS

- A. Weather Conditions: Do not proceed with installation of liquid sealants under unfavorable weather conditions. Install elastomeric sealants when temperature is in lower third of temperature range recommended by manufacturer for installation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. General: Manufacturers listed in this Article include those known to produce the indicated category of prime joint sealer material, either as a nominally pure generic product or as an equivalent-performance modification thereof or proprietary product.
- B. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
 - 1. Manufacturers of Elastomeric Sealants (Liquid):
 - a. Dow Corning Corp.; Midland, MI.
 - b. General Electric Co.; Waterford, NY.
 - c. Tremco, Inc.; Cleveland, OH (Dymeric Multi-component Urethane).
 - 2. Manufacturers for Non-Elastomeric Sealants/Caulks (Liquid/Tape):
 - a. Gibson-Homans Co.; Cleveland, OH.
 - b. Macco/Glidden/SCM; Wickliffe, OH.
 - c. W.R. Meadows, Inc.; Elgin, IL.
 - d. Pecora Corp.; Harleysville, PA.
 - e. Sika Chemical Corp.; Lindhurst, NJ.
 - f. Sonneborn/Contech, Inc.; Minneapolis, MN.
 - g. Standard Dry Wall Products Co.; Miami, FL.
 - h. Tremco, Inc.; Cleveland, OH.
 - i. Woodmont Products, Inc.; Huntingdon Valley, PA.
 - 3. Manufacturers of Joint Fillers/Sealant Backers:
 - a. Dow Chemical Co.; Midland, MI.
 - b. W.R. Meadows, Inc.; Elgin, IL.
 - c. Sonneborn/Contech, Inc.; Minneapolis, MN.
 - d. Williams Products, Inc.; Troy, MI.
 - e. Woodmont Products, Inc.; Huntingdon Valley, PA.

4. Manufacturer of flexible epoxy sealant:
 - a. Fosroc Nitoseal 280 flexible epoxy sealant.
5. For joints between precast concrete panels, use Multi-Part Nonsag Urethane Sealant or use NT: Type M, Grade NS, Class 25, and complying with the following requirements for uses: NT, M, G, A, and, as applicable to joint substrates indicated, O, as manufactured by one of the following:
 - a. "Chem-Calk 500"; Bostik Construction Products Div.
 - b. "Vulkem 227"; Mameco International, Inc.
 - c. "Vulkem 922"; Mameco International, Inc.
 - d. "Dualthane"; W. R. Meadows.
 - e. "Dynatrol II"; Pecora Corp.
 - f. "Permapol RC-2"; Products Research & Chemical Corp.
 - g. "Sikaflex-2c NS"; Sonneborn Building Products.
 - h. "Sonolastic NP 2"; Sonneborn Building Products.
 - i. "Dymeric"; Tremco, Inc.

2.02 MATERIALS

- A. General Sealer Requirements: Provide colors indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors. Select materials for compatibility with joint surfaces and other indicated exposures, and except as otherwise indicated select modulus of elasticity and hardness or grade recommended by manufacturer for each application indicated. Where exposed to foot traffic, select nontracking materials of sufficient strength and hardness to withstand heel traffic without damage or deterioration of sealer system.
- B. Elastomeric Sealants:
 1. Multi-Component Polyurethane Sealant: as otherwise indicated, provide manufacturer's standard, non-modified, 2-or-more-part, polyurethane-based, elastomeric sealant; complying with FS TT-S-00227E Type II, Class A; self-leveling grade/type where used in joints of surfaces subject to traffic, otherwise nonsag grade/type.
 - a. Modulus and Hardness: Where self-leveling grade/type is required, provide sealant with cured modulus of elasticity at 100% elongation of not more than 150 psi (ASTM D412 test procedure), and Shore A hardness of not less than 35 (ASTM D 2240). Where nonsag grade/type is required, provide sealant with cured modulus of elasticity at 100% elongation of not more than 75 psi and Shore A hardness of 20 to 30.
 - b. Sealant shall withstand total movement up to 40% extension and 25% compression.
 - c. Standard of Quality: Equal to Dymeric Multi-Component Urethane sealant as manufactured by Tremco Company.

2. Single-Component Silicon Rubber Sealant: Except as otherwise indicated, provide manufacturer's standard, non-modified, one-part, silicone-rubber-based, air-curing, nonsag, elastomeric sealant; complying with either ASTM C 920 Type S Class 25 Class NS, or FS TT-S-001543A Class A Type Non-sag.
 - a. Porous-Bond Type: Where indicated and where sealant bond surfaces are porous or noncompatible with acid-type sealant, provide manufacturer's nonacid, "low-modulus" type; with fully-cured modulus of elasticity not exceeding 40 psi, Shore A hardness of 15 to 25, minimum elongation of 400%, and minimum tensile strength of 75 psi (ASTM D 412).
 - b. Nonporous-Bond Type: Where indicated and where sealant-bond surfaces are nonporous and compatible with acid sealant, provide manufacturer's acid type with "mid-to-fully-cured modulus" of elasticity not exceeding 75 psi, Shore A hardness of 20 to 35, minimum elongation of 500% and minimum tensile strength of 150 psi (ASTM D 412); with adhesion in peel of 20 lb. per in. and 10% maximum loss of bond to substrate (ASTM C 794), and tear resistance of not less than 30 lb. per in. (ASTM D 624).
 - c. Sanitary Interior Type: Where indicated and where applied in high-humidity or wet service, provide manufacturer's clear mold/mildew-resistant, acid type sealant for application to nonporous sealant bond surfaces.

C. Non-Elastomeric Sealants and Caulking Compounds:

1. Single-Component Acrylic Sealant: Provide acrylic terpolymer, solvent-based, one-part, thermoplastic sealant compound; solids not less than 95% acrylic; recommended by manufacturer for general use as an exposed building construction sealant.
 - a. Performance Standard: Comply with either ASTM C 920 Type S Class 12-1/2 Grad NS, or FS TT-S-00230C Class B Type Non-sag.
 - b. Bond and Cohesion: Comply with ASTM C 910, with less than 0.5 sq. in. of combined cohesion and bond failure for 3 samples.

D. Miscellaneous Materials:

1. Joint Primer/Sealer: Provide type of joint primer/sealer recommended by sealant manufacturer for joint surfaces to be primed or sealed.
2. Bond Breaker Tape: Provide polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant. Provide

self-adhesive tape where applicable.

3. Sealant Backer Rod: Provide compressible rod stock of polyethylene foam, polyurethane foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable nonabsorptive material as recommended by sealant manufacturer for back-up of and compatibility with sealant. Where used with hot-applied sealant, provide heat-resistant type which will not be deteriorated by sealant application temperature as indicated.

E. Fire-Resistant Joint Sealers:

1. General: Provide manufacturer's standard fire-stopping sealant, with accessory materials, having fire-resistant ratings indicated as established by testing identical assemblies per ASTM E814 by Underwriters Laboratory, Inc., or other testing and inspecting agency acceptable to authorities having jurisdiction.
2. Foamed-In-Place Fire-Stopping Sealant: Two-part, foamed-in-place, silicone sealant formulated for use in a through-penetration fire-stop system for filling openings around cables, conduit, penetrations through walls and floors.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) "Dow Corning Fire Stop Foam"; Dow Corning Corp.
 - 2) "Pensil 851"; General Electric Co.
3. One-Part Fire-Stopping Sealant: One part elastomeric sealant formulated for use in a through-penetration fire-stop system for sealing openings around cables, conduit, pipes and similar penetrations through walls and floors.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) "Dow Corning Fire Stop Sealant"; Dow Corning Corp.
 - 2) "3M Fire Barrier Caulk CP-25"; Electrical Products Div./3M.
 - 3) "RTV 7403"; General Electric Co.
 - 4) "Fry Putty"; Standard Oil Engineered Materials Co.
4. Ceramic Fiber Blanket: Provide a density of 6.5 ± 1.5 PCF. Blanket folded to a total uncompressed thickness of material to be $3/8$ to $1/2$ in. greater than joint width. Minimum depth of ceramic blanket to be: Two $4\frac{1}{2}$ in. segments for a total depth of 9 in. separated by sealant.

F. Flexible Epoxy Sealant:

1. Flexible epoxy sealant as manufactured by Fosroc Company. Sealant shall have Shore A hardness of 60. Sealant shall be backed with closed cell ethafoam backup rod.
2. This sealant shall be used for concrete floor joints where floor coating and sealer are

scheduled.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Installer must examine substrates, (joint surfaces) and conditions under which joint sealer work is to be performed, and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with joint sealer work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 JOINT PREPARATION

- A. Clean joint surfaces immediately before installation of backer rod, sealants or caulking compounds. Remove dirt, insecure coatings, moisture and other substances which could interfere with seal of bond of sealant or caulking compound. Etch concrete and masonry joint surfaces as recommended by sealant manufacturer. Roughen vitreous and glazed joint surfaces as recommended by sealant manufacturer.
- B. Prime or seal joint surfaces where indicated and where recommended by sealant manufacturer. Confine primer/sealer to areas of sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.03 INSTALLATION

- A. Comply with manufacturer's printed instructions except where more stringent requirements are shown or specified, and except where manufacturer's technical representative directs otherwise.
- B. Set joint filler units at depth or position in joint as indicated to coordinate with other work, including installation of bond breakers, backer rods and sealants. Do not leave voids or gaps between ends of joint filler units.
- C. Install sealant backer rod for liquid-applied sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for application indicated.
- D. Install bond breaker tape where indicated and where required by manufacturer's recommendations to ensure that liquid-applied sealants will perform as intended.
- E. Employ only proven installation techniques, which will ensure that sealants are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.
- F. Install liquid-applied sealant to depths as shown or, if not shown, as recommended by

sealant manufacturer but within the following general limitations, measured at center (thin) section of beads (not applicable to sealants in lapped joints):

1. For sidewalks, pavements and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75% of joint width, but neither more than 5/8" deep nor less than 3/8" deep.
 2. For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2" deep nor less than 1/4" deep.
 3. For joints sealed with non-elastomeric sealants and caulking compounds, fill joints to a depth in range of 75% to 125% of joint width.
- G. Spillage: Do not allow sealants or compounds to overflow from confines of joints, or to spill onto adjoining work, or to migrate into voids of exposed finishes. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage.
- H. Do not overheat or reheat hot-applied sealants.

3.04 CURE AND PROTECTION

- A. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability. Advise Contractor of procedures required for cure and protection of joint sealers during construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at time of substantial completion. Cure and protect sealants in a manner which will minimize increases in modulus of elasticity and other accelerated aging effects. Replace or restore sealants which are damaged or deteriorated during construction period.

END OF SECTION

Division VIII – Doors and Windows

SECTION 08100 - METAL DOORS AND FRAMES

PART 1 - RELATED DOCUMENTS

- A. General provisions of Contract, General and Special Conditions, and General Requirements apply to this Section.

PART 2 - DESCRIPTION OF WORK

- A. Provide labor, materials, equipment, and services necessary for proper and complete installation of all hollow metal work.
- B. Include all view windows and side lights indicated on Drawings.
- C. Work Specified in Other Sections.
 - 1. Finish Hardware is specified in another Division 8 Section.

PART 3 - LABEL CONSTRUCTION

Where Label Construction is indicated in Door and Frame Schedule, materials and construction of doors and frames shall be in accordance with and bear indicated resistive rating label of Underwriters' Laboratories, Inc.

PART 4 - SUBMITTALS

Submit Shop Drawings for all work, indicating materials, uses, gauges, details of construction, connections to other work, fastenings, and anchors, to Architect for his review. Do not start fabrication until these Drawings are approved.

PART 5 - MATERIALS

- A. Manufacturers offering products complying with requirements include:
 - Steelcraft Mfg. Co.
 - Republic Steel Corporation
- B. Materials used shall be of best quality of their respective kinds.
- C. Steel in general shall be cold rolled stretcher level, prime quality steel, of U.S. Standard gauge as specified under the various headings.
- D. Doors, frames and framed openings exposed to the exterior shall be fabricated of zinc coated steel in the gauges scheduled. The steel shall be hot dipped so as to provide a

ductile coating, tightly adherent to the base steel. The zinc coating shall be an A60 coating in accordance with ASTM specification A525 (.6 oz. of zinc per sq. ft. of steel total coverage.)

PART 6 - HOLLOW METAL STEEL DOORS

A. Physical Properties:

Interior Doors

"R" Factor: 2.4

"U" Factor: .41

Compression Strength: 5000 P.S.F.

Exterior Doors

Polyurethane Core Doors

"R" Factor: 11.1

"U" Factor: .09

Compression Strength: 3600 P.S.F.

B. Doors shall be equal to those manufactured by The Steelcraft Manufacturing Company, Cincinnati, Ohio, and designated as:

LF-18 (1-3/4", 18 gage steel)

C. Doors shall be fabricated of:

1. Cold rolled steel, interior.

Galvanized steel with a zinc coating of .6 ozs. per square foot total, exterior.

D. Door shall be flush with edge seams filled and ground smooth.

E. Doors shall have 1/8" bevel in 2" on hinge and ground smooth.

F. Doors shall have vertical mechanical interlocking seams on hinge and lock edges.

G. Doors shall be provided with top and bottom inverted 14 gage steel channels spot welded within the door.

H. Doors shall be reinforced, stiffened and sound deadened with impregnated Kraft honeycomb core completely filling the inside of the door and laminated to the inside faces of panels.

I. Doors shall be mortised and adequately reinforced for all hardware.

1. Mortised hardware reinforcements shall be drilled and tapped at the factory.

- 2. Surface applied hardware shall be field drilled by others.
- J. Doors shall be reinforced internally with a 14 gage steel reinforcement for surface closers when specified.
- K. Out swinging exterior doors shall be provided with top caps for protection against weather and with a polyurethane core.
- L. Doors shall be phosphatized and receive one coat of baked on prime paint.

PART 7 - FRAMES

- A. Fabricate frames of 16 ga. steel. Manufacturers offering products complying with the requirements include:

Steelcraft Mfg. Co.
Republic Steel Corp.
Fenestra, Inc.
- B. All frames shall have welded and mitered corners, equivalent to Steelcraft Type F-14 and F-16. (Issue A).
- C. Provide three single resilient rubber silencers on strike side of frame.
- D. Provide suitable anchors for jambs as required by wall construction. Provide a minimum of six (6) jamb anchors and two (2) base anchors per frame. Provide anchors as required for labeled frames.
- E. Reinforcing channels, where called for, shall be 12 gauge reinforcing channel in head.

PART 8 - PROVISIONS FOR GLAZING

- A. Outside of interior openings for secure areas shall be removable screw-on type. Glazing stops shall be steel and secured in place with Phillip oval head countersunk screws at 12" on center. Glazing stops shall be set on inside of exterior openings and security side of interior openings. Glass requirements are specified in other Division 8 sections.

PART 9 - HARDWARE REINFORCEMENTS

- A. Accurately mortise, reinforce, drill, and tap at factory all work to receive hardware, except do drilling and tapping for door checks and brackets at building.

- B. Reinforcements shall be of ample size and thickness to stiffen work against strain of service required. Reinforcements for locks and escutcheons shall be box type with spring lead contacts for lock cases.
- C. Provide cover boxes in back of all hardware cutouts in combination type frames.

PART 10 - FINISH

- A. All steel hollow metal work shall be phosphatized and receive one coat baked on prime coat.
- B. Each coat shall be baked on and sanded smooth.

PART 11 - INSTALLATION

- A. Set frames in their proper locations, plumb and true and securely braced in position.
- B. Receive, store and protect and be responsible for all doors to be installed hereunder. Report immediately to Contractor shortages, damage, improper preparation, defective finishes and warped doors. Do not install any material not perfect in every respect.
- C. Inspect openings and frames to receive doors. Report damage or discrepancy affecting proper installation of units to Contractor, and have corrective work done in a suitable and satisfactory manner.
- D. Install doors in openings as indicated on Drawings in conformance with shop drawings and hardware schedule. Install doors so they hang plumb and true, with proper clearances using items of hardware scheduled for openings.
- E. Accurately set all frames and thoroughly and rigidly anchor and fasten in place in building construction. Weld drywall anchors to frames.
- F. Check frames before and after walls are constructed to see that they are properly erected.

End of Section

SECTION 08211 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including the General and supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Solid core doors with wood veneer faces.
 - 2. Factory fitting flush wood doors to frames and factory matching for hardware.
 - 3. Glazing stops and preparation of flush doors to receive glazing; glazing specified elsewhere.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Architectural Woodwork: Division 6.
 - 2. Metal Door Frames: Elsewhere in Division 8.
 - 3. Door Hardware: Elsewhere in Division 8.
 - 4. Glass and Glazing: Elsewhere in Division 8.
 - 5. Field Finishing of Wood Doors: Section 09900 - Painting.

1.03 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of door, including details of core and edge construction, trim for openings and louvers, and factory-finishing specifications.
- C. Shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for veneer matching and factory finishing and other pertinent data.
 - 1. For factory-machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light and louver openings.
- D. Samples for verification in the form and size indicated below:
 - 1. Corner sections of doors approximately 12 inches (300 mm) square with door faces and edging representing the typical range of color and grain for each species of veneer and solid lumber required.
 - 2. Louvers consisting of blade and frame, 6 inches (150 mm) long, for each material and finish specified.
 - 3. Frames for light openings, 6 inches (150 mm) long, for each materials, type, and

finish required.

1.04 QUALITY ASSURANCE

A. Quality Standard: Comply with the following standard:

1. AWI Quality Standard: "Architectural Woodwork Quality Standards: of the Architectural Woodwork Institute for grade of door, core, construction, finish, and other requirements.

B. Fire-Rated Wood Doors: Provide wood doors that comply with NFPA 80; are identical in materials and construction to units tested in door and frame assemblies per ASTM E 152; and are labeled and listed by UL, Warnock Hersey, or another testing and inspection agency acceptable to authorities having jurisdiction.

1. Oversized, Fire-Rated Wood Doors: For door assemblies exceeding sizes of tested assemblies, provide manufacturer's certificate stating that doors conform to all standard construction requirements of tested and labeled fire-door assemblies except for size.
2. Temperature Rise Rating: At stairwell enclosures, provide doors that have a temperature rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.

C. Single-Source Responsibility: Obtain doors from one source and by a single manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's instructions.
- B. Identify each door with individual opening numbers as designated on shop drawings, using temporary, removable, or concealed markings.

1.06 PROJECT CONDITIONS

A. Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during the remainder of the construction period to comply with the following requirements applicable to Project's geographical location:

1. AWI quality standard Section 100-S-11 "Relative Humidity and Moisture Content."

1.07 WARRANTY

A. General Warranty: Door manufacturer's warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch (6.35 mm) in a 42-by-84-inch (1067-by-2134-mm) section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 75-mm) span, or do not conform to tolerance limitations of referenced quality standards.

1. Warranty shall be in effect during the following period of time after date of Substantial Completion.

a. Solid Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide doors by one of the following:

1. Solid Core Doors:
 - a. Algoma Hardwoods, Inc.
 - b. Eggers Industries, Architectural Door Division
 - c. Fenestra Corporation
 - d. Graham Manufacturing Corp.
 - e. Mohawk Flush Doors, Inc.
 - f. V-T Industries, Inc.
 - g. Weyerhaeuser Co.

2.02 INTERIOR FLUSH WOOD DOORS

A. Solid Core Doors for Transparent Finish: Comply with the following requirements:

1. Faces: Oak for a clear finish, plain sliced
2. Grade: Premium
3. Construction: 5 or 7 plies
4. Core: Particleboard core
5. Bonding: Stiles and rails bonded to core, then entire unit abrasive planed before veneering.

B. Fire-Rated Solid Core Doors: Comply with the following requirements:

1. Faces and Grade: Provide faces and grade to match non-fire-rated doors in same area of building, unless otherwise indicated.
2. Construction: Manufacturer's standard core construction as required to provide fire-resistance rating indicated.
3. Blocking: Provide composite blocking designed to maintain fire resistance of door

but with improved screw-holding capability of same thickness as core and with minimum dimensions as follows:

- a. 5-inch (125-mm) top rail blocking
 - b. 5-inch (125-mm) bottom rail blocking
 - c. 5-by-18-inch (125-by-450-mm) lock blocks
 - d. 5-inch (125-mm) midrail blocking.
4. Edge Construction: Provide manufacturer's standard laminated-edge construction for improved screw-holding capability and split resistance as compared to edges composed of a single layer of treated lumber.
 5. Pairs: Provide fire-rated pairs with fire-retardant stiles that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.

2.03 LIGHT FRAMES

A. Wood-Veneered Beads for Light Openings in Fire Doors.

2.04 FABRICATION

A. Fabricate flush wood doors to comply with following requirements:

1. In sizes indicated for job-site fitting:
 - a. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements of NFPA 80 for fire-resistance-rated doors.
 - b. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory machining.
 - c. Metal Astragals: Pre-matching astragals and formed-steel edges for hardware for pairs of fire-rated doors.

B. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.

1. Light Openings: Trim openings with moldings of material and profile indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine installed door frames prior to hanging door:

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
2. Reject doors with defects.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Hardware: For installation see Division 8 Section "Finish Hardware."

- B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and referenced quality standard and as indicated.
1. Install fire-rated doors in corresponding fire-rated frames according to requirements of NFPA 80.
- C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
1. Fitting Clearances for Non-Fire-Rated Doors: Provide 1/8 inch (3.2 mm) at jambs and heads, 1/16 inch (1.6 mm) per leaf at meeting stiles for pairs of doors, and 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4-inch (6.4 mm) clearance from bottom of door to top of threshold.
 2. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80.
 3. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
 4. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) on lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Field-Finished Doors: Refer to Division 9, Section 09900 - Painting, for finishing requirements.

3.03 ADJUSTING AND PROTECTION

- A. Operation: Rehang or replace doors damaged during installation.
- B. Finished Doors: Refinish or replace doors damaged during installation.
- C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at the time of Substantial Completion.

End of Section

SECTION 08410 - ALUMINUM ENTRANCES, CURTAIN WALL AND WINDOWS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division - 1 specification sections, apply to Work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of aluminum entrances, curtain wall and windows is shown on drawings and schedules.
- B. Types of aluminum entrances, curtain wall and windows required include the following:
 - 1. Exterior entrance doors.
 - 2. Curtain Wall type framing system.
- C. Glazing: Refer to "Glass and Glazing" section of Division 8 for glazing requirements for aluminum entrances, curtain wall and windows, including doors.
- D. Finish hardware for aluminum doors is included as Work of this Section.
 - 1. Cylinders for locks are specified with "Finish Hardware" in another Division 8 section.
- E. Sealant around perimeter of aluminum frames is specified elsewhere in Division 7 section.
- F. Comply with provisions of Section 01028 - Modification Requirements.

1.03 SYSTEM PERFORMANCES

- A. General: Provide exterior entrance and curtain wall and windows assemblies that have been designed and fabricated to comply with requirements for system performance characteristics listed below as demonstrated by testing manufacturer's corresponding stock systems according to test methods designated.
- B. Thermal Movement: Allow for expansion and contraction resulting from ambient temperature range of 120°F (49°C).
- C. Wind Loading: Provide capacity to withstand loading indicated below, tested per ASTM E 330.
 - 1. Uniform pressure of 30 psf inward and 30 psf outward.

D. Transmission Characteristics of Fixed Framing: Comply with requirements indicated below for transmission characteristics and test methods.

1. Air and Water Leakages: Air infiltration of not more than 0.06 CFM per sq. ft. of fixed area per ASTM E 283 and no uncontrolled water penetration per ASTM E 331 at pressure differential of 8.0 psf (excluding operable door edges).

E. Transmission Characteristics of Entrances: Provide entrance doors with jamb and head frames which comply with requirements indicated below for transmission characteristics and test methods.

1. Air Leakage: Air infiltration per linear foot of perimeter crack of not more than 0.50 CFM for single doors and 1.0 CFM for pairs of doors per ASTM E 283 at pressure differential of 1.567 psf.

1.04 QUALITY ASSURANCE

A. Drawings are based on one manufacturer's standard aluminum entrance, curtain wall and windows system. Another standard system of a similar and equivalent nature will be acceptable when differences do not materially detract from design concept or intended performances, as judged solely by Architect.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, standard details, and installation recommendations for components of aluminum entrances and curtain wall and windows required for Project, including test reports certifying that products have been tested and comply with performance requirements.

B. Shop Drawings: Submit shop drawings for fabrication and installation of aluminum entrances and curtain wall and windows, including elevations, detail sections of typical composite members, hardware mounting heights, anchorages, reinforcement, expansion provisions, and glazing.

C. Samples: Submit samples of color of aluminum finish, on 12" long sections of extrusions or formed shapes and on 6" square sheets.

1.06 SPECIAL PROJECT WARRANTY

A. Provide written warranty signed by Manufacturer, Installer, and Contractor agreeing to replace aluminum entrances, curtain walls and windows which fail in materials or workmanship within 3 years of acceptance. Failure of materials or workmanship includes excessive leakage or air infiltration, excessive deflections, faulty operation of entrances, deterioration of finish or construction in excess of normal weathering, and

defects in hardware, weatherstripping, and other components of the work.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
1. Kawneer Company, Inc.
 2. YKK AP America
 3. PPG Industries, Inc.
 4. Tubelite Div., Indal Inc.
 5. Amarlite/Arco Metals Co.

2.02 MATERIALS AND ACCESSORIES

- A. Aluminum Members: Alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish; ASTM B 221 for extrusions, ASTM B 209 for sheet/plate.
- B. Fasteners: Aluminum, non-magnetic stainless steel, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum components.
1. Do not use exposed fasteners except where unavoidable for application of hardware. Match finish of adjoining metal.
 2. Provide Phillips flat-head machine screws for exposed fasteners.
- C. Brackets and Reinforcements: Manufacturer's high-strength aluminum units where feasible; otherwise, nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A 386.
- D. Concrete/Masonry Inserts: Cast iron, malleable iron, or hot-dip galvanized steel complying with ASTM A 386.
- E. Bituminous Coatings: Cold-applied asphalt mastic complying with SSPC-PS 12, compounded for 30-mil thickness per coat.
- F. Compression Weatherstripping: Manufacturer's standard replaceable stripping of either molded neoprene gaskets complying with ASTM D 2000 or molded PVC gaskets complying with ASTM D 2287. Weatherstripping shall be equal to Kawneer Sealair Weathering System which shall include head and jamb, astragal, and bottom weatherstripping.
- G. Glazing Materials: Provide manufacturers standard EDPM glazing gaskets.
- H. Sealant: Provide all sealant necessary within aluminum assemblies. Perimeter sealant around frames shall be included under Section 07900.

2.03 HARDWARE

- A. General: Refer to hardware section of Division 8 for requirements for hardware items other than those indicated herein to be provided by manufacturer of aluminum entrances.
- B. Thresholds: Extruded aluminum in mill finish, ADA compliance, complete with anchors, coordinated with pivots of size indicated or manufacturer's standard if not indicated. Set thresholds in full bed of sealant.

2.04 FABRICATION

- A. General - Sizes and Profiles: Required sizes for door and frame units, including profile requirements, are indicated on drawings.
 - 1. Details shown are based upon standard details by manufacturer indicated. Similar details by other manufacturers listed will be acceptable, provided they comply with other requirements, including profile limitations.
- B. Prefabrication: To greatest extent possible, complete fabrication, assembly, finishing, hardware application, and other work before shipment to project site. Disassemble components only as necessary for shipment and installation.
 - 1. Do not drill and tap for surface-mounted hardware items until time of installation at project site.
 - 2. Perform fabrication operations, including cutting, fitting, forming, drilling, and grinding of metal work in manner which prevents damage to exposed finish surfaces. For hardware, perform these operations prior to application of finishes.
- C. Reinforcing: Install reinforcing as necessary for performance requirements; separate dissimilar metals with bituminous paint or other separator which will prevent corrosion.
- D. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.
- E. Fasteners: Conceal fasteners wherever possible.
- F. Weatherstripping: For exterior doors, provide compression weatherstripping against fixed stops; at other edges, provide sliding weatherstripping retained in adjustable strip mortised into door edge.
 - 1. Provide EPDM/vinyl blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.
 - 2. At interior doors and other locations without-weatherstripping, provide neoprene silencers on stops to prevent metal-to-metal contact.

2.05 STOREFRONT FRAMING SYSTEM

- A. General: Provide inside-outside matched resilient flush-glazed system fabricated for stick-type erection procedure, with provisions for glass replacement.
 - 1. Drawings are based on:
 - a. All aluminum doors, 350 medium style.
 - b. All exterior windows and aluminum framed doors, storefront: Kawneer 451T System (2" x 4½") for 1" glazing. Add steel as required to meet 2002 Kentucky Building Code.
 - c. All interior aluminum windows shall be Kawneer Trifab II 400 System, 1¾" x 4" for a single pane of ¼" tempered glass. All aluminum doors shall be 350 medium style, single pane of glass, glazed by code.
 - 2. Provide thermal-break frame members.

2.06 STILE-AND-RAIL TYPE ALUMINUM DOORS

- A. Frame: Provide tubular frame members, fabricated with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods or j-bolts, or fabricate with structurally welded joints, at manufacturer's option.
- B. Glazing: Fabricate doors to facilitate replacement of glass, without disassembly of door stiles and rails. Provide square snap-on extruded aluminum glazing stops, with exterior stops anchored for non-removal.

2.07 FINISH

- A. All exposed aluminum surfaces shall be free of scratches and other serious blemishes.
 - 1. Finish shall be Kawneer standard classic bronze; i.e., Dark Bronze.
 - 2. Hardware to match door.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for installation of aluminum entrances, curtain wall and windows.
- B. Set units plumb, level, and true to line, without warp or rack of framing members, doors. Anchor securely in place, separating aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- C. Drill and tap frames and doors and apply surface-mounted hardware items, complying with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.

- D. Set sill members and other members in bed of sealant to provide weathertight construction.
- E. Refer to "Glass and Glazing" section of Division 8 for their installation of glass shown to be glazed into doors and framing.

3.02 ADJUST AND CLEAN

- A. Adjust operating hardware to function properly, without binding, and to provide tight fit at contact points and weatherstripping.
- B. Clean completed system, inside and out, promptly after erection and installation of glass and sealants. Remove excess glazing and sealants, dirt, and other substances from aluminum surfaces.
- C. Institute protective measures and other precautions required to assure that aluminum entrances and curtain wall and windows will be without damage or deterioration other than normal weathering at time of acceptance.

END OF SECTION

SECTION 08710

PART 1 – GENERAL

1.0 Related Documents

Drawings and general provisions of contract and Division 1 specification sections, apply to work of this section

1.01 SUMMARY

- A. Section Includes:
 - 1. Door Hardware.
 - 2. Storefront and Entrance Door Hardware.
 - 3. Installation of Finish Hardware.
- B. Related Sections:
 - 1. Section 06200 - Finish Carpentry
 - 2. Section 07900 - Joint Sealers – exterior thresholds
 - 3. Section 08100 – Metal Doors and Frames
 - 4. Section 08200 - Wood and Plastic Doors
 - 5. Section 08400 – Entrances and Storefronts
- C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.
 - 1. Windows.
 - 2. Cabinets, including open wall shelving and locks.
 - 3. Signs, except where scheduled.
 - 4. Toilet accessories, including grab bars.
 - 5. Folding Partitions, except cylinders where detailed.
 - 6. Sliding aluminum doors, except cylinders where detailed.
 - 7. Access doors and panels, except cylinders where detailed.

1.02 REFERENCES

- A. Use date of standard in effect as of BID date.
- B. American National Standards Institute – ANSI 156.18 – Materials and Finishes.
- C. ICC/ANSI A117.0 – 1998 – Specifications for making buildings and facilities usable by physically handicapped people.
- D. ADA – Americans with Disabilities Act of 1990.
- E. BHMA – Builders Hardware Manufacturers Association.
- F. DHI – Door and Hardware Institute
- G. NFPA – National Fire Protection Association
 - 1. NFPA 80 – Fire Doors and Windows
 - 2. NFPA 101 – Life Safety Code
 - 3. NFPA 105 – Smoke and Draft Control Door Assemblies
 - 4. NFPA 252 – Fire Tests of Door Assemblies

1.03 SUBMITTALS

ARCHITECT'S HARDWARE SCHEDULE:

Architect's hardware schedule is by hardware set number. Refer to drawings for designation of hardware set number applicable to each opening. Certain additional items of hardware and/or hardware accessories specified herein shall be finished and noted on the hardware schedule.

SUPPLIER'S HARDWARE SCHEDULE

A complete hardware schedule, indicating type, number, location, and finish shall be submitted to architect for approval, together with such samples as may be required for review. Opening numbers shall be same as used in contract documents. Schedule shall be prepared according to Door and Hardware Institute recommendations (schedule and sequence format) and shall include degree of door closer installation.

Supplier's hardware schedule will be reviewed by architect for type, quality, finish, and for function (other than hand). Contractor shall be responsible for checking schedule for correct hand of locksets and for supplying quantity of items required by contract documents.

Provide supplementary or revised hardware schedules if deemed necessary by architect.

Do not ship or deliver hardware to job prior to review of hardware schedules by architect.

Hardware schedule shall be submitted in the following format. Hardware schedules submitted to architect for review not in this format will be rejected:

HARDWARE SET 1

1 Sgl Door #001 Exterior from Corridor RHR 90 deg
Each leaf 3'0 x 7'0 x HMF x NLWD

Item, quantity, manufacturer's #, size, product type, finish, and product information

3 ea Hinge	BB1191 NRP 4.5 x 4.5	26D	HA
1 ea Cylinder	951 x GGMK	26D	FA
1 ea Exit Device	25R NL-OP	626	FA
Etc.			

1.04 QUALITY ASSURANCE

All hardware shall be furnished by an established Builders Hardware firm who maintains and operates an office, display, and stock in this area, and who is a regular authorized distributor of the lock they propose to furnish. All hardware schedules submitted for approval shall carry the signature and seal of a certified Architectural Hardware Consultant.

1.05 PROJECT CONDITIONS

Delivery storage and handling: Hardware supplier shall receive and check all hardware at his warehouse. Drop shipments to the jobsite from various manufacturers will not be permitted. All hardware shall be in its original packaging and plainly labeled and numbered to agree with the numbers and as listed in the hardware schedule. The contractor shall submit his schedules for approval to the architect before proceeding with any work. When required, hardware supplier shall deliver hardware and/or hardware templates to the various door manufacturers. The general contractor shall provide storage facilities for the finish hardware after delivery to the job site.

1.06 ITEMS NOT INCLUDED

Hardware for metal windows, toilet partitions, cabinets, access panels, etc. is not included in this section. See other sections for hardware to be furnished by others.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

Numbers given in this schedule are of the following manufacturers.

<u>PRODUCTS</u>	<u>MFG. SPECIFIED</u>	<u>APPROVED EQUAL</u>
Hinges	Ives	Hager, Bommer
Locks	Falcon	Schlage, Best
Exit Devices	Falcon	Von Duprin, Precision
Closers	LCN	Corbin-Russwin, Sargent
Trim/Auxiliary	Ives	Hager, Rockwood
Weather Strip	NGP	Pemko, Hager

2.02 HARDWARE FINISHES

US 32D-Ext 26D Int	Hinges, Pivots, Bolts
26D	Locks, Exit Devices
US 32D (630)	Push/Pulls, Stops
Sprayed Aluminum	Door Closers
Aluminum	Thresholds

2.03 HINGES

Ball Bearing Hinges shall be five-knuckle construction. Hinges for exterior doors shall be stainless steel with non-removable pins, in the finish specified. Oil impregnated bearings are not an acceptable substitute for ball bearings. All hinges shall be 4 1/2" x 4 1/2", unless otherwise specified.

2.04 LOCKSETS

Furnish locksets and cylinders by same manufacturer. Cylinders shall be provided with small format interchangeable cores keyed to the owner's specifications. All lever locks shall be mortise or bored type as indicated. Lock bodies and lock trim shall be by the same manufacturer. Backset on all lever locks and deadlocks shall be 2 3/4" or 2 3/8 as required. All deadlocks shall have 1" throw bolts and be equipped with armor fronts. Trim for locksets shall be as indicated in the hardware sets. Locksets shall be ANSI/BHMA A156.2 series 4000 Grade 1 Cylindrical lock as scheduled.

2.05 EXIT DEVICES

Characteristics:

- a. Tested to be in accordance with ANSI A156.3, 1994, Grade 1. All exit devices to be heavy duty, with one-piece removable covers. The housing shall be manufactured from extruded aluminum without exposed screws or rivets.
 - b. Exit Devices shall be "UL" listed for Life Safety. All exit devices for fire-rated door openings shall have "UL" labels for "Fire Exit Hardware". All exit devices shall conform to NFPA 80 and NFPA 101 requirements.
 - c. All series exit devices shall be "touchpad" (modern) types, incorporating a hydraulic fluid damper, which decelerates the touchpad on its return stroke and eliminates noise associated with the exit device operation.
- All exit devices shall be non-handed. The touchpad shall extend a minimum of 1/2 of the door width and shall be a minimum of 2-3/16" in height. Plastic touch pads shall not be acceptable. The touchpad height shall exceed height of mechanism case or rail assembly to eliminate "Pinch Points". If the touchpad height does not exceed the height of the mechanism case or rail assembly,

provide a factory installed insert / filler on the top and bottom of the touchpad along the mechanism case and rail assembly; to prevent "Pinch Points".

- d. All latch bolts to be the deadlocking type. Latch bolts shall have a self-lubricating coating to reduce wear. Plated or plastic coated latch bolts shall not be acceptable.
- e. All metal end caps to be standard with all exit devices.
- f. Exit device strikes, where surface applied, shall be a roller type and have an anti-slip mounting plate.
- g. All outside exit device trim shall be forged brass, full escutcheon. The pull shall have a grip that is 6 ¼" CTC and project 2 11/16".
- h. The exit device end caps shall be secured with three (3) screws to a truss bracket.
- i. The "touchpad" exit devices shall be patterned punched to designate code requirements; where required.
- j. All exit devices shall be made of brass, bronze, stainless steel, or aluminum material, plated to the standard architectural finishes to match the balance of the door hardware.
- k. Electric Latch retract options will require Power Supply from the same manufacturer.

2.06 CLOSERS

Door closers shall be full rack and pinion type. Closers shall be surface mounted. Equip closers with (2) two key operated regulating valves for individual control of both closing and latching speeds. Regulating valves shall be accessible from top of closer only and shall be completely unobtrusive. Closer shall have minimum of 15% door closing power adjustment and adjustable back check. Enclose closer in a cover of plastic. Closers on all exterior out-swinging doors and others as scheduled shall be parallel arm installation. Closer bodies and/or closer feet to be mounted on surface of door shall be supplied with sex bolts.

2.07 PUSH AND PULL UNITS

Push plates and pulls shall be solid stainless steel with a satin finish. Minimum thickness is .050; size and design are indicated in Hardware Sets.

2.08 PROTECTIVE PLATES

Kick, Armor, and Mop plates shall be height listed in schedule and width of 2" less than door width, or 1" less than door width of each leaf on pairs of doors. Plates shall be minimum thickness .050 stainless steel unless otherwise indicated.

2.09 THRESHOLDS

Provide (aluminum) thresholds where scheduled, with machine screws and lead expansion shields.

2.10 DOOR STOP

Provide door stops wherever necessary to prevent door or hardware from striking any adjacent partition or obstruction. Provide wall type whenever possible. All door stops and holders mounted on concrete floor or masonry walls shall have machine screws and lead expansion shields.

2.11 SILENCERS

Provide GJ-64 silencers for all hollow metal frames. Single doors shall have three (3) silencers. Double doors shall have two (2) silencers.

2.12 KEYING

Key locks to owner's specification. Obtain owners approval and signature on final approved keying. Perform all keying at lock factory, and register key data there. Deliver all master keys to Owner. No master keys shall be delivered to any other person.

PART 3 – EXECUTION

3.01 APPLICATION

INSTALLATION: Work shall be done by the **Hardware Supplier**, using skilled and experienced craftsman trained in the trade of installing finish hardware. Mortised items shall be neatly set in and made flush with door or frame surface. Manufacturer's instructions and recommendations shall be strictly followed.

FASTENERS: Hinges, pivots, locks, and exit devices shall be installed with proper sex bolts, wood or machine screws as supplied by the manufacturer. Surface closers shall be mounted to door with sex bolts. Door pulls shall be installed on doors with thru-bolts as supplied by manufacturer.

3.02 HARDWARE SETS

Hardware Set 1 Tag# 01, 02, 03, 04

Continuous Hinges	112 HD
Concealed Vertical Rod	CD24C 718C
Concealed Vertical Rod	CD24C EO Inactive Leaf
Mortise Cylinder	C987
Rim Cylinder	C953
Ladder Pull	9266 72" Round Tip 630
Closer	4040XP Cush 18PA, 30, 61
Threshold	By Aluminum Door Provider
Weather Strip	By Aluminum Door Provider
Door Sweep	By Aluminum Door Provider
Permanent Core	C607

Hardware Set 2 Tag# 05, 06, 07

Ball Bearing Hinge	5BB1 NRP 630
Rim Exit Device	CD25R NL
Mortise Cylinder	C987
Closer	4040XP H-Cush
Threshold	425EV
Weather Strip	160VA
Door Sweep	97V
Permanent Core	C607

Hardware Set 3 Tag # 08, 12, 17, 27

Ball Bearing Hinge	5BB1
Storeroom Lockset	T581 BD Dane
Closer	1461 R w/PA
Kick Plate	8400 B-CS 10 x 2" LTDW
Wall Stop	407CVX
Permanent Core	C607

Hardware Set 4 Tag # 19, 20

Ball Bearing Hinge	5BB1
Office Lockset	T511 BD Dane
Kick Plate	8400 B-CS 10 x 2" LTDW
Wall Stop	407CVX
Permanent Core	C607

Hardware Set 5 Tag # 28

Ball Bearing Hinge	5BB1
Office Lockset	T511 BD Dane
Closer	1461 H-Reg
Armor Plate	8400 B-CS 34 x 2" LTDW
Wall Stop	407CVX
Permanent Core	C607

Hardware Set 6 Tag # 10, 11

Ball Bearing Hinge	5BB1
Push Plate	8200 8x16
Pull w/Plate	8303-0 3 ½" x 15
Closer	1461 Rw/PA
Kick Plate	8400 B-CS 10 x 2" LTDW
Wall Stop	407CVX

Hardware Set 7 Tag# 09, 16, 26

Ball Bearing Hinge	5BB1
Flush Bolt	FB458-12 Top & Bottom
Storeroom Lockset	T581 BD Dane
Surface Overhead Stop	454H Both leaves
Permanent Core	C607

Hardware Set 8 Tag# 13, 14, 15, 18, 21, 22, 23, 24, 25

Ball Bearing Hinge	5BB1
Concealed Vertical Rod	CD25C-EO WDC
Concealed Vertical Rod	CD25C-NL-OP WDC
Mortise Cylinder	C987
Rim Cylinder	C953
Ladder Pull	9266 72" Round Tip 630
Hold Open Closer	4040XP H-Cush
Kick Plate	8400 B-CS 10 x 1" LTDW
Permanent Core	C607

End of Schedule

SECTION 08800 - GLASS AND GLAZING

PART 1 - SCOPE

- A. This Section includes all labor, materials, equipment and related items required for the work of glass and glazing as shown on the Drawings and specified herein.

PART 2 - SUBMITTALS

- A. The Contractor shall submit to the Architect for approval prior to furnishing materials at the job site, in five (5) copies, manufacturer's specifications, application and performance data, etc. for all glass and glazing materials, except miscellaneous accessories specified hereunder.
- B. Samples. The Contractor shall submit if requested to the Architect for approval prior to furnishing materials at the job site, duplicate samples of the following:
 - 1. Glass of each type, not less than 3" x 5".
 - 2. Glazing compound, one (1) cartridge.

PART 3 - CODES AND STANDARDS

- A. All glazing compounds and methods of glazing shall be in accordance with applicable portions of the Flat Glass Marketing Association's "Glazing Manual", latest edition.
- B. All safety glazing shall meet requirements of the Kentucky Department of Housing, Buildings, and Construction and appropriate Kentucky Revised Statutes.

PART 4 - PRODUCT HANDLING

- A. Glass shall be delivered to the job and shall be stored on end and under cover. Glass shall be properly crated, packaged, and protected from damage. Glazing compounds shall be delivered in manufacturer's sealed containers, with attached labels properly identifying the types.

PART 5 - MATERIALS

- A. Insulating glass for installation in aluminum windows shall be of sizes shown, composed of outer and inner panes of 1/4" (for color, see elevations) 1/4" clear .548, 1" O.A. , by LOF separated by a 1/2" dehydrated air space. Each unit shall be hermetically sealed and glass shall be separated by a spacer around the edges as standard with the manufacturer.
 - 1. Warranty. Each unit shall be guaranteed by the manufacturer not to develop, under normal conditions, material obstruction of vision as a result of film formation on the internal glass surfaces caused by failure of the hermetic seal other than through glass breakage for a period of ten (10) years.

- B. Compound for glazing in openings other than those which are dry-glazed shall be non-staining, one-part polysulfide base sealant, and shall be PRC "Rubber Caulk 5000", Pecora "Synthacalk GC-9", or DAP "Flexiseal". Color of compound shall be manufacturer's standard as selected by the Architect.
- C. Miscellaneous Items. Provide neoprene spacers, setting blocks, clips, and all accessories required for the work of glazing.
- D. Other material shall be as specified hereinafter.

PART 6 - GLAZING

- A. General Requirements:
 - 1. Glazing shall be done in a weathertight and waterproof manner. No glazing work shall be done when the temperature is below 40 degree F.
 - 2. Glazing surfaces shall be extremely clean, dry and completely dust free before commencing application of glazing materials.
 - 3. Remove glazing beads completely, perform glazing operations and set back in correct location. Do not mar beads, screws and the like.
 - 4. Glazing shall be done at the building after windows, frames, doors, etc. are installed.
 - 5. Remove excess glazing compound from glass and other adjacent surfaces to prevent permanent stains or other damage.
- B. Aluminum entrance doors and fixed window frames shall be glazed in strict accordance with entrance manufacturer's instructions and details for these operations.

PART 7 - CLEANING

- A. At completion, remove dirt, stains, etc. from glass. Wash and polish glass inside and outside surfaces. Exercise care so as not scratch or damage glass. Do not use acid solution or water containing caustic soaps. Leave work in perfect condition as approved by the Architect.

End of Section

Division IX – Finishes

SECTION 09260 - GYPSUM BOARD

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Interior metal stud wall framing studs, 20 gauge material thickness.
 - 2. Furred wall framing.
 - 3. Metal channel ceiling framing.
 - 4. Gypsum board.
 - 5. Cementitious backer board.
 - 6. Taped and sanded joint treatment.

1.02 SUBMITTALS

- A. Submit under provisions of Section 01330.
- B. Product Data: Provide data on metal framing, gypsum board, joint tape and joint compound.
- C. Submit manufacturer's installation instructions for each product proposed for use.

1.03 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM C 840, GA-201, GA-216 and GA-600.

1.04 DELIVERY, STORAGE, HANDLING

- A. Deliver, store, handle, and protect products in conformance with manufacturer's instructions and in accordance with Section 01600.
- B. Store inside building, on sleepers, and out of water.

1.05 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this section with minimum of 3 years documented experience.

1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable code for fire rated assemblies.
- B. Refer to Drawings for details and references to UL and GA assemblies.

PART 2 - PRODUCTS

2.01 MANUFACTURERS - GYPSUM BOARD

- A. Acceptable Manufacturers: Subject to compliance with requirements indicated, provide products of one of the following:
 - 1. U. S. Gypsum.
 - 2. Georgia-Pacific Gypsum, LLC.
 - 3. National Gypsum.
 - 4. Domtar Gypsum Co.
 - 5. Republic Gypsum Co.
- B. Substitutions: Under provisions of Section 01600.
- C. Specific product references are these of U.S. Gypsum Company unless noted otherwise as a standard of quality.

2.02 GYPSUM BOARD MATERIALS

- A. Fire Rated Gypsum Board: ASTM C 36; fire resistive type X or C, UL rated; 48 inch by 5/8 inch thick, maximum permissible length; ends square cut, tapered and beveled edges.
- B. Moisture Resistant Gypsum Board: ASTM C 630; 48 by 5/8-inch thick, type X or C (fire-rated), maximum permissible length ends square cut, tapered edges.
- C. Gypsum Backing Board: ASTM C 442; fire rated type 'X'; 5/8-inch thick; V-grooved edges, ends square cut, maximum permissible length.
- D. Exterior Gypsum Sheathing shall be Fiberglass, Mat-Faced Gypsum Sheathing, Type X, Densglass Fireguard Sheathing, or equal.

2.03 MANUFACTURERS - FRAMING SYSTEMS

- A. Acceptable Manufacturers: Subject to compliance with requirements indicated, provide products of one of the following:
 - 1. Clark Steel Framing Systems, Inc., Hinckley, OH.
 - 2. Consolidated Systems, Inc., Columbia, SC
 - 3. Dale/Incor Industries, Dearborn, MI.
 - 4. Delta Metal Products, Dallas, TX.
 - 5. Dietrich Industries, Inc., Hutchins, TX.

6. Knorr Steel Framing Systems. Salem, OR.
7. The Steel Network Inc., Raleigh, NC.
8. Unimast, Inc., Houston, TX
9. Western Metal, Riverside, CA.

B. Substitutions: Under provisions of Section 01600.

2.04 FRAMING MATERIALS

- A. Studs and Tracks: ASTM C 645; galvanized sheet steel, gage as indicated on Drawings, 'ST' series shape, depths as indicated on Drawings. Provide with floor and ceiling runners, 'C' shaped galvanized, 1-1/4 inch leg.
- B. Shaft Wall Studs: Galvanized finish, length and depth as required, gage as recommended by manufacturer for heights encountered to maintain a maximum deflection of L/240 with 5 pound horizontal loading.
- C. Furring, Framing and Accessories: Provide in conformance with ASTM C 645, GA-216, and GA-600 and as follows:
 1. Cold Rolled Channels: 3/4inch, 1-1/2 inch and 2 inches, 16 gage, prime painted.
 2. Furring Channels: 7/8 inch deep x 1-1/4 inch face, 25 gage, galvanized.
 3. Resilient Furring: 7/8 inch deep x 1-1/4 inch face, 25 gage, galvanized with one leg attached only.
- D. Fasteners: ASTM C 514 for nails and C 1002 for screws as follows:
 1. Inserts, clips, bolts, nails or other screws as recommended by manufacturer, of type and size to suit application and to rigidly secure materials in place.
 2. Self-drilling, self-tapping bugle head screws for use with power drive tool.
 3. Metal Framing to Structure: Power driven screw fasteners to withstand 190 pound single shear resistance and 200 pound bearing force when drive through structural head or base and without exceeding allowable design stress in runner, fastener, or structural support.
 4. Metal to Metal: 3/8 inch, Type S or S-12, pan head screws.
 5. Gypsum Board to Sheet Metal Application: Type S screws.
 6. Gypsum Board to Gypsum Board Application: Type G screws.

7. Vertical Deflection Connection (required under all steel beams where the top metal track is tied into the steel beam): Provide VertiClip® or VertiTrack™ deflection-accommodating anchorage devices, by The Steel Network Inc. Products shall conform to the following material properties and performance criteria:
 - a. Code Criteria:
 1. Meet required head of wall connection criteria as required by applicable referenced code for cyclic wall movement.
 - b. Material Composition: Meeting ASTM A653/A, SS grade 50, class 1, 50 ksi minimum yield strength, 65 ksi minimum tensile strength, G-60 hot dipped galvanized coating.
 - c. Material Thickness: 0.036 inch thick for VertiClip SLD series.
 - d. Clips shall be designed for positive attachment to structure and stud web using step-bushing technology to provide frictionless vertical movement.
 - e. Provide clips with attached bushing and screw of the series, size, and configuration as recommended by manufacturer.
 - f. Friction-fit deep-leg track assemblies and tracks relying on steel flexure to perform are unacceptable.
 - g. Substitutions: Must comply with the following:
 1. Meets ASTM A653/A, SS Grade 50, class 1 50 ksi minimum yield strength, 65 ksi minimum tensile strength, G-60 hot dipped galvanized coating.
 2. Certified for use in UL 2079-approved assemblies for cyclic movement.
 3. Structural testing performed per AISI requirements.

2.05 ACCESSORIES

- A. U. S. Gypsum Company products specified below as a standard of quality, unless noted otherwise.
 1. Acoustical Insulation: Refer to Section 07210.
 2. Acoustical Sealant and Tape: Non-hardening, non- skinning, for use in conjunction with gypsum board; manufactured by Tremco, Pecora, or USG.
 3. Corner Beads: Metal, equal to USG Durabead No. 103, galvanized.

4. Casing Beads: Equal to USG No. 200-A, galvanized.
5. Control Joint: Equal to USG No. 093, galvanized.
6. Hanger Wire: Annealed galvanized wire, of gauges indicated (or required to suit application) to rigidly support ceiling components in place.

B. Joint Treatment and Texture Materials

1. Joint Tape:
 - a. ASTM C 475 or FS SS-J-570, Type II, perforated tape.
 - b. Joint compound:
 1. ASTM C 475 or FS SS-J-570, Type I.
 2. Acceptable Product:
 - i) Taping compound: USG Durabond Joint Compound Taping.
 - ii) Topping: USG Joint Compound-All Purpose.

C. Reveal Moldings

1. Extruded aluminum, 6063 T5 alloy, clear anodized unless otherwise noted, in profiles as indicated on the Drawings, as made by Pittcon or Fry Reglet.

PART 3 - EXECUTION

3.01 INSPECTION

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

3.02 METAL STUD INSTALLATION

- A. Follow recommendations of U.S. Gypsum Co., "Gypsum Construction Handbook".
- B. Install studding in accordance with ASTM C 754, GA-201, GA- 216, and GA-600.
- C. Metal Stud Spacing: 16 inches on center, unless otherwise noted in schedule or on Drawings. Locate studs maximum of 2 inches from door frames, abutting partitions, corners, and other construction features.

- D. Stud to Structure: Refer to Drawings for indication of partitions extending stud framing through the ceiling to the structure above. Provide vertical deflection accommodating devices where each stud connects to structural members above.
- E. Stud to Ceiling: Refer to Drawings for indication of partitions extending to finished ceiling only and for partitions extending through the ceiling to the structure above.
- F. Door Opening Framing: Install double studs at door frame jambs. Install stud tracks on each side of opening, at frame head height, and between studs and adjacent studs.
- G. Blocking: Screw wood blocking to studs. Bolt or screw steel channels to studs. Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, shelving, toilet accessories, and hardware.
- H. Coordinate installation of bucks, anchors, blocking, electrical and mechanical work placed in or behind partition framing.
- I. Stud Connections: Secure studs to runners with screws at door and window frames, partition intersections and corners. Where required for additional height, splice studs by nesting a minimum lap of 18 inches and attach flanges together with 2 screws in each flange. Prevent structural loading of stud systems.
- J. Restroom Chase Wall Studs: Position double row of studs vertically in runners so that studs are opposite each other in pairs with flanges pointed in same direction. Space at 16 inches on center unless otherwise noted. Anchor each stud to runner flanges with screws. Cross brace between rows of studs with wallboard, 12 inches by chase width, screw attached to stud webs at quarter points in partition height, with 1 inch screws spaced 8" off center in each stud web.
- K. Seismic Requirements: Provide lateral bracing and other measures in accordance with seismic requirements of applicable codes and regulations.

3.03 WALL FURRING INSTALLATION

- A. Erect wall furring for direct attachment to concrete block and concrete walls.
- B. Erect furring channels vertically. Secure in place on alternate channel flanges at maximum 24 inches on center.
- C. Space furring channels maximum 16 inches off center, not more than 4 inches from floor, ceiling lines and abutting walls.
- D. Erect free-standing metal stud framing tight to concrete and concrete masonry walls, attached by adjustable furring brackets in accordance with manufacturer's instructions.

3.04 FURRING FOR FIRE RATINGS

- A. Install furring as required for fire resistance ratings indicated.

3.05 SHAFT WALL INSTALLATION

- A. Shaftwall Framing: In accordance with manufacturer's installation instructions. Space studs at 16 inches on center. Cut so that studs are no more than 1/2 inch shorter than rough opening.

3.06 CEILING FRAMING INSTALLATION

- A. Install in accordance with ASTM C 754, GA-201, GA-216, and GA-600 and manufacturer's instructions.
- B. Coordinate location of hangers with other work. Use 9 gage wire for single layer wall board, and 8 gage wire for double layer. Space at maximum 48 inches on center each way, unless ceiling framing occurs at more frequent intervals.
- C. Install ceiling framing independent of walls, columns, and above-ceiling work. Locate members within 6 inches of walls. Unless shown otherwise, use 1-1/2 inch cold-rolled channels, 2 inch on double layer board, at 48 inches off center main framing with furring channels at 24 inches on center, 16 inches on center for double layer board.
- D. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 24 inches past each end of openings.
- E. Laterally brace entire suspension system.

3.07 ACOUSTICAL ACCESSORIES INSTALLATION

- A. Install resilient channels at maximum 24 inches on center. Locate joints over framing members.
- B. Place acoustical insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.
- C. Install acoustical sealant at wall perimeter of designated partitions as follows:
 - 1. Metal Framing: Two beads at contact area at intersecting walls, floors and ceilings.
 - 2. Base Layer Gypsum Board: One bead.
 - 3. Seal penetrations of partitions by conduit, pipe, ductwork, rough-in boxes, and access door frames.

3.08 GYPSUM BOARD INSTALLATION

- A. Install gypsum board in accordance with GA 201, GA 216, GA-600 and U.S.G. "Gypsum Construction Handbook".
- B. Erect interior board horizontally if space is small so as to avoid end butt joint; otherwise install gypsum board vertically, with ends and edges occurring over firm bearing. Stagger end joints to occur at different locations on opposite sides of wall. Apply board to suspended ceilings with long dimension at right angles to framing.
- C. Erect exterior gypsum sheathing horizontally, with edges butted tight and ends occurring over firm bearing. Abut boards without forcing. Neatly fit ends and edges of boards and make cuts and penetrations so that paper facing and gypsum core are not damaged.
- D. Use screws when fastening gypsum board to metal furring or framing and nails to wood studding. Stagger fasteners opposite each other on adjacent ends and edges. Space fasteners as recommended in U.S.G., "Gypsum Construction Handbook". Do not attach gypsum board to top track on partitions extending from floor to structure above.
- E. Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum ceiling board with sealant.
- F. Place control joints at changes in back-up material, at maximum 20'-0" off center in exterior walls, and at maximum 30'-0" off center at interior partitions. In ceilings, install at maximum 30'-0" off center each way. Provide fire resistant protections behind control joints in fire rated assemblies.
- G. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.
- H. On fire rated assemblies, seal penetrations and make air-tight. Refer to Section 07840 for firestopping requirements and materials.
- I. Thicken partitions to eliminate wall surface jogs for the full length of the wall within a room to conceal structural members, pipes, panels, specialty items, and accessories.
- J. Coordinate door and other frame thicknesses as required.

3.09 JOINT TREATMENT

- A. Tape, fill, and sand exposed joints, edges, and corners to produce surface ready to receive finishes. The intent is to provide the highest quality of joint treatment work consistent with commercial construction. Leave surfaces smooth, uniform, and free of fins, depressions, ridges, cracks, and other imperfections.
- B. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.

C. Levels of Finish:

1. Comply with GA-214; italicized commentary is excluded; replace words "may" and "should" with "shall."
2. Locations to receive Level 4 finish: Areas to be painted.
3. Locations to receive Level 3 finish: Areas to receive moisture resistant gypsum board used as a tile substrate.
4. Locations to receive Level 2 finish: Fire-rated, sound-rated, and smoke-rated assemblies in ceiling plenums and concealed areas.
5. Locations to receive Level 1 finish: Non-fire-rated, non-sound-rated, and non-smoke-rated assemblies in ceiling plenums and concealed areas.

3.10 TOLERANCES

- A. Maximum Variation from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09300 - CERAMIC TILE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Furnish all labor, materials, tools, equipment and services necessary for and reasonably incidental to complete the tile work as shown on the drawings or specified.

B. Related documents, drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to work of this section.

C. Related Sections

1. Division 7, sealing expansion joints and other joints in tile work (joint sealant types, colors and manufacturers to be specified by Architect).
2. Division 3, Concrete. 03300

1.2 REFERENCE STANDARDS

Comply with current editions and applicable Specifications of the following:

1. American Society for Testing and Materials (ASTM).
2. American National Standards Institute (ANSI).
3. Tile Council of North America (TCNA) Handbook for Ceramic Tile Installation.

1.3 QUALITY ASSURANCE

A. Provide tile materials of each type, color and finish as indicated on Finish Schedule in architectural drawings.

B. Deliver, store and handle materials in accordance with manufacturer's instructions.

C. Tile contractor, by commencing the work of this section, assumes overall responsibility to assure that all assemblies, components and parts shown or required within the work of this section comply with contract documents and are compatible with each other and with the conditions and expected use.

D. Qualified Labor: Engage an installer with a minimum of five (5) years experience with commercial tile installations similar in material, design and scope to that indicated.

- E. Extra Stock: Furnish extra stock of quantity equal to 5% of amount installed, in full-size units, for each type, color, size and finish of tile.

1.4 SUBMITTALS

- A. Verification Samples: Submit the following for each type, color, size, and finish included in the work.

- 1. Full size tile and trim shapes.
- 2. Grout color samples.
- 3. Sealant color samples or Prefabricated Joint/Transition Strip Samples

- B. Product and Installation Data:

- 1. Porcelain tile manufacturer's product and technical data indicating compliance with applicable standards.
- 2. Master Grade Certificates for each type of tile issued by tile manufacturer and signed by the installer, only available after the material has shipped from the manufacturer.
- 3. Mortar and grout manufacturer's technical data sheets indicating suitability for the installation specified and compliance with applicable standards.
- 3. Sealant or prefabricated joint manufacturer's product and technical data.

1.5 ENVIRONMENTAL

- A. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during and after installation.
- B. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.
- C. Maintain minimum and maximum temperature limits as recommended by manufacturers.
- D. Protect adjacent surfaces during progress of the work in this section.

- E. Illuminate the work area during installation providing the same level and angle of illumination as will be available for final inspection. The use grazing or cove type lighting where lights are located either at the wall/ceiling interface, or mounted directly to the wall prompts the light to strike the tile finish at a straight down angle, creating unwanted shadows from grout lines giving the tile layout an un-flat irregular appearance. Installing overhead lighting at a wide downward angle 18"-24" away from the tiled wall will provide a flatter more uniform appearance to the tiled surface.

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Furnish tile complying with "Standard/First Grade" requirements per ANSI A137.1 - 2012, for types of tile indicated.
- B. Comply with ANSI Standard for Tile Installation Material and current Tile Council of North America (TCNA) Handbook for products and materials indicated for setting and grouting.

2.2 TILE

- A. Unglazed and glazed porcelain tile shall be of style, color, size and finish as listed in Finish Schedule on Architectural Drawings, and shall conform to the requirements of ANSI A137.1

2.3 SETTING AND GROUTING MATERIALS

- A. Use appropriate installation mortars according to ANSI A118-2014.
- B. Grouting Materials: Select grouting materials according to the following types: Tile setting and grouting epoxy: A118.6-2010 Standard Cement Grout, A118.7-2010, High Performance Cement Grout or A118.8-2010, Modified Epoxy Emulsion Grout. Provide grout in colors selected by the Architect from standard colors available from the approved manufacturers.
- C. Use waterproofing/Anti Fracture Membrane as required according to ANSI A118.12.

2.4 EXPANSION JOINTS, CONTROL, CONTRACTION, AND ISOLATION JOINTS

- A. Refer to most current TCNA Handbook, Method EJ171 for recommendations on locating, treating and detailing various types of construction joints.
- B. Use sealant complying with ASTM C920 according to Type, Grade, Class and Uses required.
- B. Prefabricated expansion joints can also be used when suitable for installation.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates where tile will be installed for compliance with requirements for installation tolerances and other conditions effecting performance of installed tile. Before tiling concrete surfaces saturated dry (SSD), free of standing water verify that substrates for setting tile are well cured, structurally sound dry, clean, and free from oil or waxy films, curing compounds or other coatings and surface treatments. Nonstructural shrinkage cracks should be pretreated with a crack suppression membrane (to prevent telegraphing of cracks through the finished tile installation) ANSI A118.12.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected. Commencement of work signifies acceptance of substrate and installation conditions.

3.2 PREPARATION

- A. Substrate Preparation: Prepare and clean substrate in accordance with installation standards and manufacturer's instructions, and as follows:
 - 1. Remove protrusions, bumps and ridges by grinding or chipping.
 - 2. Repair, fill, and level cracks, holes, depressions and rough or chipped areas in substrate using patching material recommended by setting materials manufacturer.
 - 3. Slab to have light broom finish when tile is installed by thin-set method.
 - 4. Before tiling, verify that all surfaces to be tiled are structurally sound true to plane, and fall within maximum variations shown below: Ensure that the substrate is within the following tolerances:

- a. Horizontal surfaces (floors) - Maximum variation in substrate shall not exceed 1/4 " in ten feet* from required plane, depending on substrate.
- b. Vertical surfaces (walls) - Maximum variation in substrate shall not exceed 1/4 " in ten feet* from the required plane, depending on substrate.

* When using large format defined by TCNA Handbook as tiles with at least one edge 15" in length or greater; a more stringent tolerance 1/8" in 10' or 1/16" in 24" when measure from the high points on the surface is required.

Report all unacceptable surfaces to the architect in writing, and do not tile such surfaces until they are leveled enough to meet above requirements.

- B. Jobsite Blending: Blend tiles before installing in accordance with reference standards to produce an even range and distribution of color and finish.

3.3 INSTALLATION

- A. Manufacturers' Instructions: Perform work in compliance with standard accepted installation guidelines, manufacturer's instructions and setting materials manufacturers' instructions.
- B. Comply with appropriate ANSI A108-2014 specification and current Tile Council of North America Handbook (TCNA) for appropriate method of installation for each specification. For thin set adhesive mortar application use following technique:
 - With the flat side of trowel, key mortar into substrate.
 - Using the appropriate size trowel, comb mortar in one direction with notched side of the trowel.
 - Set tile with a sliding motion, perpendicular to the mortar ridges.
 - Obtain as near 100% coverage as possible of mortar to tile.
 - Mortar coverage shall be no less than 85% and shall be sufficiently distributed to give full support under all corners and edges of the tile.
 - Note: 95-100% coverage is mandatory for wet and exterior areas. Periodically, remove sheets or individual tiles to assure proper bond coverage consistent with industry specifications.
- C. Installing Tile:
 1. Install tile in pattern indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Adjust to minimize tile cutting and to avoid tile less than half size.

2. When possible, smooth cut edges of tile and/or use appropriate cutter or wet saw to produce smooth cuts. Provide straight cuts which align with adjacent materials.
3. Extend tile into recesses and under equipment and fixtures to form a complete covering without interruption.
4. Terminate tile neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment.
5. Provide tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints smooth and even, without voids, cracks, or excess mortar or grout.
6. Mix mortar in strict accordance with manufacturer's recommendations.
7. Apply setting material in accordance with manufacturer's directions and install tile before mortar has started initial cure. For thin set mortar application, use a notch trowel that will achieve the recommended coverage of mortar after tiles have been installed. Reference standard coverage information and follow manufacturer's recommendations for trowel size when using mortar.
8. Do not spread more material than can be covered within 10 to 15 minutes. If "skinning" occurs, remove mortar and spread fresh material. Spread mortar with notches running in one direction that shall be perpendicular to the pressing, pushing and pulling of tile during placement.
9. Place tile in fresh mortar, press, push and pull the tile slightly to achieve as near 100% coverage and contact of tile with setting material and substrate as possible. The coverage shall be no less than 85% and be sufficiently distributed to give full support of the tile. Make sure that all corners and edges are well supported with mortar. Leave no hollow corners or edges. NOTE: 95-100% coverage is mandatory for wet or exterior areas. A skim coat ("back-butter") of mortar can be placed onto the entire back of the tile using a trowel in order to assist in optimum adhesion and coverage of the mortar being used.
10. Ensure there is a minimum 1/8" of mortar between tile and substrate after proper bedding. Installer must periodically remove sheets or individual tiles to assure proper bond coverage consistent with industry specifications. If coverage is found to be insufficient, use a larger size notch trowel.
11. Use a beating block and hammer or rubber mallet so that faces and edges of individual tiles are flush and level with faces and edges of adjacent tiles, and to reduce lippage.
12. For running bond/brick joint patterns utilizing tiles (square or rectangular) where the side being offset is greater than 18" (nominal dimension), the running bond

offset will be a maximum of 33% unless otherwise specified by the tile manufacturer. If an offset greater than 33% is specified, specifier and owner must approve mock-up and lippage.

D. Grouting:

1. Install grout in accordance with ANSI A108.10, A108.6, A108.8, A108.9-2010 correlating to grout type chosen and manufacturer's recommendations.
2. Mix grout material in strict accordance with manufacturer's directions.
3. Apply grout to produce full, smooth grout joints of uniform width, and free of voids and gaps.
4. Before grouting entire area do a test area to assure there will be no permanent staining or discoloration of the tile and to verify that the grout is easily removed from the surface. If necessary, pre-coat exposed surfaces of tile with a grout release as recommended by the manufacturer, as this will facilitate removal of the grout.
5. Cure all setting and grouting materials in accordance with manufacturer's recommendations.

E. Cleaning and Protection:

1. If one has been used, remove grout release and clean tile surfaces so they are free of grout residue and foreign matter, in accordance with manufacturer's instructions. If a grout haze or residue remains, use a suitable grout haze remover or cleaner and contact grout manufacturer for recommendations. Flush surface with clean water before and after cleaning. Do not use harsh hydrochloric, muriatic or sulfuric acid or acid-based cleaners to clean glazed tiles or tiles grouted with latex modified grout.
2. When a heavy residue of Portland cement grout is present, acceptable tile cleaning acids may be used. However, the grout should be allowed to cure a minimum of 10 days before this aggressive cleaning method is employed. Tile and grout shall be soaked with water before cleaning. In the absence of a recommendation from the grout manufacturer, acid cleaning may be done with a saturated solution of phosphoric or sulfamic acid, mixed in accordance with manufacturer's recommendations.
3. Protect all floor tile installations with clean construction paper or other heavy covering during construction period to prevent staining or damage. After cleaning,

provide protective covering and maintain conditions to protect tile work from damage or deterioration. Where tiled surfaces will be subject to equipment or wheel traffic or heavy construction traffic, and during move-in of furniture and equipment, cover protective covering with 1/4" hardboard, plywood or similar material. No foot or wheel traffic permitted on floor for at least 3 days after grouting. Owner/specifier is responsible for protecting tile from damage including allowing sufficient time for installed materials to cure properly typically 30-45 days is required for full cure of thin set bonding mortars.

4. Leave finished installation clean and free of cracked, chipped, broken, un-bonded, and otherwise defective tile work.

END OF SECTION

SECTION 09511 - SUSPENDED ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 Work Included

- A. Suspended metal grid ceiling system.
- B. Acoustical tile panels.

1.02 Related Work

- A. Air diffusion devices in ceiling system.
- B. Light fixtures in ceiling system.

1.03 References

- A. ASTM C635 - Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- B. ASTM C636 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
- C. UL - Underwriter's Laboratories System Ratings.

1.04 Quality Assurance

- A. Manufacturer: Company specializing in the manufacture of ceiling suspension system and ceiling tile panels, three years minimum experience.
- B. Installer: Company shall have experience installing the approved manufacturer.

1.05 Regulatory Requirements

- A. Conform to applicable code for fire rated assembly where required.

1.06 Submittals

- A. Submit shop drawings and product data for review.
- B. Indicate on shop drawings, grid layout and related dimensioning, junctions with other work or ceiling finishes, interrelation of mechanical and electrical items related to system.
- C. Provide product data on metal grid system components, and acoustic units.
- D. Submit samples to Owner and Architect for review.

E. Submit manufacturer's installation instruction.

1.07 Environmental Requirements

A. Maintain uniform temperature of minimum 60 degree F (16 degrees C), and humidity of 20 to 40 percent prior to, during, and after installation.

1.08 Sequencing/Scheduling

A. Do not install acoustical ceilings until building is enclosed, sufficient heat is provided, dust generating activities have terminated and overhead work is completed, tested, and approved.

B. Schedule installation of acoustic units after interior work is dry.

1.09 Extra Stock

A. Provide one carton [of each type used] extra tile panels to Owner.

PART 2 - PRODUCTS

2.01 Manufacturer - Suspension System

A. Suspension system shall be from the same manufacturer as acoustic units.

2.02 Suspension System Materials

A. Armstrong "Prelude XL" 15/16" Exposed Tee Grid System, ASTM Class Intermediate Duty, non-fire rated exposed, to be used with "Fine Fissured" acoustic units.

B. Armstrong "Silhouette XL" 1/4" Reveal, 9/16" bolt-slot system, ASTM Class Intermediate duty, non-fire rated exposed, to be used with "Optima" acoustic units.

C. Grid Finish: White

D. Support Channels and Hangers: Size and type to suit application, to rigidly secure acoustic ceiling system including integral mechanical electrical components with maximum deflection of 1/360.

2.03 Acoustic Units

A. Armstrong "Optima" #3251, 24" x 24" x 1", square tegular edge, sag resistant; or approved equal.

Specifications:

1. Composition:.....Fiberglass with Durabrite acoustically transparent membrane
2. Light Reflectance:0.89
3. NRC :0.95
4. CAC :27
5. Classification:ASTM E1264, Type XII, Form 2, Pattern E
6. Fire Resistance:Class A

- B. Armstrong "Fine Fissured" #1713, 24"x24"x $\frac{3}{4}$ ", square lay-in, color: white, Certain Teed, or approved equal.

Specifications:

1. Composition: Wet-formed mineral fiber
2. Light Reflectance: 0.85
3. NRC : 0.55
4. CAC 33
5. Classification: ASTM E1264, Type III, Form 2, Pattern CE
6. Fire Resistance: Class A

PART 3 - EXECUTION

3.01 Inspection

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

3.02 Installation

- A. Install system in accordance with ASTM C636 manufacturer's instructions and as supplemented in this Section.
- B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.
- C. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.
- D. Supply hangers or inserts for installation of mechanical and electrical if metal deck is not supplied with hanger tabs, coordinate the installation of hanger clips during steel deck erection. Provide additional hangers and inserts as required.
- E. Hang 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 are other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers (and related carrying channels) to span the extra distance.
- G. Center system on room axis leaving equal border units, unless otherwise directed by reflected ceiling plan.

- H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- I. Do not eccentrically load systems, or produce rotation of runners.
- J. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.
- K. Form expansion joints as required.
- L. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.
- M. Install acoustic units level, in uniform plane, and free from twist, warp and dents.

3.03 Tolerances

- A. Variation from flat and level surface: 1/8 inch in 10 ft.

End of Section

SECTION 09650 - RESILIENT FLOORING

PART 1 - GENERAL

1.01 SUMMARY

- A. Extent of resilient flooring and accessories as shown on Drawings and Specified herein.
Work includes:
 - 1. Rubber Tile
 - 2. Contoured Resilient Wall Base
 - 3. Vinyl Cove Base
 - 4. Resilient Edge Strips

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for resilient flooring and accessories in accordance with Section 01300.
- B. Samples: Submit, for verification purposes, samples of each type, color and pattern of resilient flooring and accessory required, indicating full range of color/pattern variation.
- C. Maintenance Instructions: Submit copies of manufacturer's recommended maintenance practices for each type of resilient flooring required to Owner.

1.03 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of standard quality of manufacturers as specified. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Provide materials and adhesives which do not contain asbestos.

PART 2 - PRODUCTS

2.01 MATERIALS

Refer to Finish Schedule on Drawings for styles and colors of specified materials.

- A. Sheet vinyl flooring shall be 0.080" gauge, available in 6'-6" wide rolls, meeting ASTM F 1913 performance standards for homogeneous single layered vinyl floor covering, ASTM E 648 – CRF, Class 1. Styles and colors as selected by Architect and shown on drawings/finish schedule.
- B. Contoured resilient Wall Base shall be Johnsonite "Millwork", solid color throughout, meeting dimensional and performance requirements of ASTM F-1861, Type TP, Group 1 Standard Specification for Resilient Wall Base. Inside and outside corners shall be

miter cut and fitted in the field. Profile, height and color as indicated on Finish Schedule.

- C. Vinyl Cove Base, 4" high x 1/8" gauge set-on type, as manufactured by Tarkett or approved equal, and furnished in 120' long rolls meeting the requirements of ASTM F1861, Type TV, Group 1 and ASTM E-648/NFPA 253, Class 1.
- D. Resilient Edge Strips: ADA compliant, homogeneous vinyl or rubber transition strips as required where change of flooring types occur. Color to match flooring or as selected by Architect from standard colors available.
- F. Adhesives: Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions.
- G. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.
- H. Leveling Compound: As recommended by flooring manufacturer.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Make a thorough examination of surfaces to receive resilient flooring. If surfaces are defective and will not permit a proper finished installation, immediately notify the Architect in writing, or assume responsibility for and rectify any resulting unsatisfactory condition.
- B. Inspect floor for holes, cracks and smoothness. Test for dryness. Do not proceed with laying until subfloors are dry and smooth, holes and cracks filled.

3.02 PROJECT CONDITIONS

- A. Substrate Conditions: The installer shall verify in writing to the Owner, a minimum of 30 days prior to scheduled resilient flooring installation, the following substrate conditions:
 - 1. Moisture: Initial emission rate, as tested with a calcium chloride test kit.
 - 2. Alkalinity: pH range of 6-8. Must not exceed pH of 10.
- B. After application (by others) of the concrete sealer, the installer shall perform a second calcium chloride test. These second test results will be compared with the previous results. Final results shall not exceed resilient flooring manufacturer's allowable emission rate.
- C. Maintain minimum temperature of 68_F (20_C) in spaces to receive resilient flooring

for at least 72 hours prior to installation, during installation and for not less than 48 hours after installation. Subsequently, maintain minimum temperature of 68_F (20_C) in areas where work is completed.

- D. Install resilient flooring and accessories after they have the same temperature as the space and after other finishing operations, including painting, have been completed. Moisture content and alkalinity level of concrete slabs, as well as environmental conditions, must be within limits recommended by manufacturer of products being installed.

3.03 PREPARATION

- A. Broom clean or vacuum surfaces to be covered, and inspect subfloor. Start of flooring installation indicates acceptance of subfloor conditions and full responsibility for completed work.
- B. Use leveling compound as recommended by flooring manufacturer for filling small cracks, holes and depressions in subfloor.
- C. Perform moisture tests on concrete slabs to determine that concrete surfaces are sufficiently cured dry as well as to ascertain presence of curing compounds, and ready to receive flooring.
- D. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with manufacturer's directions.

3.04 INSTALLATION

- A. Place flooring with adhesive cement in strict compliance with manufacturer's recommendations. Butt tightly to vertical surfaces, thresholds, nosings, and edgings. Scribe around obstructions to produce neat joints, laid tight, even, and straight. Extend flooring into toe spaces, door reveals, and into closet and similar openings.
- B. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent-marking device.
- C. Install flooring on covers for telephone and electrical ducts, and other such items as occur within finished floor areas.
- D. Maintain overall continuity of color and pattern with pieces of flooring installed in these covers. Tightly cement edges to perimeter of floor around covers and to covers.
- E. Tightly cement flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll flooring at perimeter for each covered area to assure adhesion.
- F. Tile Floors

1. Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of room are of equal width. Adjust as necessary to avoid use of cut widths less than $\frac{1}{2}$ tile at room perimeters.
 - a. Lay tile square to room axis, unless otherwise shown.
 - b. Lay tile in “checkerboard” fashion with grain reversed in adjacent tiles.
 - c. Follow Floor Tile Patterns as indicated on Drawings where required.
 2. Match tile for color and pattern by using tile from cartons in same sequence as manufactured and packaged if so numbered. Cut tile neatly around all fixtures. Broken, cracked, chipped or deformed tiles are not acceptable.
 3. Adhere tile flooring to substrates using full spread of adhesive applied in accordance with flooring manufacturer’s recommendations.
- G. Accessories: Apply resilient base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practicable, with preformed corner units or fabricated from base materials with mitered or coped inside corners. Tightly bond base to backing throughout length of each piece, with continuous contact at horizontal and vertical surfaces.
1. On masonry surfaces or other similar irregular surfaces, fill voids along top edge of resilient wall base with manufacturer’s recommended adhesive filler material.
 2. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.
 3. Apply butt type metal edge of flooring where shown on drawings, and prior to resilient flooring. Secure units to substrate with countersunk stainless steel anchors, complying with manufacturer’s recommendation.

3.05 CLEANING AND PROTECTION

- A. Immediately upon completion of the resilient flooring remove any excess adhesive or other surface blemishes, using neutral type cleaners as recommended by flooring manufacturer.
1. Do not wash or machine scrub linoleum for at least 3-5 days after installation.
 2. Do not strip factory finish from linoleum sheet flooring per Manufacturer recommendations.

- B. Protect installed flooring with heavy Kraft paper or other covering.
- C. Finishing: After completion of project and just prior to final inspection of work, thoroughly clean all floors and accessories.
 - 1. Apply waxes to linoleum sheet flooring as recommended by the Manufacturer and buff coats minimum prior to Owner's occupancy and/or final completion of the project.

3.06 EXTRA STOCK

- A. Provide the Owner with the following: one (1) unopened carton of each tile selection specified on this project.

End of Section

SECTION 09681 - MODULAR CARPET

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Carpet Tile as specified on the drawings.
 - 1. Moldings, adhesives cements for glued-down installation.
- B. Specified in Other Sections:
 - 1. Wall Base.
 - 2. Transition edges

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's complete technical product data for each type of edge trim, tack strip, cement and adhesive types and other related materials necessary to complete the installation.
- B. Submit carpet samples for verification of color and patterns:

1.03 QUALITY ASSURANCE

- A. Products and methods of installation specified herein are compatible with and approved by carpet manufacturer.
- B. General Terminology/Information Standard: Carpet and Rug Institute's "Carpet Specifier's Handbook".
- C. Flame/Smoke Resistance Standards: Provide materials meeting the following test rating standards as required Building Code Requirements.
 - 1. Pill Test: ASTM D 2859, or DOC FF-1-70.
 - 2. Floor Radiant Panel Test: ASTM E 648, with minimum average radiant flux ratings not less than 0.22 watts/sq. cm.
 - 3. Smoke Density Test: ASTM E 662 or NFPA No. 258 rating within limit required by governing regulation.

1.04 PRODUCT HANDLING

- A. Contractor is responsible for receiving and handling, on-site, all carpet materials furnished by Owner.
 - 1. For each material delivery, the Contractor shall fill out receiving reports furnished by Owner. Each delivery shall be inspected for damage. All damage shall be noted on the carrier's delivery slips and shall be forwarded to the Construction Manager immediately upon receipt of delivery. If damaged material is not reported when discovered, the Contractor assumes full responsibility.

- B. Storage areas shall be secure and dry with temperatures maintained above 65°F at all times.

1.05 PROJECT CONDITIONS

- A. Coordination: Coordinate this Work with the Work of other Sections to avoid any delay or interference with other Work.
- B. Maintain 70°F. during and 24 hours before and after installation. Maintain temperature of 55°F and a relative humidity range of 35% to 50% in completed areas.
- C. Notify Construction Manager of any defects, mismarking or evidence of damage to carpet materials or appearance of moisture, mildew or fungus.

1.06 WARRANTY

- A. Warrant carpet installation for one year from opening date of facility from becoming unserviceable or causing an objectionable appearance resulting from defects such as:
 - 1. Release from the substrate.
 - 2. Bunching and rippling.
 - 3. Opening of seams.

1.07 MAINTENANCE MATERIALS

- A. Deliver 20 carpet squares of each carpet type to Owner at completion of installation for reserve supply. In addition, save squares over 1/2 square in size for the Owner's reserve.

PART 2 - PRODUCTS

2.01 ACCEPTABLE PRODUCTS

- A. Carpet Tile: See Architectural drawings, Finish Schedule, for materials to be provided.

2.02 CARPET ACCESSORIES

- A. Adhesive:
 - 1. Water resistant, non-staining type meeting flammability requirements for installed carpet.
 - 2. Acceptable Products: Adhesive as recommended by Manufacturer of modular carpet tiles.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Repair minor holes, cracks, depressions and rough areas using material recommended by carpet and adhesive manufacturer. Remove contaminants and dirt. Prepare floor as

recommended by carpet manufacturer. Leave floor clean and dry.

3.02 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for joint locations and carpet direction. Maintain uniformity of carpet direction and lay of pile. Center joints at door openings.
- B. Extend carpet under open-bottomed obstructions and under removable flanges and furnishings, and into alcoves and offsets of each space.
 - 1. Install edge guard with epoxy where carpet ends against other materials. Center edge guard under doors in door openings.
- C. Provide cutouts where required. Install edge guards where edge of carpet is exposed.

3.03 GLUE-DOWN INSTALLATION

- A. Test substrate to demonstrate effectiveness of adhesive. Remove sample demonstrating procedure to minimize damage to carpet. Apply primer to entire substrate as necessary for adequate bond of carpet.
- B. Layout carpet tile prior to adhering. Maintain straight joints, true with lines of building. Except where patterns are indicated, install carpet squares centered in space in both directions. However, no edge tiles shall be cut to less than 1/2 of their width. Carpet tiles shall be laid with 5 adhesive spots per tile. Unless otherwise indicated, install tiles with the nap all running in the same direction.
- C. Securing base of pile at cut edges with seaming cement without evidence on carpet face.
- D. Apply adhesive to substrate in accordance with manufacturer's instructions. Butt carpet edges tightly together to form joints without gaps. Roll lightly to eliminate air pockets and ensure uniform total-area bond of carpet to substrate. Remove adhesive (if any appears) promptly from face of installed carpet.

3.04 SUBSEQUENT OPERATIONS

- A. Remove and dispose of debris and all cut squares less than 1/2 square in size.
- B. Vacuum carpet using commercial machine with face-beater element. Remove spots and replace carpet where spots cannot be removed. Remove protruding face yarn.

END OF SECTION

SECTION 09900 - PAINTING

PART 1 - GENERAL

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide paint products of one of the following:

1. Benjamin Moore
2. The Sherwin-Williams Company
3. PPG
4. Calhoun Farrell

2.2 MATERIALS

A. Material Quality: Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.

B. Proprietary names used to designate colors or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.

PART 3 - EXECUTION

3.1 INSPECTION

A. Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.

B. Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.

C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

3.2 SURFACE PREPARATION

A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.

1. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify Architect in writing of any anticipated problems in using the specified coating systems with substrates primed by others.
 2. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.
 3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease in accordance with SSPC SP-1, prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.
- B. Cementitious Materials: Prepare cementitious surfaces of concrete, concrete block, to be painted by removing efflorescence, chalk, dust, dirt, grease, oils in accordance with ASTM D 4258/D 4259/D 4261 (CMV).
1. Determine alkalinity and moisture content of surfaces to be painted by performing ASTM D 4262. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
- C. Wood: Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.
1. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, paneling.
 2. When transparent finish is required, use spar varnish for back-priming.
 3. Seal tops, bottoms, and cut-outs of unprimed wood doors with a heavy coat of varnish or equivalent sealer immediately upon delivery to job.
- D. Ferrous Metals: Clean ferrous surfaces which are not galvanized or shop-coated of oil, grease, dirt, loose mill scale, and other foreign substances by solvent or mechanical cleaning in accordance with SSPC SP-1.
1. Touch up shop-applied prime coats wherever damaged or bare, where required by other sections of these specifications.
 - a. Clean and touch-up with same type shop primer.

- E. Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum based solvent such as Benjamin Moore Oil & Grease Emulsifer V600 or Great Lakes Laboratories "Clean N' Etch".

3.3 MATERIALS PREPARATION

- A. Mix and prepare painting materials in accordance with manufacturer's directions.
- B. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
- C. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3.4 APPLICATION

- A. General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
 - 1. Paint colors, surface treatments, and finishes are indicated in "Schedules" of the Contract Documents.
 - 2. Provide finish coats which are compatible with prime paints used.
 - 3. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint, until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces. Dry film thickness will be measured according to SSPC PA-2.
 - 4. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.
 - 5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat non-specular black paint or primer such as Insl-X Aqua-Lock AQ-0420
 - 6. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.
 - 7. Finish exterior doors on tops, bottoms, and side edges same as exterior faces unless otherwise indicated.
 - 8. Sand lightly between each succeeding enamel or varnish coat.
 - 9. Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted unless otherwise indicated.

- B. Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - 1. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
- C. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer. Dry film thickness will be measured according to SSPC PA-2.
- D. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to those items exposed in mechanical equipment rooms and in occupied spaces, and exposed exterior work that is not factory finish painted.
- E. Prime Coats: Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others.
 - 1. Re-coat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
- F. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- G. Transparent (Clear) Finishes: Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.
 - 1. Provide satin finish for final coats unless otherwise indicated.
- H. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.5 CLEAN-UP AND PROTECTION

- A. Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans, and rags at end of each work day.
 - 1. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

- B. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

1. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.
2. At the completion of work of other trades, touch up and restore all damaged or defaced painted surfaces.

3.6 ADJUST AND CLEAN

- A. Clean surfaces of spills, splatters, drips and stains from painting application.
- B. Replace and adjust finish hardware, accessories, fixtures and similar items removed from work.
- C. Touch-up damaged paint surface prior to acceptance of building by the Owner. Mix or thin touch-up paint as recommended by the Manufacturer and blend into existing paint.

3.7 PAINT SYSTEMS

- A. Paints listed are those of Benjamin Moore unless noted otherwise.
Painting subcontractor wishing to use other products must submit their "or equal" for review during the bidding process. Please note that *colors have been selected*.

B. Exterior Coating Systems:

1. Ferrous Metals (Typical Applications: Overhead doors and frames, steel doors and frames, piping, pipe railing, miscellaneous metals.)
 - 1st Coat: Benjamin Moore Corotech Waterborne Bonding Primer HP1750 @ 1.5-2 mils dft
 - 2nd Coat: Benjamin Moore High Performance Acrylic DTM HP28 @ 1.8-2.5 mils dft
 - 3rd Coat: Benjamin Moore High Performance Acrylic DTM HP28 @ 1.8-2.5 mils dft
2. Zinc Coated Metals
 - 1st Coat: Benjamin Moore High Performance Waterborne Bonding Primer HP1750 @ 1.5-2 mils dft
 - 2nd Coat: Benjamin Moore Command Waterborne Acrylic Urethane V390 @ 1.5-2 mils dft
 - 3rd Coat: Benjamin Moore Command Waterborne Acrylic Urethane V390 @ 1.5-2 mils dft
3. Concrete Block: Provide clean and dulled surface for application of new paint as recommended by paint manufacturer.
 - 1st Coat: Benjamin Moore Ultra Spec Block Filler 571 @ 8.5-11.3 mils dft
 - 2nd Coat: Benjamin Moore Ultra Spec Low Luster W455 @ 1.2-1.6 mils dft
 - 3rd Coat: Benjamin Moore Ultra Spec Low Luster W455 @ 1.2-1.6 mils dft

C. Interior Coating Systems:

1. Interior Ferrous Metal: Door Frames, Miscellaneous Metals: 2 coats of an all purpose industrial enamel, over a fast drying, rust inhibitive alkyd enamel.
1st Coat: Benjamin Moore High Performance Universal Metal Primer HP1320
2nd Coat: Benjamin Moore High Performance Alkyd Urethane Enamel HP2200 @ 1.9-2.4 mils dft per coat
3rd Coat: Benjamin Moore High Performance Alkyd Urethane Enamel HP2200 @ 1.9-2.4 mils dft per coat
2. Interior Gypsum Drywall (semi-gloss): 2 coats of an interior waterborne acrylic semi-gloss, durable and non-yellowing, over an interior vinyl acrylic latex wall primer.
1st Coat: Benjamin Moore Multi-Purpose Primer 067 @ 1.3-1.6 mils dft
2nd Coat: Benjamin Moore Super Hide Zero Semi-Gloss 358 @ 1.2-1.5 mils dft
3rd Coat: Benjamin Moore Super Hide Zero Semi-Gloss 358 @ 1.2-1.5 mils dft
3. Interior Gypsum Drywall (flat): 2 coats of an interior latex flat, durable and non-yellowing, over an interior latex wall primer.
1st Coat: Benjamin Moore Multi-Purpose Primer 067 @ 1.3-1.6 mils dft
2nd Coat: Benjamin Moore Super Hide Zero Flat 355 @ 1.1-1.5 mils dft
3rd Coat: Benjamin Moore Super Hide Zero Flat 355 @ 1.1-1.5 mils dft
4. Interior Gypsum Drywall (eggshell): 2 coats of an interior latex eggshell, durable and non-yellowing, over an interior latex wall primer.
1st Coat: Benjamin Moore Multi-Purpose Primer 067 @ 1.3-1.6 mils dft
2nd Coat: Benjamin Moore Super Hide Zero Eggshell 357 @ 1.3-1.6 mils dft
3rd Coat: Benjamin Moore Super Hide Zero Eggshell 357 @ 1.3-1.6 mils dft
5. Galvanized Metal: 2 coats of an interior waterborne acrylic semi-gloss, durable and non-yellowing
1st Coat: Benjamin Moore High Performance Waterborne Bonding Primer HP1750 @1.5-2 mils dft per coat
2nd Coat: Benjamin Moore High Performance Acrylic DTM HP29 @ 1.8-2.5 mils dft
3rd Coat: Benjamin Moore High Performance Acrylic DTM HP29 @ 1.8-2.5 mils dft
6. Aluminum: 2 coats of an interior waterborne acrylic semi-gloss, durable and non-yellowing.
1st Coat: Benjamin Moore High Performance Waterborne Bonding Primer HP1750 @1.5-2.1mils dft

2nd Coat: Benjamin Moore High Performance Acrylic DTM HP29 @ 1.8-2.5 mils dft

3rd Coat: Benjamin Moore High Performance Acrylic DTM HP29 @ 1.8-2.5 mils dft

7. Wood-Closed Grain: Stained: 2 coats of a satin waterborne polyurethane over an interior oil based stain.

1st Coat: Old Masters Wiping Stain 11XXX

2nd Coat: Benjamin Moore Stays Clear Acrylic Polyurethane Low Luster W423

3rd Coat: Benjamin Moore Stays Clear Acrylic Polyurethane Low Luster W423

8. Concrete Floors (Unpolished)

1 application of Prosoco "Consolideck LS/CS" @ 300 - 800 sq.ft./gallon, using low pressure spray-on method as directed by manufacturer.

Note: New concrete must cure long enough to walk on before application. Do not use concrete curing compound where product is specified. Blanket-cure ONLY.

END OF SECTION

SECTION 09950 - VINYL COATED FABRIC WALL COVERINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide all labor, materials, equipments, etc. as required for the application of vinyl wallcoverings or borders where indicated on Interior Finish Schedule.
- B. Prepare required surfaces to receive wallcovering.

1.02 SUBMITTALS

- A. Submit (2) 8" x 10" samples of each specified wallcovering to illustrate color, finish and texture.
- B. Indicate on shop drawings, wall elevations with seaming layout.
- C. Submit manufacturer's installation instructions.
- D. Submit manufacturer's test reports verifying flame/fuel/smoke ratings as tested by UL.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials in manufacturer's cartons, properly labeled and identified.
- B. Store wallcoverings in undamaged condition as packaged by manufacturer.
- C. Store all materials in a clean, dry area where temperatures shall be maintained above 40°F with normal humidity. Do not store materials in upright position.

1.04 EXTRA STOCK

- A. Provide 25 lineal feet of each color of wallcovering. Package and label each roll by designated room name, store where directed.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Vinyl wallcovering shall meet Federal Specification CCC-W-408D; Manufacturers, styles and colors shall be as indicated on architectural Drawings Decor/Interior Finish sheet. Substitutions allowed if pattern is not readily available or is discontinued. Pattern/color to be selected by Architect.
- B. Adhesives: Comply with manufacturer's recommended installation instructions.
- C. Substrate Primer and Sealer shall be one coat of an alkyd enamel undercoat, such as

Sherwin Williams Pro Mar 200 Enamel Undercoat.

- D. Corner Guards: Apply clear acrylic corner guards with self adhesive tape to outside corners in high usage areas, where subject to abrasion damage.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Areas to receive wallcoverings shall have a constant temperature of at least 55 degrees for (3) days before and all during application. Maintain these conditions for 24 hours after completion of installation.
- B. Test substrates with electronic moisture meter to verify that surfaces to be covered do not exceed 4% moisture content.
- C. Inspection: Verify that substrate surfaces are sound, dry, clean, prime-painted and ready to receive final finish. Beginning of installation means acceptance of existing surfaces.

3.02 INSTALLATION

- A. Before cutting, examine pattern and color and determine that they match approved samples. Examine material for repeat in design. Examine materials for defects. Any variation in color and/or pattern match shall be immediately communicated to the manufacturer's representative for his inspection before proceeding further with installation.
- B. Install in accordance with manufacturer's instructions. Apply adhesive and install with seams plumb and overlapped and double-cut to ensure tight closure except where pattern would not match. Do not place seams within 6" of corners.
- C. Remove air bubbles, blisters, wrinkles and other defects; horizontal seams are not permitted. Remove excess adhesive immediately; clean walls and protect surfaces.
- D. Replace all wall plates and accessories removed prior to work.
- E. Remove surplus materials, rubbish and debris resulting from operations of this section, including equipment, and leave entire structure and site in a neat clean and acceptable condition.

3.03 SCHEDULE

- A. Refer to Architectural Drawings for room finish schedule.

END OF SECTION

Division X

SECTION 10155 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Metal partitions for toilets.
- B. Urinal Screens
- C. Attachment hardware.

1.02 RELATED WORK

- A. Section 10800 - Toilet and Bath Accessories: Toilet accessories.

1.03 REFERENCES

- A. ASTM A424 - Steel Sheets for Porcelain Enameling.
- B. FS RR-P-1352 - Partitions, Metal Toilet, Complete.
- C. ASTM A526 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.
- D. ASTM A167 - Stainless and Heat Resisting Chromium-Nickel Steel, Plate, Sheet and Strip.

1.04 SUBMITTALS

- A. Submit shop drawings and product data, along with manufacturer's descriptive literature, installation instructions and appropriate color selection charts.
- B. Clearly indicate partition layouts, swing of doors, elevations, anchorage and mounting details, panel construction, components hardware, finishes and all relevant dimensions.

PART 2 - PRODUCTS

2.01 METAL TOILET COMPARTMENTS

- A. Acceptable Manufacturers
 - 1. Flush-Metal Partition Corp.
 - 2. Metpar
 - 3. Sanymetal
 - 4. Approved Equal
- B. Type
 - 1. Provide floor-mounted, overhead-braced toilet partitions with anti-grip headrail.
 - 2. Provide pilaster-type floor-supported urinal screens.

3. Provide end stalls to meet ADA requirements.

C. Materials

1. 1" thick, of two sheets galvanized steel, honeycomb core, welded edges and corners.
2. Finish: Baked enamel. Color to be selected by Architect.
3. Attachments, Screws and Bolts: Stainless steel, tamper-proof type, heavy duty extruded aluminum brackets.
4. Hardware: Chrome-plated non-ferrous cast pivot hinges, gravity type, adjustable for door closing positioning; nylon bearings; concealed, thumb-turn door latch; door strike and keeper with rubber bumper; chrome plated coat hook and bumper.

D. Fabrication

1. Fabricate partitions in accordance with FS RR-P-1352
2. Doors and Panels: 1" or 1-1/4" x 58" high, 24" wide doors at standard stalls, 34" wide doors at handicap stalls.
3. Provide internal reinforcement where necessary for attachment of hardware and fittings. Mark locations of reinforcement for partition-mounted washroom accessories.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Examine site conditions to which work is to be applied. Report discrepancies to Architect/ Engineer in writing.
- B. Take site dimensions affecting this work.
- C. Ensure correct spacing of plumbing fixtures.
- D. Ensure correct location or built-in framing, anchorage, and bracing, where required.

3.02 INSTALLATION

- A. Install partitions secure, plumb, level, and square.
- B. Leave 1/2 inch space between wall and panels and between wall and end plasters.
- C. Attach panel brackets securely to walls using anchor devices as required by manufacturer.
- D. Attach panels and pilasters to bracket with through sleeve tamperproof bolts and nuts.

- E. Anchor urinal screen panels to walls with two panel brackets and vertical upright to floor.
- F. Provide for adjustment of floor variations.
- G. Equip each door with hinges, one door latch, and one coat hook and bumper.
- H. Install door strike keeper and door bumper on each pilaster in alignment with door latch.
- I. Adjust and align hardware to uniform clearance at vertical edges of doors not exceeding 3/8".
- J. Adjust hinges to locate doors in partial open position when unlatched, except that out-swing doors shall return to closed position.

3.03 CLEANING

- A. Damaged, scratched or marred defective materials will be rejected, and shall be replaced with new materials.
- B. Remove protective maskings. Clean surfaces free of oil and imperfections.

End of Section

SECTION 10426 - IDENTIFYING DEVICES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Furnish and install all signage and identifying devices and handicap parking signs where shown or scheduled on the Drawings and specified herein.
- B. This section includes the installation of such devices in locations as indicated on plans, or where not shown, as required to meet requirements of the Americans with Disability Act of 1990 (ADA).

1.02 SUBMITTALS

- B. Manufacturer's Data: Submit manufacturer's descriptive literature and specifications, including color samples of material for selection, as applicable for approval.
- B. Submit shop drawings listing sign styles, lettering and locations, and overall dimensions of each sign.

1.03 REFERENCES

- A. American National Standards Institute (ANSI): A117.1 - 1992 Accessible Signage Standards (4.28 Signage)
- B. American Society for Testing and Materials (ASTM).
- C. Americans with Disabilities Act Accessibility Guideline (ADAAG): 4.30 Signage
- D. California Title 24 Accessible Signage Standards (3105)

1.04 DELIVERY, STORAGE & HANDLING

- A. Deliver components correctly packaged to prevent damage.
- B. Store in secure areas, out of weather and protected from work of other trades.

1.05 WARRANTY

- A. Provide Manufacturer's standard one year limited warranty covering manufacturing defects.

PART 2 - PRODUCTS

2.01 TACTILE SIGNAGE

- A. Tactile signage stating "EXIT" and complying with ICC/ANSI A117.1, shall be installed adjacent to the latch side of the door, 48" minimum/60" maximum above the finished floor to center of sign.

Sign shall be 4"x4" unless space is restricted, then 2"x8" sign shall be used.

Locate at doors #1, 2, 3, 4, 5, 6, 7, 13, 14, 15, 18, 21, 22, 23, 24 and 25.



2.02 INTERIOR ROOM SIGNAGE

- A. Style: Signs shall be single-faced, Lettering Specialists, Inc. - Tactile Signage, Inc., or an approved equal, radiused corners, beveled edge with decorative reveal around the perimeter; Optima semi-bold style, color as selected by Architect. Schedule shall be as furnished by the Architect/Owner. Composition shall be a design similar to manufacturers standards and meeting all requirements of Americans with Disabilities Act (ADA). Signs shall be mounted with double-faced tape as furnished by the manufacturer.
- B. Pictograms: Pictograms (where required) shall be accompanied by the equivalent verbal description placed directly below the pictogram. The border dimensions of the pictogram shall be 6 inches minimum in height. Pictograms, like non-permanent text, may be recessed.
- C. Mounting Location and Height: Signs shall be installed on the wall adjacent to the latch side of the door. Where there is no wall space to the latch side of the door, including at double leaf doors, signs shall be placed on the nearest adjacent wall. Mounting height shall be 60 inches above the finished floor to the centerline of the sign.

D. SCHEDULE:

Types:

<u>Room No.</u>	<u>Description</u>	<u>Qty.</u>	<u>Sign Type</u>
103	Women (w/ADA Symbol)	1	A
102	Men (w/ADA Symbol)	1	B



A



B

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Before installing signs, verify that mounting surfaces are completely finished and ready for installation. Inspect surface to be sure it is clean and free from contaminants that may adversely affect mounting system adhesion.
- B. Do not install signs until surfaces are acceptable. Notify Architect if there are any questions as to suitability of installation surfaces or installation locations.

3.02 INSTALLATION

- A. Install signs in accordance with manufacturer's instructions and in accordance with ADA guidelines for location and as indicated in schedules.
- B. Install after doors are installed and after doors and walls are finished.
- C. Assure signs are installed level.
- D. Mounting Location and Height: Signs shall be installed on the wall adjacent to the latch side of the door. Where there is no wall space to the latch side of the door, including at double leaf doors, signs shall be placed on the nearest adjacent wall. Mounting height shall be 60 inches above the finished floor to the centerline of the sign.

3.03 CLEANING AND PROTECTION

- A. At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION

SECTION 10522 - FIRE EXTINGUISHERS AND ACCESSORIES

PART 1 - GENERAL

1.01 Work Included

- A. Fire extinguishers
- B. Cabinets and wall mounting brackets

1.02 References

- A. NFPA 10 Portable Fire Extinguishers.

1.03 Quality Assurance

- A. Conform to NFPA 10 requirements for extinguishers.

1.04 Submittals

- A. Submit product data.
- B. Submit manufacturer's installation instruction.

1.05 Operation and Maintenance Data

- A. Submit manufacturer's operation and maintenance data.
- B. Include test, refill or recharge schedules, procedures, and re-certification requirements.

1.06 Environmental Requirements

- A. Do not install extinguishers when ambient temperatures may cause freezing.

PART 2 - PRODUCTS

2.01 Acceptable Manufacturers

- A. Larsen
- B. J.L. Industries
- C. Modern Metal Products.
- D. Substitutions: Reviewed equal.

2.02 Extinguishers

- A. Fire Extinguishers #1 - #8 shall be Larsen Model MP10, 10 lbs., U.L. Rating 4A-60B:C.
- B. For location of extinguishers, see Floor Plan.

2.03 Cabinets/Accessories

- A. Fire Extinguishers #1 - #7 shall be mounted in a semi-recessed cabinet, Larsen Model 2409-6R, non-fire-rated cabinet, clear anodized aluminum with Vertical Duo, partial glass door and 2½" rolled edge.
- B. Fire Extinguisher #8 shall be wall mounted with manufacturer's standard bracket.

PART 3 - EXECUTION

3.01 Installation

- A. Install fire extinguishers 36" a.f.f. or as required by NFPA 10. Top of cabinet mounted at 60" a.f.f.
- B. Secure rigidly in place in accordance with manufacturer's instructions.

End of Section

SECTION 10650 - OPERABLE PARTITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Manually operated, paired panel operable partitions.

B. Related Sections include the following:

1. Division 03 Sections for concrete tolerances required.
2. Division 05 Sections for primary structural support, including pre-punching of support members by structural steel supplier per operable partition supplier's template.
3. Division 06 Sections for wood framing and supports, and all blocking at head and jambs as required.
4. Division 09 Sections for wall and ceiling framing at head and jambs.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified in writing by the operable partition manufacturer, as qualified to install the manufacturer's partition systems for work similar in material, design, and extent to that indicated for this Project.
- B. Acoustical Performance: Test operable partitions in an independent acoustical laboratory in accordance with ASTM E90 test procedure and classified in accordance with ASTM E413 to attain no less than the STC rating specified. Provide a complete and unedited written test report by the testing laboratory upon request.
- C. Preparation of the opening shall conform to the criteria set forth per ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions.
- D. The operable wall must be manufactured by a certified ISO-9001-2015 company or an equivalent quality control system.
- E. Indoor Air Quality: Operable partition, movable wall manufacturer's non-wood products must meet the SCS Indoor Advantage™ Gold Certification or equivalent. This approval guarantees conformance to indoor air concentrations meeting Indoor Advantage Gold Indoor Air Quality Certified to SCS-105 v4.2-2023 Conforms to ANSI/BIFMA M7.1 and X7.1 and the CDPH/EHLB Standard Method (CA 01350) v1.2-2017 conducted in an independent third-party air quality testing laboratory.

1.4 REFERENCE STANDARDS

A. ASTM International

1. ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions.
2. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
3. ASTM E84 - Surface Burning Characteristics of Building Materials.
4. ASTM E413 - Classification for Rating Sound Insulation

B. Health Product Declaration Collaborative

1. Health Product Declaration Open Standard v2.1

C. International Standards Organization

1. ISO 14021 - Environmental Labels and Declarations - Self-Declared Environmental Claims (Type II Environmental Labeling).
2. ISO 14025:2011-10, Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures.
3. ISO 14040:2009-11, Environmental Management - Life Cycle Assessment - Principles and Framework.
4. ISO 14044:2006-10, Environmental Management - Life Cycle Assessment - Requirements and Guidelines.
5. ISO 21930 – Sustainability in Buildings and Civil Engineering Works — Core Rules for Environmental Product Declarations of Construction Products and Services.

D. Other Standards

1. ADA – Americans with Disabilities Act.

1.5 SUBMITTALS

- A. Product Data: Material descriptions, construction details, finishes, installation details, and operating instructions for each type of operable partition, component, and accessory specified.
- B. Shop Drawings: Show location and extent of operable partitions. Include plans, elevations, sections, details, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings, and at storage areas, and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, including floor tolerances required and direction of travel. Indicate blocking to be provided by others.
- C. Setting Drawings: Show imbedded items and cutouts required in other work, including support beam punching template.
- D. Samples: Color samples demonstrating full range of finishes available by architect. Verification samples will be available in same thickness and material indicated for the work.
- E. Reports: Provide a complete and unedited written sound test report indicating glass thickness and spacing in test specimen matches product as submitted.
- F. Create spaces that are healthy for occupants: Furnish products and materials with Health Product Declaration (HPD), Manufacturer Inventory, or other material health disclosure documentation. Products without an HPD or other disclosure documentation are not acceptable.
- G. Furnish materials that generate the least amount of pollution.
 1. Furnish products and materials that have third party verified environmental product declarations (EPD's). Consider products and materials that have optimized environmental performance (reduced life cycle impacts). Products without an EPD or other disclosure documentation are not acceptable.
- H. Buy American: Operable partition to be manufactured in the United States in compliance with applicable U.S. Federal Trade Commission (FTC) and U.S. Customs Service and Border Protections regulations and be labeled "Made in America".

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Clearly mark packages and panels with numbering systems used on Shop Drawings. Do not use permanent markings on panels.
- B. Protect panels during delivery, storage, and handling to comply with manufacturer's direction and as required to prevent damage.

1.7 WARRANTY

- A. Provide written warranty by manufacturer of operable partitions agreeing to repair or replace any components with manufacturing defects.
- B. Warranty period: Three (3) years.

PART 2 – PRODUCTS

2.1 MANUFACTURERS, PRODUCTS, AND OPERATION

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Modernfold, Inc.
 - 2. Approved Equal
- B. Panels to be manufactured in the U.S.A.
- C. Products: Subject to compliance with the requirements, provide the following product:
 - 1. Acousti-Seal Encore™ – Paired Panel: Manually operated paired panel operable partition.

2.2 OPERATION

- A. Acousti-Seal Encore™ – Paired Panel: Series of paired flat panels hinged together in pairs, manually operated, top supported with operable floor seals and automatic top seals.
- B. Final Closure: Horizontally expanding panel edge with removable crank.

2.3 PANEL CONSTRUCTION

- A. Nominal 4-1/4-inch (108 mm) thick panels in manufacturer's standard 51-inch (1295 mm) widths. All panel horizontal and vertical framing members fabricated from minimum 16-gage formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system components. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin.
- B. Panel Skin Options:
 - 1. Roll-formed steel wrapping around panel edge.Panel skins shall be lock formed and welded directly to the frame for unitized construction. Acoustical ratings of panels with this construction - 56 STC - 16-gage steel.
- C. Hinges for Panels, Pass Doors, and Pocket Doors shall be (select one):
 - 1. Full leaf butt hinges, attached directly to panel frame with welded hinge anchor plates within panel to further support hinge mounting to frame. Lifetime warranty on hinges. Hinges mounted into panel edge or vertical astragal are not acceptable.
 - 2. Concealed laminated hinge with antifriction segments mounted between each heat-treated link. Hinge to be attached directly to panel frame. Welded internal hinge bracket shall support the hinge and allow for adjustment of hinge plates. Concealed hinges mounted into panel edge or vertical astragal are not acceptable.
- D. Panel Trim: No vertical or horizontal trim required or allowed on edges of panels; minimal groove appearance at panel joints.
- E. Panel Weight:
 - Steel Skin: 56 STC – 11.9 lbs./square foot

2.4 PANEL FINISHES

- A. Panel face finish shall be (select as required):
 - 1. Reinforced heavy-duty vinyl with woven backing weighing not less than 30 ounces per lineal yard.
- B. Panel trim: No exposed panel trim required or allowed; seals and hardware to be of one color.
 - 1. Smoke Gray

2.5 SOUND SEALS

- A. Vertical Interlocking Sound Seals between panels: Roll-formed steel astragals, with tongue and groove configuration in each panel edge. Rigid plastic or aluminum astragals are not acceptable.
- B. Horizontal Top Seals shall be Modernfold SureSet™ automatic operable top seals, manually operated operable top seals not required or permitted.
- C. Horizontal Bottom Seals shall be Modernfold SureSet™ bottom seal:
 - 1. SM2 - Manually activated seals providing nominal 2-inch operating clearance with an operating range of +1/2-inch to -1-1/2-inch. Seal shall be operable from panel edge or face. Extended seal shall exert nominal 120 pounds downward force to the floor throughout operating range.

2.6 SUSPENSION SYSTEM

- A. #14 Suspension System
 - 1. Suspension Tracks: Minimum 7-gage, 0.18-inch roll-formed steel. Track shall be supported by adjustable steel hanger brackets connected to structural support pairs of 1/2-inch diameter threaded rods. Brackets must support the load bearing surface of the track.
 - a. Exposed track soffit: Steel, removable for service and maintenance, attached to track bracket without exposed fasteners, and pre-painted off-white.
 - 2. Carriers: One all-steel trolley with steel-tired ball bearing wheels per panel (except hinged panels). Non-steel tires are not acceptable.
 - 3. Warranty period: Twenty (20) years.

2.7 OPTIONS

- A. Single Pass Doors:
 - 1. Matching pass door same thickness and appearance as panels. ADA compliant pass door to be trimless and equipped with friction latch and flush pulls for panic operation. No threshold will be permitted.
 - 2. Hardware:
 - a. Lever handles both sides of door
 - b. Panic hardware with or without locking lever handle.
 - c. Self-Illuminated exit signs: Photo luminescent exit sign – surface mount

PART 3 – EXECUTION

3.1 INSTALLATION

- A. General: Comply with ASTM E557, operable partition manufacturer's written installation instructions, Drawings and approved Shop Drawings.
- B. Install operable partitions and accessories after other finishing operations, including painting have been completed.
- C. Match operable partitions by installing panels from marked packages in numbered sequence indicated on Shop Drawings.

D. Broken, cracked, chipped, deformed or unmatched panels are not acceptable.

3.2 CLEANING AND PROTECTION

- A. Clean partition surfaces upon completing installation of operable partitions to remove dust, dirt, adhesives, and other foreign materials according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to the manufacturer and installer that ensure operable partitions are without damage or deterioration at time of Substantial Completion.

3.3 ADJUSTING

- A. Adjust operable partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

3.4 EXAMINATION

- A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

3.5 DEMONSTRATION

- A. Demonstrate proper operation and maintenance procedures to Owner's representative.
- B. Provide Operation and Maintenance Manual to Owner's representative.

End of Section

SECTION 10800 - TOILET ROOM ACCESSORIES

PART 1 - GENERAL

1.01 Work Included

- A. Toilet room accessories.

1.02 Related Work

- A. Wall blocking required to secure accessories
- B. Glazing/caulking
- C. Toilet compartments
- D. Gypsum wallboard systems
- E. Plumbing fixtures
- F. Countertops

1.03 References (including but not limited to)

- A. ANSI A117 - 1986 Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.
- B. UBC - Chapters 5 and 33 Requirements for Handicapped.
- C. Title 24, California Code of Regulations, Parts 2, 3, and 5.
- D. ADA, Accessibility Guidelines for Buildings and Facilities, Federal Register Volume 56, Number 144, Rules and Regulations.
- E. Fair Housing Amendments Act of 1988, Accessibility Guidelines, Federal Register Volume 56, Number 44.
- F. Southern Building Code.

1.04 Quality Assurance

- A. Manufacturer
 - 1. Model numbers for toilet room accessories manufactured by Bradley Corp. Washroom accessories are listed to establish a standard of quality for design, function, materials, workmanship and appearance. Other manufacturers may be submitted for evaluation by the architect by following the conditions of the substitutions clause. Unless approval is obtained 10 days prior to the bid date, all bids shall be based on the standard of quality. The architect shall be the sole judge as to the acceptability of all products submitted for substitutions.

2. Accessories shall be the products of a single manufacturer. Accessories with tumbler locks shall be keyed alike with the exception of coin boxes in vending equipment.

B. Regulatory requirements

1. Operation of accessories shall comply with guidelines set forth by the American Disabilities Act, Title III. Documentation and samples to be provided to the architect upon request.

1.05 Submittals

A. Comply with requirements of Section regarding submittals.

B. Manufacturer's Data

1. Provide required number copies of:
 - a. Product data sheets.
 - b. Installation instructions.
 - c. Service and parts manual.

C. Samples

1. Upon request, submit one sample of each item specified. If more than one manufacturer is specified, submit one sample of each item for architect's review.

1.06 Product Delivery, Storage, and Handling

- A. Deliver items in manufacturer's original unopened protective packaging.
- B. Store materials in original protective packaging to prevent physical damage, or wetting.
- C. Handle so as to prevent damage to accessories.

1.07 Warranty

- A. Furnish one year guarantee against defects in material and workmanship on all accessories. In addition to the above the following shall apply:
 1. Welded stainless steel framed mirrors shall have a fifteen year guarantee against silver spoilage.

PART 2 - PRODUCTS

2.01 Toilet Room Accessories Schedule:

Note: Items not listed such as toilet tissue dispensers, paper towel dispensers, soap dispensers, etc., to be supplied by product vendor at owner's selection.

- A. Grab Bars of sizes as shown on plans, #812-001, heavy-duty stainless steel with sanitary safety grip finish, concealed mounting kits to be included.
- B. Mirror 90" x 48", #7802-90x48, full lavatory width, angle framed mirror, 1/4" tempered glass.
- C. Mirror 106" x 48", #7802-106x48, full lavatory width, angle framed mirror, 1/4" tempered glass.
- D. Napkin Disposal Unit, #4722-1015, semi-recessed, satin finish stainless steel.
- E. Napkin Disposal Unit, #4721-15, partition mounted to serve two compartments.
- F. Baby Changing Station, # 963, bacterial-resistant high-density plastic in a Gray and White Speckled color. Concealed gas shock mechanism, adjustable safety belt, integrated dual liner dispenser and a molded-in diaper bag/purse hook. Surface-mounted, ADA compliant and rated to support a static load of 250 lbs.

2.02 Materials (if applicable to items in contract)

- A. All cabinets shall be constructed of 18-8, type 304 stainless steel.
- B. All waste receptacle shall be constructed of 18-8, type 304 stainless steel or rigid molded leak-proof plastic.
- C. Waste receptacles or cabinets manufactured of type 400 stainless steel are not acceptable.
- D. All tumbler locks to be fastened to accessories with lock nuts. Fastening locks to units with spring clip is not acceptable.

PART 3 - EXECUTION

3.01 Inspection

- A. Check wall opening for dimensions, plumbness of blocking or frames that would affect installation of recessed accessories. For surface mounted accessories check condition of wall and confirm installation of backing within wall.

- B. Verify spacing of plumbing fixtures and toilet compartments that affect installation of toilet room accessories.

End of Section

Division 22 & 23
Mechanical

SECTION 210000 - FIRE PROTECTION SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

- A. Extent of fire protection systems work is as indicated on the Drawings to renovate the existing fire suppression system to suppress the new addition areas 100% as indicated on Drawings. Work to suppress these areas shall be performed in accordance with NFPA-13 as a wet-pipe system. System is to be a wet pipe system as indicated on the Drawings. General classification for areas suppressed is Light Hazard.
- B. Before submitting bid, examine all Mechanical, Architectural, and Structural Drawings, visit the site and become acquainted with all conditions that may, in any way whatsoever, affect the execution of this work.
- C. Furnish all material, labor, tools, equipment and supervision required for installation of a complete fire protection stand pipe system and limited area fire protection system as indicated on the project drawings. Include all necessary piping, sprinkler heads, test connections, valves, drains, fire department connections, etc.
- D. The Contractor shall provide flushing and sterilization of all water lines in accordance with current Kentucky Plumbing Codes, Rules and Regulations and shall make connection to domestic water mains in accord with current rules and regulations of the State Department of Sanitary Engineering and Division of Water Quality.
- E. Piping systems shall be hydraulically sized based tests performed at the fire riser.

1.2 QUALITY ASSURANCE:

- A. Manufacturers: Firms regularly engaged in manufacturer 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.
- B. Installer: A firm with at least 5 years of successful installation experience on projects with fire protection piping systems work similar to that required for project.
- C. Local Fire Department/Marshall Regulations: Comply with governing regulations pertaining to fire sprinkler piping.

1.3 SUBMITTALS:

- A. 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. Prepare detailed design of system in accordance with all local and national codes and the following guidelines.
- B. Complete shop drawings shall be submitted to the State Fire Marshall office for approval. No work shall proceed until shop drawings are approved. Indicate all information required for review by NFPA-13.
- C. The Contractor shall submit these drawings to the Engineer through the General Contractor and Architect. The Engineer will review these drawings and will return these back to the Contractor. It is the Contractor's responsibility to correct any comments and to submit the reviewed drawings to the fire marshal's office for their review and approval. No work shall be done until drawings are approved by the authority having jurisdiction.
- D. All equipment, devices and materials included in the installation shall be approved or listed by Underwriters' Laboratories or other nationally recognized testing laboratories.

PART 2 - PRODUCTS

2.1 FIRE PROTECTION PIPING MATERIALS AND PRODUCTS:

- A. Pipe & Fittings
 - 1. Interior Piping:
 - a. Up to 2" (Interior) Schedule 40 ASTM A-53 black steel; 175# cast iron screwed fittings or Schedule 10, ASTM A-135 black steel with victaulic or similar type approved fittings.
 - b. 2½" and larger (Interior) Schedule 40 black steel with flanged, welded or victaulic (or similar) type approved fittings or Schedule 10, ASTM A-135 black steel with victaulic or similar type approved fittings.
 - 2. Exterior Piping:
 - a. Piping for the Fire Department Line and Fire Suppression lead in to be ductile iron. SDR-18 "Blue Brute" C900 piping is also acceptable, if acceptable to the local water utility.
- B. Sprinkler Head Cabinet:

1. Furnish and install a cabinet, clearly labeled, with five (5) sprinklers of each type complete with required wrenches. Locate as directed by Engineer. Label "Sprinkler Heads".

C. Check Valves:

1. 2½" and over; listed and approved by UL and FM; marked SV-FM; 175# working pressure; 1 BBM; flanged; equivalent to Mueller, Scott or Lunkenheimer.
2. 2" and under; 150# working pressure; bronze; screwed; equivalent to Jenkins, Scott or Lunkenheimer.

D. Gate Valves:

1. 2½" and over; listed and approved by UL and FM; marked SV-FM; 175# working pressure; 1 BBM; OS&Y; flanged; cast iron discs; bronze seat rings; four point wedging mechanism; equivalent to Mueller, Scott or Lunkenheimer.
2. 2" and under; 150# working pressure; bronze; rising stem; screwed; bronze discs; bronze seat rings; two point wedging mechanism; equivalent to Jenkins, Scott or Lunkenheimer.

E. Sleeves and Escutcheon Plates:

1. Provide cast brass chrome plated split ring type escutcheons where piping penetrates walls, ceilings and floors, whether in finished areas or not.

F. Sprinkler Heads:

1. Grinnell, Star, Reliable, Viking, Central Sprinkler Corporation, or approved equivalent as follows:
2. Where piping is exposed: "Standard up right".
3. Where piping is concealed above finished ceilings, provide two piece, semi-recessed, Pendant sprinkler heads with removable escutcheon plates. All piping shall be concealed throughout.
4. Install sprinkler head guards where heads are subject to physical abuse. Heads located below seven (7) feet above floor, etc..
5. Sprinkler head degree ratings shall be determined by the area serviced in accord with current Codes and Standard Practices. Indicate degree ratings on submitted Shop Drawings.

6. NOTE: "Omega" brand & Central Sprinkler Corporation sprinkler heads shall be prohibited.

G. Hangers:

1. All piping shall be adequately and permanently supported in an approved manner on approved hangers (Submit with drawings).

PART 3 - EXECUTION

3.1 SYSTEM DRAINAGE

- A. The entire Sprinkler System (except that part which is below grade and will not freeze) shall be installed so as to allow 100% drainage.
- B. All sprinkler branch piping shall be installed so as to drain back to the main riser. No piping shall be installed which will pool greater than 4 gallons of water without drainage capability.
- C. Approved 2" drain piping shall be provided on sprinkler risers with discharge piping running to nearest open air location on the exterior of the building. Where sprinkler piping is trapped, an approved auxiliary draw-off shall be provided and neatly installed.
- D. All drain valves shall have a metal tag labeled "Sprinkler Drain".

3.2 ADJUST AND CLEAN:

- A. 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.

3.3 FIELD QUALITY CONTROL:

- A. Hydrostatic Testing: After flushing system, test fire sprinkler piping with compressed air for a period of 2 hours, at not less Than 125 PSI. 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.

END OF SECTION

220500 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS:

- A. All requirements under Division One and the General and Supplementary Conditions of these specifications shall be a part of this section. Each contractor shall be responsible to thoroughly familiarize himself with all its contents as to requirements which affect this division or section. The work required under this section includes all material, equipment, appliances, transportation, services, and labor required to complete the entire system as required by the drawings and specifications.

1.2 SCOPE

- A. The work included in this division consists of the furnishing of all labor, equipment, transportation, supplies, material, appurtenances and services necessary for the satisfactory installation of the complete and operating Plumbing System(s)/Equipment indicated or specified in the Contract Documents.
- B. Any materials, labor, equipment or services not mentioned specifically herein which may be necessary to complete or perfect any part of the Plumbing Systems in a substantial manner, in compliance with the requirements stated, implied or intended in the drawings and, or specifications, shall be included as part of this Contract.
- C. It is the intent of this Contract to deliver to the Owners a "like new" project once work is complete. Although plans and specifications are complete to the extent possible, it shall be the responsibility of the Contractors involved to coordinate all new systems with items of construction provided by others, and to relocate items which interfere with new equipment or materials required for the complete installation without additional cost to the Owner.

1.3 DEFINITIONS AND ABBREVIATIONS

- A. Contractor - Any Contractor whether proposing or working independently or under the supervision of a General Contractor and, or Construction Manager and who installs any type of mechanical work or, the General Contractor.
- B. Engineer - The Consulting Mechanical-Electrical Engineers either consulting to the Owners, Architect, other Engineers, etc.
- C. Architect - The Architect of Record for the project.

- D. Furnish - Deliver to the site in good condition and turn over to the Contractor who is to install.
- E. Provide - Furnish and install complete, tested and ready for operation.
- F. Indicated - Shown on the Drawings or Addenda thereto.
- G. Typical - Where indicated repeat this work, method or means each time the same or similar condition occurs whether indicated or not.
- H. OSHA - Office of Safety and Health Administration.
- I. NEC - National Electrical Code.
- J. NFPA - National Fire Protection Association.
- K. AGA - American Gas Association
- L. ASME - American Society of Mechanical Engineers.
- M. ANSI - American National Standards Institute.
- N. ASHRAE - American Society of Heating, Refrigeration and Air Conditioning Engineers.
- O. NEMA - National Electrical Manufacturers Association.
- P. UL - Underwriters Laboratories.

1.4 INSPECTION OF THE SITE:

- A. The contractor shall personally inspect the site of the proposed work and inform himself fully as to the conditions under which the work is to be done. Failure to do so will not be considered sufficient justification to request or obtain extra compensation over and above the contract price.

1.5 MATERIAL AND WORKMANSHIP:

- A. All material and apparatus shall be new and in first class condition. All workmanship shall be of the finest possible by experienced mechanics. All installations shall be made in a manner that will comply with applicable Codes and laws. In general, all materials and equipment shall be of commercial specification grade in quality.

1.6 DRAWINGS AND SPECIFICATIONS

- A. The drawings are diagrammatic only and indicate the general arrangement of the systems and are to be followed. If deviations from the layouts are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Engineer for approval before proceeding with the work. The drawings are not intended to show every item that may be necessary to complete the systems. All proposers shall anticipate that additional items may be required and submit their bid accordingly.
- B. Each Contractor shall make all his own measurements in the field and shall be responsible for correct fitting. He shall coordinate this work with all other branches of work in such a manner as to cause a minimum of conflict or delay.
- C. The Engineer shall reserve the right to make adjustments in location of piping, ductwork, equipment, etc. where such adjustments are in the interest of improving the project.
- D. Unless dimensioned, the mechanical drawings only indicate approximate locations of equipment, piping, etc.. Dimensions given in figures on the drawings shall take precedence over scaled dimensions and all dimensions, whether given in figures or scaled, shall be verified in the field to insure no conflict with other work.

1.7 COORDINATION:

- A. Coordinate all work with that of other trades so that the various components of the systems will be installed at the proper time, will fit the available space, and will allow proper service access to those items requiring maintenance. Any components which are installed without regard to the above shall be relocated at no additional cost to the owner.
- B. It is the Contractor's responsibility to provide materials with trim which will fit properly the types of ceiling, wall, or floor finishes actually installed. Model numbers in specifications or shown on drawings are not intended to designate the required trim.

1.8 ORDINANCES AND CODES:

- A. Comply with National Fire Protection Association codes, Kentucky Building Code, Kentucky Plumbing Code, and/or all other applicable codes and ordinances. Obtain and pay for all permits. Contractor shall be held responsible for any violation of the law.
- B. The Contractor shall give all necessary notices, obtain and pay for all permits, government sales taxes, fees, inspections and other costs, in connection with his work. He shall also file all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having any jurisdiction, whether indicated or

specified or not.

- C. The contractor shall also obtain all required certificates of inspection for his work and deliver same to the Engineers before request for acceptance and final payment for the work.

1.9 PROTECTION OF EQUIPMENT:

- A. Adequately protect equipment from damage after delivery to job. Cover with heavy polyethylene plastic as required to protect from plaster, dirt, paint, water, or physical damage. Equipment which has been damaged by construction activities will be rejected, and contractor is obligated to furnish new equipment of a like kind.
- B. Keep premises broom clean at all times from foreign material created under this contract. All piping, equipment, etc. shall have a neat and clean appearance at the termination of the work.

1.10 EQUIPMENT AND MATERIALS SUBSTITUTIONS OR DEVIATIONS

- A. When any Contractor requests approval of materials and/or equipment of different physical size, capacity, function, color, access, it shall be understood that such substitution, if approved, will be made without additional cost to anyone other than the Contractor requesting the change regardless of changes in connections, space requirements, electrical characteristics, etc. from that indicated, electrical service, etc.. In all cases where substitutions affect other trades, the Contractor requesting such substitutions shall advise all such Contractors of the change and shall renumerate them for all necessary changes in their work.
- B. NOTE: Any drawings, Specifications, Diagrams, etc., required to describe and coordinate such substitutions or deviations shall be professionally prepared at the responsible Contractor's expense. Review of Shop Drawings by the Engineers does not in any way absolve the Contractor of this responsibility.
- C. Notwithstanding any reference in the specifications to any article, device, product, material, fixture, form, or type of construction by name, make or catalog number, such reference shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; any devices, products, materials, fixtures, forms, or types of construction which, in the judgment of the Engineer, are equivalent to those specified are acceptable, provided the provisions of the paragraph immediately preceding are met. Requested substitutions shall be submitted to the Engineer a minimum of five days prior to bids.

1.11 SUPERVISION OF WORK

- A. Each Contractor shall personally supervise the work for which he is responsible or have a competent superintendent, approved by the Engineers, on the work at all times during progress with full authority to act for him.

1.12 SHOP DRAWINGS:

- A. Submit for approval eight sets of manufacturers shop drawings of all major items of equipment and all items requiring coordination between contractors. Before submitting shop drawings and material lists, the contractor shall verify that all equipment submitted is mutually compatible and suitable for the intended use, and shall fit the available space and allow ample room for maintenance. The Engineer's checking and subsequent approval of such shop drawings shall not relieve the contractor from responsibility for errors in dimensions, details, size of members, or quantities; or omissions of components or fittings; or for coordinating items with actual building conditions. Provide any needed wiring diagrams.
- B. Catalog data must have the item or model number clearly marked and all accessories indicated. Mark out all inapplicable items.
- C. NOTE: Any shop drawings received without being reviewed and stamped by the Contractor shall be returned Rejected without review.

1.13 OPERATION AND MAINTENANCE INSTRUCTIONS:

- A. Submit to the architect four (4) copies each of material for maintenance and operation instruction manuals, appropriately bound into manual form including approved copies of the following, revised if necessary to show system and equipment as actually installed:
 - 1. Manufacturers Catalog Sheets
 - 2. Wiring Diagrams
 - 3. Maintenance Instructions
 - 4. Recommended Maintenance Schedules and Timelines
 - 5. Operating Instructions
 - 6. Parts Lists
 - 7. Preventative Maintenance Recommendations
- B. All binders shall be as per the applicable Division I General Specifications.

1.14 GUARANTEE:

- A. Each Contractor shall guarantee all equipment, apparatus, materials, and workmanship entering into this Contract to the best of its respective kind and shall replace all parts at

his own expense, which are proven defective for a duration as indicated in the Division I General Conditions and Specifications.

- B. Where such duration is not identified, then guarantee shall be for one year from final acceptance of the work by the Engineer/Architect. The effective date of completion of the work shall be the date of the Engineer's (Architect's) Statement of Substantial Completion. Items of equipment which have longer guarantees, as called for in these specifications, shall have warranties and guarantees completed in order, and shall be in effect at the time of final acceptance of the work by the Engineer. The Contractor shall present the Engineer with such warranties and guarantees at the time of final acceptance of the work. The Engineer shall then submit these warranties, etc. to the Owner. Refer to other sections for any special or extra warranty requirements.

1.15 CONDUCT OF WORKMEN

- A. Each Contractor shall be responsible for the conduct of all workmen under his supervision. Misconduct on the part of any workman to the extent of creating a safety hazard, or endangering the lives and property of others, shall result in the prompt relief of that workman. The consumption of alcoholic beverages or other intoxicants, narcotics, barbiturates, hallucinogens or debilitating drugs on the job site is strictly forbidden.

1.16 ROUGH-IN:

- A. Coordinate without delay all roughing-in with general construction. All piping, conduit, rough-in shall be concealed except in unfinished areas and where otherwise shown.

1.17 CUTTING AND PATCHING:

- A. Each Mechanical Contractor shall be responsible for all openings that he may require in floors, roofs, ceilings, walls, etc., and shall coordinate all such work prior to execution. Improperly located openings shall be reworked at the expense of the responsible Contractor.
- B. Each Mechanical Contractor shall be responsible for properly shoring, bracing, supporting, etc., any existing and/or new construction to guard against cracking, settling, collapsing, displacing or weakening while openings are being made. Any damage occurring to the existing structure, due to failure to exercise proper precautions or due to action of the elements shall be promptly and properly made good to the satisfaction of the Architect and Engineer.
- C. Patching and repairing made necessary by work performed under this division shall be included as a part of the work and shall be done by skilled mechanics of the trade or trades for work cut or damaged, of like type to match adjacent surfaces and in a manner

acceptable to the Architect & Engineer.

- D. Where the installation of conduit, ducts, piping, etc. requires the penetration of fire or smoke rated walls, ceilings or floors, the penetrations MUST be made using a U.L. listed through penetration assembly. These materials must be U.L. listed as a recorded assembly and shall be submitted for approval prior to use.
- E. Piping passing through floors, ceilings and walls in finished areas, unless otherwise specified, shall be fitted with chrome plated brass escutcheons of sufficient outside diameter to amply cover the sleeved openings and an inside diameter to closely fit the pipe around which it is installed.

1.18 LINTELS

- A. The Mechanical Contractor shall provide lintels for all masonry bearing openings required for the mechanical work (Louvers, wall boxes, duct penetrations, etc.). Lintels shall be sized as indicated by the structural drawings and specifications. Coordinate requirements with the general contractor and the Structural Engineer. Contact Engineer for additional direction if necessary. Plan all lintel depths to ensure maintenance of all Architectural ceiling levels. Also, plan all required angles for fire damper and UL listed sleeves for a total depth for coordination with ceiling heights. No cutting is to be done at points or in a manner that will weaken the structure and unnecessary cutting must be avoided. If in doubt, contact the Structural Engineer. Provide lintels where ever bearing walls are penetrated. Plan the location of all lintels prior to any penetrations being performed.

1.19 ACCESSIBILITY

- A. The Contractor shall locate and install all equipment so that it may be serviced, and maintained as recommended by the manufacturer. Allow ready access and removal of the entire unit and, or parts such as valves, filters, fan belts, motors, prime shafts, etc.

1.20 REQUIRED CERTIFICATIONS

- A. Upon completion of the project, the Contractor shall deliver all inspection certificates acquired during the course of the project to the Owner for their records, inclusive of the boiler certificate (if applicable).
- B. The Contractor shall upon completion of the Final Punch list, deliver to Architect and Engineer a written certification that all systems and work has been completed in compliance with the plans and specifications. The Contractor also shall deliver over to the Owner all required maintenance manuals and phone numbers of the equipment suppliers. The delivery of these documents and certifications will be required prior to final payment and release of retainage.

1.21 INDEMNIFICATION

- A. The Contractor(s) shall hold harmless and indemnify the Engineer, employees, officers, agents and consultants from all claims, loss, damage, actions, causes of actions, expense and/or liability resulting from, brought for, or on account of any personal injury or property damage received or sustained by any person, persons, (including third parties), or any property growing out of, occurring, or attributable to any work performed under or related to this contract, resulting in whole or in part from the negligence of the Contractor, any subcontractor, any employee, agent or representative.

PART 2 - PRODUCTS

2.1 NONE

PART 3 - EXECUTION

3.1 NONE

END OF 220500

220519: METERS AND GAGES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

- A. Extent of gauges and thermometers required by this section is indicated on drawings and/or specified in other Division 22 sections.

1.2 QUALITY ASSURANCE:

- A. Manufacturers: Firms regularly engaged in manufacturer of pressure gauges and thermometers, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.3 SUBMITTALS:

- A. Product Data: Submit catalog cuts, specifications, and installation instructions, for each type of measuring device required. Submit showing Manufacturer's figure number, size, and features for each required device.

PART 2 - PRODUCTS

2.1 TEMPERATURE GAGES:

- A. Direct Mount Dial Thermometers:
 - 1. General: Provide direct mount dial thermometers of materials, capacities, and ranges indicated, designed and constructed for use in service indicated.
 - 2. Type: Vapor tension, universal angle.
 - 3. Case: Drawn steel or brass, clear acrylic plastic lens, 4½" diameter.
 - 4. Adjustable Joint: Die cast aluminum, 180° adjustment in vertical plane, 360° adjustment in horizontal plane, with locking device.
 - 5. Thermal Bulb: Copper with phosphor bronze bourbon pressure tube, on scale division accuracy.
 - 6. Movement: Brass precision geared.
 - 7. Scale: Progressive, satin faced, non-reflective aluminum, permanently etched markings.
 - 8. Stem: Copper plated steel, or brass, for separable socket, length to suit

installation.

9. Range: Conform to the following:
 - a. Hot & Cold Water: 40° - 240°F (10°-115°C).
10. Available Manufacturers: Subject to compliance with requirements, manufacturers offering direct mount dial thermometers which may be incorporated in the work include, but are not limited to the following:
 - a. Marsh Instrument Co., Unit of General Signal.
 - b. Terice (H.O.) Co.
 - c. Weiss (Albert A. & Son, Inc.

B. Dial Type Insertion Thermometers:

1. General: Provide dial type insertion thermometers of materials, capacities, and ranges indicated, designed and constructed for use in service indicated.
2. Type: Bi-metal, stainless steel case and stem, 1" diameter dial, dust and leak proof, 1/8" diameter stem with nominal length of 5".
3. Accuracy: 0.5% of dial range.
4. Range: Conform to the following:
 - a. Hot & Cold Water: 0°- 220°F (-10°-110°C).
5. Available Manufacturers: Subject to compliance with requirements, manufacturers offering direct mount dial type insertion thermometers which may be incorporated in the work include, but are not limited to the following:
 - a. Marsh Instrument Co., Unit of General Signal.
 - b. Taylor Instrument Process Control Div., Sybron Corp.
 - c. Terice (H.O.) Co.
 - d. Weiss (Albert A.) & Son, Inc.

C. THERMOMETER WELLS:

1. General: Provide thermometer wells constructed of brass or stainless steel, pressure rated to match piping system design pressure. Provide 2" extension for insulated piping.

2.2 PRESSURE GAGES AND FITTINGS:

- A. General: Provide pressure gages of materials, capacities and ranges indicated, designed

and constructed for use in service indicated.

- B. Type: General use, 1% accuracy, ANSI B 40.1 grade A, phosphor bronze bourdon type, bottom connection.
- C. Case: Drawn steel or brass, clear acrylic plastic lens, 4½" diameter.
- D. Connector: Brass with ¼" male NPT.
- E. Scale: White coated aluminum, with permanently etched markings.
- F. Range: Conform to the following:
 - 1. Water: 0 - 100 PSI.
- G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering pressure gages which may be incorporated in the work include, but are not limited to the following:
 - 1. Ametek, U.S. Gauge Div.
 - 2. Marsh Instrument Co., Unit of General Signal.
 - 3. Marshalltown, An Eltra Company
 - 4. Terice (H.O.) Co.
 - 5. Weiss (Albert A.) & Son, Inc.
- H. Pressure Gage Cocks:
 - 1. General: Provide pressure gage cocks between pressure gages and gage tees on piping systems. Construct gage cock of brass with ¼" female NPT on each end, and "T" handle brass plug.
- I. Snubber: ¼" brass bushing with corrosion resistant porous metal disc, through which pressure fluid is filtered. Select disc material for fluid served and pressure rating.
- J. Pressure Gage Connector Plugs:
 - 1. General: Provide pressure gage connector plugs pressure rated for 150 PSI and 200°F. Construct of brass and finish in nickel-plate, equip with ½" NPT fitting, with self-sealing valve core type neoprene gasketed orifice suitable for inserting 1/8" O.D. probe assembly from dial type insertion pressure gage. Equip orifice with gasketed screw cap and chain. Provide extension, length equal to insulation thickness, for insulated piping.

PART 3 - EXECUTION

3.1 INSTALLATION OF TEMPERATURE GAGES:

A. General: Install temperature gages in vertical upright position, and tilted so as to be easily read by observer standing on floor.

B. Locations: Install at the following locations, and elsewhere as indicated:

1. At the supply line from the domestic water heaters

C. Thermometer Wells: Install in piping tee where indicated, in vertical upright position. Fill well with oil or graphite, secure cap.

3.2 INSTALLATION OF PRESSURE GAGES:

A. General: Install pressure gages in piping tee with pressure gage cock, located on pipe at most readable position.

B. Locations: Install in the following locations, and elsewhere as indicated:

1. At inlet and discharge of each pump

END OF 220519

220523 - GENERAL DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1. DESCRIPTION OF WORK:

1.1 Extent of valves required by this section is indicated on drawings and/or specified in other Division 22 sections.

A. Types of valves specified in this section include the following:

1. Gate Valves.
2. Globe Valves.
3. Drain Valves.
4. Ball Valves.
5. Swing and Lift Check Valves.

1.2 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of valves, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.3 SUBMITTALS:

A. Product Data: Submit catalog cuts, specifications, installation instructions, and dimensioned drawings for each type of valve. Include pressure drop curve or chart for each type and size of valve. Submit valve schedule showing Manufacturer's figure number, size, location, and valve features for each required valve.

PART 2 - PRODUCTS

2.1 VALVES:

A. General: Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

2.2 GATE VALVES:

A. Packing: Select valves designed for repacking under pressure when fully opened,

equipped with packing suitable for intended service. Select valves designed so back seating protects packing and stem threads from fluid when valve is fully opened, and equipped with gland follower.

1. For Low Pressure Domestic Water Service:

- a. Threaded Ends 2" and Smaller: Class 125, bronze body, union bonnet, rising stem, solid wedge.
- b. Flanged Ends 2½" and Larger: Class 125, iron body bronze mounted, bolted bonnet, rising stem, OS&Y, solid wedge.
- c. Soldered Ends 2" and Smaller: Class 125, bronze body, screwed bonnet, non-rising stem, solid wedge.

2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering gate valves which may be incorporated in the work include, but are not limited to the following:

- a. Crane Co., Valve Div.
- b. Fairbanks Co.
- c. Hammond Valve Corp., Div. of Conval Corp.
- d. Jenkins Bros., A Corp.
- e. NIBCO, Inc.
- f. Powell (Wm.) Co.
- g. Stockham Valves and Fittings, Inc.
- h. Walworth Co.

2.3 GLOBE VALVES:

- A. Packing: Select valves designed for repacking under pressure when fully opened, equipped with packing suitable for intended service. Select valves designed so back seating protects packing and stem threads from fluid when valve is fully opened, and equipped with gland follower.
- B. Composition Discs: Where required, provide suitable material for intended service. For stem throttling service, fit composition disc valve with throttling nut.
- C. Comply with the following standards:
 - 1. Bronze Valves: MSS SP-80.
- D. For Domestic Water Service:

1. Flanged, Threaded or Solder Ends 2½" and Larger: Class 150, bronze body, union bonnet, plug-type, OS&Y, renewable seat and disc, rated for severe throttling.

E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering globe valves which may be incorporated in the work include, but are not limited to, the following:

1. Crane Co., Valve Div.
2. Fairbanks Co.
3. Hammond Valve Corp., Div. of Conval Corp.
4. Jenkins Bros., A Corp.
5. NIBCO, Inc.
6. Powell (Wm.) Co.
7. Stockham Valves and Fittings, Inc.
8. Walworth Co.

2.4 SWING CHECK VALVES:

A. General: Construct pressure containing parts of valves as follows:

1. Bronze Valves, 125 or 150 PSI: ANSI/ASTM B 62.

B. Construct valves of pressure castings free of any impregnating materials.

C. Construct valves of bronze, regrinding, with seating angle 40° to 45°, unless composition disc is specified.

D. Provide stop plug as renewable stop for disc hanger, unless otherwise specified.

E. Construct disc and hanger as separate parts, with disc free to rotate.

F. Support hanger pins on both ends by removable side plugs.

2.5 Available Manufacturers: Subject to compliance with requirements, manufacturers offering swing check valves which may be incorporated in the work include, but are not limited to the following:

1. Crane Co., Valve Div.
2. Fairbanks Co. (The)
3. Hammond Valve Corp., A Condec Co.
4. Jenkins Bros., A Corp.
5. NIBCO, Inc.

6. Powell Co. (The Wm.)
7. Stockham Valves and Fittings, Inc.
8. Walworth Co.

2.6 LIFT CHECK VALVES:

- A. General: Provide lift check valves, 2" and smaller, constructed of bronze or forged steel to suit service. Construct bronze valves with basic rating of 125 or 150 PSI with pressure containing parts of materials having at least physical properties of ANSI/ASTM B 62. Conform to ANSI /FCI 74-1 for design, rating, and testing. Construct pressure castings, free of any impregnating materials.
- B. Horizontal Lift Check Valves: ¼" to 2", straight pattern threaded or soldered ends, pressure rated for 150 PSI, renewable composition disc, screw-over cap, bronze body.
- C. Spring Loaded Horizontal Lift Check Valves: ¼" to 2", straight pattern, threaded or soldered ends, pressure rated for 150 PSI, renewable composition disc, phosphor bronze wire spring, screw over cap, bronze body.
- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering lift check valves which may be incorporated in the work include, but are not limited to the following:
 1. Fairbanks Co. (The).
 2. Hammond Valve Corp., A Condec Co.
 3. Jenkins Bros., A Corp.
 4. Lunkenheimer Co. (The), Div. Conval Corp.
 5. Powell Co. (The Wm.).
 6. Stockham Valves & Fittings, Inc.

2.7 BALL VALVES:

- A. General: Select with port area equal to or greater than connecting pipe area, include seat ring designed to hold sealing material.
- B. For Domestic Water Service:
 1. Threaded Ends 2" and Smaller: Class 125, bronze 2 piece body, bronze ball, bronze stem.
 2. Soldered Ends 2" and Smaller: Class 125, bronze, 2 piece body, bronze ball, bronze stem.

- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering ball valves which may be incorporated in the work include, but are not limited to the following:

1. Conbraco Industries, Inc.
2. Crane Co., Valve Div.
3. Fairbanks Co.
4. Hammond Valve Corp., Div. of Conval Corp.
5. Jamesbury Corp.
6. NIBCO, Inc.
7. Stockham Valves and Fittings, Inc.
8. Walworth Co.

2.8 DRAIN VALVES:

- A. For Low Pressure Drainage Service:

1. Threaded Ends 2" and Smaller: Class 125, bronze body, screwed bonnet, rising stem, composition disc, 3/4" hose outlet connection.
2. Soldered Ends 2" and Smaller: Class 125, bronze body, screwed bonnet, rising stem, composition disc, 3/4" hose outlet connection.

- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering drain valves which may be incorporated in the work include, but are not limited to, the following:

1. Crane Co., Valve Div.
2. Fairbanks Co.
3. Hammond Valve Corp., Div. of Conval Corp.
4. Jenkins Bros., A Corp.
5. NIBCO, Inc.
6. Walworth, Co.

2.9 SWING CHECK VALVES:

- A. General: Construct pressure containing parts of valves as follows:

1. Bronze Valves, 125 or 150 PSI: ANSI/ASTM B 62.
2. Metallic Seated Bronze Valves, 200 or 300 PSI: ANSI/ASTM B 61.
3. Iron Body Valves: ANSI/ASTM A 126, Grade B.

- B. Comply with MSS SP-71 for design, workmanship, material and testing.
- C. Construct valves of pressure castings free of any impregnating materials. Construct valves of bronze, regrinding, with seating angle 40° to 45°, unless composition disc is specified.
- D. Provide stop plug as renewable stop for disc hanger, unless otherwise specified.
- E. Construct disc and hanger as separate parts, with disc free to rotate.
- F. Support hanger pins on both ends by removable side plugs.
- G. For Domestic Water Service:
 - 1. Threaded Ends 2" and Smaller: Class 125, bronze body, screwed cap, horizontal swing, bronze disc.
 - 2. Soldered Ends 2" and Smaller: Class 125, bronze body, screwed cap, horizontal swing, bronze disc.
 - 3. Flanged Ends 2½" and Larger: Class 125, iron body bronze mounted, bolted cap, horizontal swing, cast iron disc.
- H. Available Manufacturers: Subject to compliance with requirements, manufacturers offering swing check valves which may be incorporated in the work include, but are not limited to the following:
 - 1. Crane Co., Valve Div.
 - 2. Fairbanks Co. (The)
 - 3. Hammond Valve Corp., A Condec Co.
 - 4. Jenkins Bros., A Corp.
 - 5. NIBCO, Inc.
 - 6. Powell Co. (The Wm.)
 - 7. Stockham Valves and Fittings, Inc.
 - 8. Walworth Co.

2.10 VALVE FEATURES:

- A. General: Provide valves with features indicated and, where not otherwise indicated, provide proper valve features as determined by Installer for installation requirements. Comply with ANSI B31.1

- B. Outside Screw and Yoke: Stem and handwheel designed to rise out of bonnet or yoke as valve is operated from closed to open position.
- C. Inside Screw, Non-Rising Stem: Stem and handwheel designed to rotate without rising when valve is operated from closed to open position.
- D. Threaded: Valve ends complying with ANSI B2.1.
- E. Bonnet: Part of gate or globe valve through which stem passes to valve body, and attached to valve body by screws, bolts, union or welding.
- F. Solid Wedge: One piece tapered disc in gate valve, designed for contact on both sides.
- G. Outside Screw and Yoke: Stem and handwheel designed to rise out of bonnet or yoke as valve is operated from closed to open position.
- H. Inside Screw, Non-Rising Stem: Stem and handwheel designed to rotate without rising when valve is operated from closed to open position.
- I. Valve System: Select and install valves with outside screw and yoke stems, except provide inside screw non-rising stem valves where headroom prevents full opening of OS&Y valves.
- J. Renewable Seats: Select and install valves with renewable seats, except where otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. General: Except as otherwise indicated, comply with the following requirements:
- B. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.
- C. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward for horizontal plane unless unavoidable. Install valve drains with hose end adapter for each valve that must be installed with stem below horizontal plane.
- D. Insulation: Where insulation is indicated, install extended stem valves, arranged in proper manner to receive insulation.

- E. Applications Subject to Shock: Install valves with bodies of metal other than cast iron where thermal or mechanical shock is indicated or can be expected to occur.
- F. Valve System: Select and install valves with outside screw and yoke stems, except provide inside screw non-rising stem valves where headroom prevents full opening of OS&Y valves.
- G. Fluid Control: Where throttling is indicated or recognized as principal reason for valve, install globe valves.
- H. Installation of Check Valves:
 - 1. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction of flow.

END OF 220523

220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

- A. Extent of supports, anchors and seals required by this section is indicated on drawings and/or specified in other Division 22 sections.
- B. Types of supports, anchors, and seals specified in this section include the following:
 - 1. Horizontal-Piping Hangers and Supports.
 - 2. Vertical-Piping Clamps.
 - 3. Hanger-Rod Attachments.
 - 4. Building Attachments.
 - 5. Saddles and Shields.
 - 6. Miscellaneous Materials.
 - 7. Anchors.
- C. Supports, anchors, and seals furnished as part of factory-fabricated equipment, are specified as part of the equipment assembly in other Division 22 sections. Also refer to Drawings for notes regarding the post tension slab system.

1.2 QUALITY ASSURANCE:

- A. Manufacturers: Firms regularly engaged in manufacturer of supports, anchors, and seals, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Select and apply pipe hangers and supports, complying with MSS SP-69. Size hangers and supports to support pipe weight and fluid conveyed.

PART 2 - PRODUCTS

2.1 HORIZONTAL-PIPING HANGERS AND SUPPORTS:

- A. General: Except as otherwise indicated, provide factory fabricated horizontal-piping hangers and supports complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or

shield for insulated piping.

1. Adjustable Steel Clevises: MSS Type 1.
2. Alloy Steel Pipe Clamps: MSS Type 2.
3. Steel Double Bolt Pipe Clamps: MSS Type 3.
4. Steel Pipe Clamps: MSS Type 4.
5. Pipe Hangers: MSS Type 5.
6. Adjustable Swivel Pipe Rings: MSS Type 6.
7. Adjustable Steel Band Hangers: MSS Type 7.
8. Adjustable Band Hangers: MSS Type 9.
9. Extension Split Pipe Clamps: MSS Type 12.
10. Single Pipe Rolls: MSS Type 41.
11. Pipe Roll Stands: MSS Type 44.
12. Adjustable Roller Hangers: MSS Type 43.
13. Pipe Rolls and Plates: MSS Type 45.

2.2 VERTICAL-PIPING CLAMPS:

- A. General: Except as otherwise indicated, provide factory fabricated vertical-piping clamps complying with ANSI/MSS SP-58, of one of the following types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe.
 1. Two-Bolt Riser Clamps: MSS Type 8.
 2. Four-Bolt Riser Clamps: MSS Type 42.

2.3 HANGER-ROD ATTACHMENTS:

- A. General: Except as otherwise indicated, provide factory fabricated hanger-rod attachments complying with ANSI/MSS SP-58. Select size of hanger-rod attachments to suit hanger rods.
 1. Steel Clevises: MSS Type 14.
 2. Swivel Turnbuckles: MSS Type 15.
 3. Steel Weldless Eye Nuts: MSS Type 17.

2.4 BUILDING ATTACHMENTS:

1. General: Except as otherwise indicated, provide factory fabricated building attachments complying with ANSI/MSS SP-58

2.5 SADDLES AND SHIELDS:

1. General: Except as otherwise indicated, provide saddles or shields for piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.
- B. Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.
- C. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.

2.6 MANUFACTURERS OF HANGERS AND SUPPORTS:

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering hangers and supports which may be incorporated in the work include, but are not limited to the following:
 1. Anvil
 2. C & S Mfg. Corp.
 3. Carpenter and Patterson, Inc.
 4. Elcen Metal Products Co.
 5. F & S Central Mfg. Corp.
 6. Fee & Mason Mfg. Co., Div. of A-T-O, Inc.
 7. ITT Grinnel Corp.

PART 3 - EXECUTION

3.1 INSTALLATION OF HANGERS AND SUPPORTS:

- A. General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Install supports with maximum of eight foot spacing. Building attachments and/or hangers systems shall be cast in place into the concrete post tension slab system during concrete placement. Refer to Drawings for additional notes. Do not use wire or perforated metal to support piping, and do not support piping from other piping, ductwork or other supported mechanical or electrical items.
- B. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.
- C. Prevent electrolysis in support of copper tubing by use of hangers and supports which

are copper plated, or by other recognized industry methods.

- D. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes.
- E. Insulated Piping: Comply with the following installation requirements.
- F. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
- G. Saddles: Where insulation without vapor barrier is indicated, install protection saddles.

END OF 220529

220533 - IDENTIFICATION FOR DOMESTIC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

- A. Extent of mechanical identification work required by this sections indicated on drawings and/or specified in other Division 23 sections. Systems which must be identified are as follows:
 - 1. Water Heaters
 - 2. Domestic Hot Water Systems
 - 3. Natural Gas Piping
- B. Type of identification devices specified in this section include the following:
 - 1. Engraved Plastic-Laminate Signs
 - 2. Pipe Identification

1.2 SUBMITTALS

- A. Product Data: Submit product specifications and installation instructions for each identification material and device required.

PART 2 - PRODUCTS

2.1 IDENTIFICATION MATERIALS:

- A. PIPE STENCILING
 - 1. Provide stenciled markers and arrows indicating direction of flow on all piping installed under this Contract after the piping has been painted. Markers and arrows shall be painted on the piping using machine cut stencils. All letters shall be sprayed using fast drying lacquer paint. All markers and arrows shall be properly oriented so that descriptive name may be easily read from the floor.
- B. VALVE TAGS:
 - 1. Provide the following:
 - a. Brass Valve Tags: Provide 19 gauge polished brass valve tags with stamp engraved piping system abbreviation in 1/4" high letters and

sequenced valve numbers ½" high, and with 5/32" hole for fastener.
Provide 1½" diameter tags, except as otherwise indicated.

- b. Valve Tag Fasteners: Manufacturer's standard solid brass chain (wire link or headed type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.

C. ENGRAVED PLASTIC-LAMINATE SIGNS:

- 1. General: Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate. Thickness: 1/16" for units up to 20 sq. in. or 8" length; 1/8" for larger units. Fasteners: Self-tapping stainless steel screws, expect contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

2.2 LETTERING AND GRAPHICS:

- A. General: Coordinate names, abbreviations and other designations used in mechanical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturer's or as required for proper identification and operation/maintenance of mechanical systems and equipment. Lettering in no case shall be less than 1/2" in height.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION:

A. PIPING & VALVING:

- 1. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.
- 2. Locate pipe markers as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums), exterior exposed locations and above removable acoustical ceilings.

- a. Near each valve and control device.
 - b. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.
 - c. Near major equipment items and other points of origination and termination.
 - d. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
- 3. Valve Identification General: Provide valve tag on every valve, cock and control device in each piping system listed under the paragraph entitled "DESCRIPTION OF WORK"; exclude check valves, valves within factory-fabricated equipment units, and shut-off or isolation valves at equipment. List each tagged valve in valve schedule for each piping system.
 - 4. Mount valve schedule frames and schedules in machine rooms where indicated or, if not otherwise indicated, where directed by the Architect/Engineer.
 - 5. Do not use plastic piping markers where located in a return air plenum.

3.2 PIPE PAINTING AND IDENTIFICATION

- A. Piping shall be required to be painted and identified as follows:

- 1. Domestic Hot Water: Black Letters on Yellow or White Background: “ DOM. HOT “
- 2. Natural Gas Piping: Yellow Letters on a Green Background: " N.GAS"

3.3 PLUMBING EQUIPMENT:

- A. Mechanical Equipment Identification, General: Install engraved plastic laminate sign on or near each major item of mechanical equipment and each operational device, as specified herein.
- 1. Water Heaters

END OF 220533

220700 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

- A. Extent of mechanical insulation required by this section is indicated on drawings, and by requirements of this section.
- B. Types of mechanical insulation specified in this section include the following:
 - 1. Piping System Insulation:
 - a. Domestic Cold Water Lines
 - b. Hot Water & Circulating Hot Water Lines
 - c. Lavatory P-Trap and Supplies

1.2 QUALITY ASSURANCE:

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:
 - 1. Armaflex
 - 2. Armstrong World Industries, Inc.
 - 3. Babcock & Wilcox Co., Insulating Products Div.
 - 4. Certainteed Corp.
 - 5. Johns-Manville Corp.
 - 6. Keene Corp.
 - 7. Knauf Fiber Glass
 - 8. Owens-Corning Fiberglass Corp.
- B. 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 E 84 (NFPA 255) method.

1.3 INSULATION SHIELDS

- A. Metal insulation shields are required at all pipe hangers where the piping is insulated. Metal shields shall be constructed of galvanized steel, formed to a 180 degree arc with lengths equal to at least twice the pipe diameter.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's specifications and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, thickness, and furnished accessories for each mechanical system requiring insulation.
- B. Certified Tests: With product data submit certified test reports on performances including burning characteristics and thermal insulating values.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard ratings of products.
- B. Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged insulation; remove damaged insulation from project site.

PART 2 - PRODUCTS

2.1 PIPING INSULATION: Piping Insulation:

- A. All hot water, and domestic water piping shall be insulated. The insulation shall be a heavy density, pipe insulation with a K factor .22 at 75°F mean temperature. The insulation shall be wrapped with a vapor barrier jacket with self-sealing lap, equal to Certain-teed, Mansville, Owens-Corning. Cover fittings with Zeston or equal premolded insulating fittings. Insulation shall be installed in a professional, neat appearing manner; poor workmanship shall be corrected at the Contractor's expense.
- B. Application thicknesses shall be as follows:

Domestic hot and recirc. hot water piping:	1" thick
Domestic cold water piping:	1/2" thick
- C. Lavatory P-traps and supplies shall be insulated with 1/2" premolded fiberglass "Trap-wrap" with integral plastic white jacket.

PART 3 - EXECUTION

3.1 INSTALLATION OF INSULATION:

- A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.

- B. Install insulation materials with smooth and even surface. Insulate each continuous run of piping or ductwork with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other.
- C. Clean and dry all surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- D. 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.
- E. Maintain integrity of vapor-barrier jackets on pipe insulation, and protect to prevent puncture or other damage.
- F. Extend piping insulating without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.
- G. Install protective metal shields and insulated inserts wherever needed to prevent compression of insulation. Pipe Hanger Insulation Inserts: Butt pipe insulation against pipe hanger insulation inserts. For cold piping apply wet coat of vapor barrier lap cement on butt joints and seal joints with 3 inch wide vapor barrier tape or band.

3.2 PROTECTION AND REPLACEMENT:

- A. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
- B. Protection: Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF 220700

221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

- A. Extent of domestic water piping required by this section is indicated on drawings and/or specified in other Division 22 sections or as required to provide a complete system.

1.2 QUALITY ASSURANCE:

- A. Plumbing Code Compliance: Comply with Kentucky State Plumbing Code and pertaining to plumbing materials, construction and installation of products. Also comply with all state and local codes having jurisdiction. No work shall begin until the Contractor has approved plumbing plans. The Contractor is responsible for installing the indicated systems in accordance with code, therefore any modifications to the project required by the Division of Plumbing shall be considered as part of this project and shall be made at no increase in contract price.

1.3 DELIVERY STORAGE, AND HANDLING:

- A. Where possible, store pipe and tube inside and protected from weather. Where necessary to store outside, elevate above grade and enclose with durable, waterproof wrapping. Maintain end-caps through shipping, storage and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube.
- B. Protect flange and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

1.4 SUBMITTALS:

- A. Product Data: Submit catalog cuts, specifications, installation instructions, and dimensioned drawings for each type of valve, specialty, etc. Include pressure drop curve or chart for each type and size of equipment.

PART 2 - PRODUCTS

2.1 PLUMBING PIPING MATERIALS:

- A. All piping for hot and cold water above the slab, within the building, shall be type "L" hard temper copper tube with wrought copper fittings and soldered connections made up with lead free solder equal in performance to 95/5 solder.
- B. All piping for cold water below the slab shall be type "K" hard temper copper tube with

wrought copper fittings and soldered connections made up with lead free solder equal in performance to 95/5 solder.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION;

- A. Pipe shall be accurately cut from job measurements and shall be neatly aligned, securely connected, and properly supported. Piping shall be thoroughly cleaned before installation. Provide pipe sleeves where piping passes through structure. Threaded and soldered joints shall be made in a workmanlike manner according to good pipe fitting practices.
- B. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold piping 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 piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1.0" clearance outside insulation. Wherever possible in finished and occupied spaces, conceal piping from view, by locating in column enclosures, in hollow wall construction or above suspended ceilings; do not encase horizontal runs in solid partitions, except as indicated.
- C. Electrical Equipment Spaces: Do not run piping through transformer vaults, over panels and other electrical or electronic equipment spaces and enclosures.
- D. Braze copper tube-and-fitting joints where indicated, in accordance with ANSI B31.
- E. Solder copper tube-and-fitting joints where indicated, in accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.
- F. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary. Install shut-off valves for each piece of plumbing equipment.
- G. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward for horizontal plane unless unavoidable. Install valve drains with hose end adapter for each valve that must be installed with stem below horizontal

plane.

- H. Ferrous pipe hangers shall be Fee & Mason Figure 215 or equal Unistrut malleable iron split ring hanger; copper pipe hangers shall be Figure 361 cast brass with plated adjuster. No perforated strap iron hangers will be permitted. Fee & Mason #400 "Auto-Grip" type hangers are an acceptable alternative hanger. Concrete inserts, where required, shall be Unistrut, Midwest, or Truscon. Hangers shall be spaced at ten foot intervals or less, as required to avoid sag, prevent vibration, and allow accurate leveling or grading. Vertical piping shall be supported by Fee & Mason Figure 241 or equal clamp for ferrous piping, and Figure 368 for copper. Provide sheet metal saddles for insulated piping.
- I. Do not use wire or perforated metal to support piping, and do not support piping from other piping, ductwork or other supported mechanical or electrical items. Install hangers and supports to provide indicated pipe slopes.

3.2 AIR CHAMBERS AND TRAPS:

- A. Wherever water piping terminates at a fixture or valve, furnish and install air chambers of sufficient capacity to prevent water hammer. Length shall be at least 12 times branch pipe diameter. Every fixture shall be separately trapped with a water sealed trap installed as close to the fixture as possible.

3.3 PIPING STERILIZATION:

- A. Sterilize the new hot and cold water piping system with solution containing not less than 50 PPM available chlorine. Solution shall remain in the system a minimum of 24 hours, with each valve being operated several times during the period. After completion, flush system with city water until chlorine residual is lowered to incoming city water level.

3.4 TESTING:

- A. All water piping shall be tested with 50 PSI hydrostatic pressure; isolate piping from boiler prior to testing. All piping shall be tested before any insulation installed, and shall be subject to the above pressure for an uninterrupted period of not less than 4 hours. All lines, joints, flanges, valve stems, etc., shall be leak tight.
- B. General: Provide temporary equipment for testing, including pump and gages. Test piping system before insulation is installed. Remove control devices before testing.
- C. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.
- D. Repair piping systems sections which fail required piping test, by disassembly and re-installation, using new materials to extent required to overcome leakage. Do not use

chemicals, stop-leak compounds, mastics, or other temporary repair methods.

END OF 221116

221119 -: DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

- A. Extent of piping specialties required by this section is indicated on drawings and/or specified in other Division 22 sections or as required to provide a complete system.
- B. Types of piping specialties specified in this section include the following:
 - 1. Wall Hydrants
 - 2. Pipe Escutcheons
 - 3. Pipeline Strainers.
 - 4. Dielectric Unions.
 - 5. Sleeves.

1.2 QUALITY ASSURANCE:

- A. Plumbing Code Compliance: Comply with Kentucky State Plumbing Code and pertaining to plumbing materials, construction and installation of products. Also comply with all state and local codes having jurisdiction. No work shall begin until the Contractor has approved plumbing plans. The Contractor is responsible for installing the indicated systems in accordance with code, therefore any modifications to the project required by the Division of Plumbing shall be considered as part of this project and shall be made at no increase in contract price.
- B. Manufacturers: Firms regularly engaged in manufacturer of piping specialties of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.3 SUBMITTALS:

- A. Product Data: Submit catalog cuts, specifications, installation instructions, Also submit dimensioned drawings for pipeline strainers. Include pressure drop curve or chart for each type and size of pipeline strainer. Submit schedule showing manufacturer's figure number, size, location and features for each required pipeline strainer.
- B. Maintenance Data: Submit maintenance data and spare parts lists for each type of pipeline strainer. Include this data in Maintenance Manual.

PART 2 - PRODUCTS

2.1 MANUFACTURED PIPING SPECIALTIES:

- A. General: Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types, pressure ratings, voltage and wattage indicated for each service, or if not indicated, provide proper selections as determined by Engineer to comply with installation requirements. Provide sizes as indicated, and connections, which properly interface with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.
- B. Hose Valves: American-Standard #4224.028 with screw-on vacuum breaker and 3/4" hose thread outlet.
- C. Wall Hydrants: Wall hydrants shall be Jay R. Smith #5609-PB "non-freeze", cast bronze, polished bronze face, with integral vacuum breaker, 3/4" hose connection, removable key handle operator; or equal Josam, Wade, or Zurn. Provide accessible stop valve inside building.
- D. 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.
 - 1. Pipe Escutcheons for Moist and Wet 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.
 - 2. Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.
- E. Low Pressure Y-Type Pipeline Strainers, General: Comply with FCI 73-1. 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" performance at 233 per sq. in.
 - 1. Threaded Ends, 2" and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.
 - 2. Threaded Ends, 2½" and Larger: Cast-iron body, bolted screen retainer with off-

center blowdown fitted with pipe plug.

3. Flanged Ends, 2½" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
 4. Available Manufacturers: Subject to compliance with requirements, manufacturers offering low pressure Y-type strainers which may be incorporated in the work include, but are not limited to the following:
 - a. American Air Filter, an Allis-Chalmers Co.
 - b. Armstrong Machine Works.
 - c. Hoffman Specialty, ITT Fluid Handling Div.
 - d. Metraflex Co.
 - e. Sarco Co., Div. of White Consolidated.
 - f. Crane Co.
 - g. Trerice (H.O.) Co.
 - h. Victaulic Co. of America
- F. 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. Universal Controls or equal
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering dielectric unions which may be incorporated in the work include, but are not limited to the following:
 - a. Atlas Products Co.
 - b. Capital Mfg. Co., Div. of Harsco Corp.
 - c. Eclipse, Inc.
 - d. Epco Sales, Inc.
 - e. FMC Corp.
 - f. McNally, Inc.
 - g. PSI Industries.
 - h. Stockham Valves and Fittings.
 - i. Universal Controls

2.2 FABRICATED PIPING SPECIALTIES:

- A. Pipe Sleeves: Provide pipe sleeves of one of the following:
1. 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.

- a. Steel-Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
- b. Iron-Pipe: Fabricate from cast-iron or ductile-iron pipe, remove burrs.

PART 3 - EXECUTION

3.1 INSTALLATION OF MANUFACTURED PIPING SPECIALTIES:

- A. 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
- B. Wall Hydrants: Install as indicated on the Drawings in accordance with manufacturer's recommendations.
- C. Dielectric Unions: Install at each piping joint between ferrous and non-ferrous piping. Comply with manufacturer's installation instructions.
- D. Y-Type Strainers: Install Y-type strainers, full size of pipe line, in accordance with manufacturer's installation instructions. Install pipe nipple and shutoff valve in strainer blow down connection, full size of connection. Where indicated, provide drain line from shutoff valve to plumbing drain, full size of blow down connection.
- E. Locate Y-type strainers in supply line ahead of the following equipment, and elsewhere as indicated, if integral strainer is not included in equipment, or if suction diffuser is not indicated.

3.2 INSTALLATION OF FABRICATED PIPING SPECIALTIES:

- A. Sleeves: Install pipe sleeves of type 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.
 - 1. Install sheet-metal sleeves at interior partitions and ceilings other than suspended

ceilings.

2. Install iron-pipe sleeves at exterior penetrations, both above and below grade.
3. Install steel-pipe or plastic-pipe sleeves except as otherwise indicated.

3.3 SPARE PARTS:

- A. Furnish to Owner, with receipt, one valve key for each key operated hydrant, bibb, or faucet installed.

END OF 221119

221123 - NATURAL GAS PIPING SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

- A. Extent of domestic water piping required by this section is indicated on drawings and/or specified in other Division 22 sections or as required to provide a complete system.

1.2 QUALITY ASSURANCE:

- A. Plumbing Code Compliance: Comply with Kentucky State Plumbing Code and pertaining to plumbing materials, construction and installation of products. Also comply with all state and local codes having jurisdiction. No work shall begin until the Contractor has approved plumbing plans. The Contractor is responsible for installing the indicated systems in accordance with code, therefore any modifications to the project required by the Division of Plumbing shall be considered as part of this project and shall be made at no increase in contract price.

1.3 DELIVERY STORAGE, AND HANDLING:

- A. Where possible, store pipe and tube inside and protected from weather. Where necessary to store outside, elevate above grade and enclose with durable, waterproof wrapping. Maintain end-caps through shipping, storage and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube.
- B. Protect flange and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

1.4 SUBMITTALS:

- A. Product Data: Submit catalog cuts, specifications, installation instructions, and dimensioned drawings for each type of valve, specialty, etc. Include pressure drop curve or chart for each type and size of equipment.

PART 2 - PRODUCTS

2.1 BASIC IDENTIFICATION:

- A. Building Distribution Piping: Plastic pipe markers.
- B. Gas Valves: Brass valve tags.

2.2 BASIC PIPE, TUBE AND FITTINGS:

- A. Exterior Gas Piping:

1. All Pipe Sizes: Galvanized steel pipe, Schedule 40 with Wrought-steel, threaded fittings.

B. Underground Exterior Gas Service Piping:

1. Pipe Sizes ½" Through 4": Thermoplastic gas pressure pipe, tubing, and fittings complying with ANSI/ASTM D 2513. All joining methods shall be as approved by the International Mechanical Code and Kentucky State Code Revisions. All underground thermoplastic pipe shall be provided with No. 18 AWG copper tracer wire with yellow insulation.

C. Building Distribution Piping:

1. Pipe Size 2" and Smaller: Black steel pipe, Pipe Weight: Schedule 40 with Malleable iron threaded fittings.
2. Pipe Size 2½" and Larger: Black steel pipe, Schedule 40 with Wrought-steel butt welded fittings.

2.3 SPECIAL VALVES

- A. Gas Cocks 2" and Smaller: 150 PSI non-shock WOG, bronze straightway cock, flat or square head, threaded ends.
- B. Gas Cocks 2½" and Larger: 125 PSI non-shock WOG, iron body bronze mounted, straightway cock, square head, flanged ends.

PART 3 - EXECUTION

3.1 INSTALLATION OF NATURAL GAS PIPING:

- A. 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.
- B. Remove cutting and threaded burrs before assembling piping.
- C. Do not install defective piping or fittings. Do not use pipe with threads which are chipped, stripped or damaged.
- D. Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping, or equipment connection are completed.
- E. Ground gas piping electrically and continuously within project, and bond tightly to grounding connection.

3.2 Install drip-legs in gas piping where indicated, and where required by code or regulation.

A. Install "Tee" fitting with bottom outlet plugged or capped, at bottom of pipe risers.

B. Use dielectric unions where dissimilar metals are joined together.

C. Install piping with 1" drop in 60' pipe run (0.14%) in direction of floor.

3.3 EQUIPMENT CONNECTIONS:

A. General: Connect gas piping to each gas-fired equipment item, with drip leg and shutoff gas cock. Comply with equipment manufacturer's instructions.

3.4 PIPING TESTS:

A. Test natural gas piping in accordance with ANSI B31.2, and local utility requirements.

END OF 221123

221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

- A. Extent of sanitary waste and vent piping required by this section is indicated on drawings and/or specified in other Division 22 sections or as required to provide a complete system.

1.2 QUALITY ASSURANCE:

- A. Plumbing Code Compliance: Comply with applicable portions of Kentucky State Plumbing Code and pertaining to plumbing materials, construction and installation of products. Also comply with all state and local codes having jurisdiction. No work shall begin until the Contractor has approved plumbing plans. The Contractor is responsible for installing the indicated systems in accordance with code, therefore any modifications to the project required by the Division of Plumbing shall be considered as part of this project and shall be made at no increase in contract price.

PART 2 - PRODUCTS

2.1 PLUMBING PIPING MATERIALS:

- A. Soil and waste: Piping materials to be as below for the indicated areas.
 - 1. Soil and waste piping may be Schedule 40 PVC and pipe fittings, or hub service weight cast iron with sealed fittings.
- B. Plumbing Vents: All vent piping to cast iron no-hub or DWV copper where located above lay-in ceilings in the return air plenum. Vent piping concealed in walls may be Schedule 40 PVC and pipe fittings, or cast iron no hub; however piping must transition once it exits the wall cavity to non-PVC material.
- C. Condensate Waste: Condensate waste piping may be Schedule 40 PVC, unless piping must travel through a return air plenum, in which it should be Type M copper.

2.2 CLEANOUTS

- A. All **floor cleanouts** shall be Jay R. Smith #4051 series, coated cast iron, with square Nikaloy top, hub outlet with gasket, of sizes required. It shall be the responsibility of this contractor to determine the type of floor covering to be used at each cleanout location, and to rough-in and install each cleanout flush with the finished floor construction.

- B. All **wall cleanouts** shall be Jay R. Smith #4472 series, with round stainless steel access cover, center screw and recessed bronze tapped plug, of sizes required.
- C. All **cleanouts for installation exterior to the building** where required by the drawings or code, shall be Jay R. Smith #4237-U, full size of line, cast iron, hub outlet, heavy duty round cast iron tractor cover with vandal proof screw.
- D. Approved equivalent Josam, Zurn, or Wade is acceptable.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION;

- A. Pipe shall be accurately cut from job measurements and shall be neatly aligned, securely connected, and properly supported. Piping shall be thoroughly cleaned before installation. Joints shall be made in a workmanlike manner according to good pipe fitting practices.
- B. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Locate runs as shown or described by diagrams, details and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct usable space or block access for servicing building and its equipment.
- C. Do not use wire or perforated metal to support piping, and do not support piping from other piping, ductwork or other supported mechanical or electrical items. Install hangers and supports to provide indicated pipe slopes.

3.2 CLEANOUTS:

- A. Cleanouts shall be installed at points as noted on the drawings, as well as at the foot of each soil, waste or interior downspout stack, minimum every 80 feet in horizontal soil and waste lines, and at other points as required for easy system maintenance. Cleanouts shall be full size of the pipe up to 4", and 4" size for pipe above 4" size. Grease all cleanout plugs.
- B. Cleanouts and/or test tees concealed in inaccessible pipe spaces, walls and other locations shall have an eight (8) inch by eight (8) inch (minimum) access panel or cover plates shall be set flush with finished floors and walls and shall be key or screw driver operable.
- C. Access panels for cleanouts shall be of the Zurn, 1460 series or equivalent by Josam or Wade. Where they are not to receive paint, they shall be polished bronze unless otherwise indicated where they are to receive paint or other finishes. They may, at the Contractor's

option, be Perma-Coated steel, prepared to receive finish.

- D. Cleanouts and access panels shall be sized so as to permit the entry of a full sized rodding head capable of one hundred percent circumferential coverage of the line served.
- E. Provide a non-hardening mixture of graphite and grease on threads of all screwed cleanouts during installation.
- F. Do not install cleanouts against walls, partitions, etc. where rodding will be difficult or impossible. Extend past the obstruction. Hold a minimum of 12" from all walls.
- G. In finished walls, floors, etc., insure that cleanouts are installed flush with finished surfaces and, where required, grout or otherwise finish in a neat and workmanlike manner.

3.3 FLOOR DRAINS

- A. Provide floor drains at locations indicated and/or as required by Kentucky Building Code. Install in a neat and workmanlike manner. Coordinate locations with appropriate persons or party to insure floor pitch to drain where required.
- B. Each floor drain located on floors above the lowest floor shall to provided complete with flashing and clamping collar.
- C. Ensure by coordination with the appropriate persons or party that spaces served by a floor drain(s) has a water seal extending at least three (3) inches from the floor of the space served on all floors above the lowest level.
- D. The floor drains shall be Zurn, Josam, Wade, Ancon or equivalent, as specified on the Drawings.

3.4 TESTING:

- A. All waste piping shall be tested with all stacks filled with water, and any other tests required by the Plumbing Inspector. All lines, joints, flanges, etc., shall be leak tight.
- B. Repair piping systems sections which fail required piping test, by disassembly and re-installation, using new materials to extent required to overcome leakage.
- C. Drain test water from piping systems after testing and repair work has been completed.

END OF 221316

SECTION 223300 - ELECTRIC WATER HEATERS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

- A. Extent of water heater work required by this section is indicated on drawings and schedules, and by requirements of this section.

1.2 QUALITY ASSURANCE:

- A. Manufacturers: Firms regularly engaged in manufacturer of electric water heaters, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. ASME Compliance: Construct water heaters in accordance with American Society of Mechanical Engineers (ASME) Pressure Vessel Codes, where such requirements is indicated.
- C. UL Labels: Provide electrical water heaters which have been listed and labeled by Underwriters Laboratories (UL).

1.3 PRODUCT DELIVERY, STORAGE, AND HANDLING:

- A. Handle water heaters carefully to prevent damage, breaking, and scoring. Store heaters and equipment in clean dry place. Protect from weather, dirt, fumes, water, construction debris and physical damage.

PART 2 - PRODUCTS

2.1 DOMESTIC WATER HEATERS

- A. Provide domestic electric water heaters as scheduled on the drawings.
- B. Water heaters shall meet ASHRAE 90.1 and 90.1b energy efficiency standards.
- C. Water heaters shall be provided with durable glass lining, with insulated water heater jacket. Integral thermostats shall be provided.
- D. Tanks shall be provided with three (3) year minimum warranty.

END OF SECTION 223400

224000 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

- A. Extent of plumbing fixture work required by this section is indicated on drawings and schedules, and by requirements of this section.

1.2 SUBMITTALS:

- A. Product Data: Submit manufacturer's specifications for plumbing fixtures, equipment 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.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES:

- A. General: Provide factory-fabricated fixtures of type, style and material indicated. For each type fixture, provide fixture manufacturer's standard trim 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 type is not otherwise indicated, provide fixtures complying with governing regulations.
- B. Fixtures shall be set firm and true, connected to all required piping services ready to use; all fixtures shall be left clean.

2.2 PLUMBING FITTINGS, TRIM AND ACCESSORIES:

- A. 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 shutdown of water supply piping systems.
- B. P-Traps: Include adjustable and removable P-traps where drains are indicated for direct connection to drainage system.
- C. Vacuum Breakers: Provide with flush valves where required by governing regulations, including locations where water outlets are equipped for hose attachment.

- D. Carriers: Provide carriers indicated, or if not indicated, provide cast-iron supports for fixtures of either graphite gray iron, ductile iron, or malleable iron as required.
- E. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.
- F. Escutcheons: Where fixture supplies and drains penetrate walls in exposed locations, provide chrome plated cast-brass escutcheons with set screw.
- G. All faucets, stops and fittings must be of one manufacturer with interchangeable parts, unless otherwise specified.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION:

- A. 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.
- B. 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 Kentucky State and local codes pertaining to installation of plumbing fixtures.
- C. 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.

3.2 CLEAN AND PROTECT:

- A. Clean plumbing fixtures of dirt and debris upon completion of installation.
- B. Protect installed fixtures from damage during the remainder of the construction period.

3.3 FIELD QUALITY CONTROL:

- A. 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.

END OF 224000

230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS:

- A. All requirements under Division One and the General and Supplementary Conditions of these specifications shall be a part of this section. Each contractor shall be responsible to thoroughly familiarize himself with all its contents as to requirements which affect this division or section. The work required under this section includes all material, equipment, appliances, transportation, services, and labor required to complete the entire system as required by the drawings and specifications.

1.2 SCOPE

- A. The work included in this division consists of the furnishing of all labor, equipment, transportation, supplies, material, appurtenances and services necessary for the satisfactory installation of the complete and operating Mechanical System(s)/Equipment indicated or specified in the Contract Documents.
- B. Any materials, labor, equipment or services not mentioned specifically herein which may be necessary to complete or perfect any part of the Mechanical Systems in a substantial manner, in compliance with the requirements stated, implied or intended in the drawings and, or specifications, shall be included as part of this Contract.
- C. It is the intent of this Contract to deliver to the Owners a "like new" project once work is complete. Although plans and specifications are complete to the extent possible, it shall be the responsibility of the Contractors involved to coordinate all new systems with items of construction provided by others, and to relocate items which interfere with new equipment or materials required for the complete installation without additional cost to the Owner.

1.3 DEFINITIONS AND ABBREVIATIONS

- A. Contractor - Any Contractor whether proposing or working independently or under the supervision of a General Contractor and, or Construction Manager and who installs any type of mechanical work (Controls, Plumbing, HVAC, Boiler Work, Sprinkler, Air Systems, etc.) or, the General Contractor.
- B. Engineer - The Consulting Mechanical-Electrical Engineers either consulting to the Owners, Architect, other Engineers, etc.

- C. Architect - The Architect of Record for the project.
 - D. Furnish - Deliver to the site in good condition and turn over to the Contractor who is to install.
 - E. Provide - Furnish and install complete, tested and ready for operation.
 - F. Indicated - Shown on the Drawings or Addenda thereto.
 - G. Typical - Where indicated repeat this work, method or means each time the same or similar condition occurs whether indicated or not.
 - H. OSHA - Office of Safety and Health Administration.
 - I. NEC - National Electrical Code.
 - J. NFPA - National Fire Protection Association.
 - K. AGA - American Gas Association
 - L. ASME - American Society of Mechanical Engineers.
 - M. ANSI - American National Standards Institute.
 - N. ASHRAE - American Society of Heating, Refrigeration and Air Conditioning Engineers.
 - O. NEMA - National Electrical Manufacturers Association.
 - P. UL - Underwriters Laboratories.
- 1.4 INSPECTION OF THE SITE:
- A. The contractor shall personally inspect the site of the proposed work and inform himself fully as to the conditions under which the work is to be done. Failure to do so will not be considered sufficient justification to request or obtain extra compensation over and above the contract price.
- 1.5 MATERIAL AND WORKMANSHIP:
- A. All material and apparatus shall be new and in first class condition. All workmanship shall be of the finest possible by experienced mechanics. All installations shall be made in a manner that will comply with applicable Codes and laws. Any abnormal noise caused by

rattling equipment, piping, ducts, air devices, and squeaks in rotating components will not be acceptable. In general, all materials and equipment shall be of commercial specification grade in quality.

1.6 DRAWINGS AND SPECIFICATIONS

- A. The drawings are diagrammatic only and indicate the general arrangement of the systems and are to be followed. If deviations from the layouts are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Engineer for approval before proceeding with the work. The drawings are not intended to show every item which may be necessary to complete the systems. All proposers shall anticipate that additional items may be required and submit their bid accordingly.
- B. Each Contractor shall make all his own measurements in the field and shall be responsible for correct fitting. He shall coordinate this work with all other branches of work in such a manner as to cause a minimum of conflict or delay.
- C. The Engineer shall reserve the right to make adjustments in location of piping, ductwork, equipment, etc. where such adjustments are in the interest of improving the project.
- D. Unless dimensioned, the mechanical drawings only indicate approximate locations of equipment, piping, ductwork, etc.. Dimensions given in figures on the drawings shall take precedence over scaled dimensions and all dimensions, whether given in figures or scaled, shall be verified in the field to insure no conflict with other work.

1.7 COORDINATION:

- A. Coordinate all work with that of other trades so that the various components of the systems will be installed at the proper time, will fit the available space, and will allow proper service access to those items requiring maintenance. Any components which are installed without regard to the above shall be relocated at no additional cost to the owner.
- B. It is the Contractor's responsibility to provide materials with trim which will fit properly the types of ceiling, wall, or floor finishes actually installed. Model numbers in specifications or shown on drawings are not intended to designate the required trim.

1.8 ORDINANCES AND CODES:

- A. Comply with National Fire Protection Association codes, Kentucky Building Code, International Mechanical Code, and/or all other applicable codes and ordinances. Obtain and pay for all permits. Contractor shall be held responsible for any violation of the law.

- B. The Contractor shall give all necessary notices, obtain and pay for all permits, government sales taxes, fees, inspections and other costs, in connection with his work. He shall also file all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having any jurisdiction, whether indicated or specified or not.
- C. The contractor shall also obtain all required certificates of inspection for his work and deliver same to the Engineers before request for acceptance and final payment for the work. Contractor shall submit all required documents to obtain boiler permit and inspection.
- D. Contractor shall be responsible for submitting plans and obtaining boiler permit for boiler system and all hot water piping.

1.9 PROTECTION OF EQUIPMENT:

- A. Adequately protect equipment from damage after delivery to job. Cover with heavy polyethylene plastic as required to protect from plaster, dirt, paint, water, or physical damage. Equipment which has been damaged by construction activities will be rejected, and contractor is obligated to furnish new equipment of a like kind.
- B. Keep premises broom clean at all times from foreign material created under this contract. All piping, equipment, etc. shall have a neat and clean appearance at the termination of the work.

1.10 EQUIPMENT AND MATERIALS SUBSTITUTIONS OR DEVIATIONS

- A. When any Contractor requests approval of materials and/or equipment of different physical size, capacity, function, color, access, it shall be understood that such substitution, if approved, will be made without additional cost to anyone other than the Contractor requesting the change regardless of changes in connections, space requirements, electrical characteristics, etc. from that indicated, electrical service, etc.. In all cases where substitutions affect other trades, the Contractor requesting such substitutions shall advise all such Contractors of the change and shall renumerate them for all necessary changes in their work.
- B. NOTE: Any drawings, Specifications, Diagrams, etc., required to describe and coordinate such substitutions or deviations shall be professionally prepared at the responsible Contractor's expense. Review of Shop Drawings by the Engineers does not in any way absolve the Contractor of this responsibility.

- C. Notwithstanding any reference in the specifications to any article, device, product, material, fixture, form, or type of construction by name, make or catalog number, such reference shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; any devices, products, materials, fixtures, forms, or types of construction which, in the judgment of the Engineer, are equivalent to those specified are acceptable, provided the provisions of the paragraph immediately preceding are met. Requested substitutions shall be submitted to the Engineer a minimum of five days prior to bids.

1.11 SUPERVISION OF WORK

- A. Each Contractor shall personally supervise the work for which he is responsible or have a competent superintendent, approved by the Engineers, on the work at all times during progress with full authority to act for him.

1.12 SHOP DRAWINGS:

- A. Submit for approval eight sets of manufacturers shop drawings of all major items of equipment and all items requiring coordination between contractors. Before submitting shop drawings and material lists, the contractor shall verify that all equipment submitted is mutually compatible and suitable for the intended use, and shall fit the available space and allow ample room for maintenance. The Engineer's checking and subsequent approval of such shop drawings shall not relieve the contractor from responsibility for errors in dimensions, details, size of members, or quantities; or omissions of components or fittings; or for coordinating items with actual building conditions. Provide any needed wiring diagrams.
- B. Catalog data must have the item or model number clearly marked and all accessories indicated. Mark out all inapplicable items.
- C. **NOTE: Any shop drawings received without being reviewed and stamped by the Contractor shall be returned Rejected without review.**

1.13 OPERATION AND MAINTENANCE INSTRUCTIONS:

- A. Submit to the architect four (4) copies each of material for maintenance and operation instruction manuals, appropriately bound into manual form including approved copies of the following, revised if necessary to show system and equipment as actually installed:
 - a) Manufacturers Catalog Sheets
 - b) Wiring Diagrams
 - c) Maintenance Instructions

- d) Recommended Maintenance Schedules and Timelines
- e) Operating Instructions
- f) Parts Lists
- g) Preventative Maintenance Recommendations

- B. All maintenance schedules and recommendations shall be developed in full coordination with the Engineer. All binders shall be as per the applicable Division I General Specifications, unless such specifications are not included or are not as stringent as the below requirements.

1.14 GUARANTEE:

- A. Each Contractor shall guarantee all equipment, apparatus, materials, and workmanship entering into this Contract to the best of its respective kind and shall replace all parts at his own expense, which are proven defective for a duration as indicated in the Division I General Conditions and Specifications.
- B. Where such duration is not identified, then guarantee shall be for one year from final acceptance of the work by the Engineer/Architect. The effective date of completion of the work shall be the date of the Engineer's (Architect's) Statement of Substantial Completion. Items of equipment which have longer guarantees, as called for in these specifications, shall have warranties and guarantees completed in order, and shall be in effect at the time of final acceptance of the work by the Engineer. The Contractor shall present the Engineer with such warranties and guarantees at the time of final acceptance of the work. The Engineer shall then submit these warranties, etc. to the Owner. Refer to other sections for any special or extra warranty requirements.

1.15 RECORD DRAWINGS

- A. Each Contractor shall insure that any deviations from the Design are as they occur recorded in red, erasable pencil on record drawings kept at the jobsite. The Engineer may review the record documents from time to time to insure compliance with this specification. Compliance shall be a contingency of final payment. Pay particular attention to Deviations in the Control Systems. Keep information in a set of drawings set aside at the job site especially for this purpose and deliver to the Engineers the originals and three (3) copies of the record drawings upon completion of the work. Delivery of these documents will be contingent of final payment.

1.16 QUALIFICATIONS OF WORKMEN

- A. All mechanical work shall be accomplished by qualified workmen competent in the area of work for which they are responsible. Mechanical contractors shall be licensed as required

by Kentucky State Law.

- B. All sheet metal, insulation and pipe fitting work shall be installed by workmen normally engaged or employed in these respective trades.
- C. All electrical work shall be installed only by competent workmen under direct supervision of a fully qualified Electrician.

1.17 CONDUCT OF WORKMEN

- A. Each Contractor shall be responsible for the conduct of all workmen under his supervision. Misconduct on the part of any workman to the extent of creating a safety hazard, or endangering the lives and property of others, shall result in the prompt relief of that workman. The consumption of alcoholic beverages or other intoxicants, narcotics, barbiturates, hallucinogens or debilitating drugs on the job site is strictly forbidden.

1.18 ROUGH-IN:

- A. Coordinate without delay all roughing-in with general construction. All piping, conduit, rough-in shall be concealed except in unfinished areas and where otherwise shown.

1.19 CUTTING AND PATCHING:

- A. This contractor shall do all cutting of walls, floors, ceilings, etc. as required to install work under this section. Contractor shall obtain permission of the Architect before doing any cutting. All holes shall be cut as small as possible. Contractor shall patch walls, floors, etc. as required by work under this section. All patching shall be thoroughly first class and shall match the original material and construction.

1.20 ACCESSIBILITY

- A. The Contractor shall locate and install all equipment so that it may be serviced, and maintained as recommended by the manufacturer. Allow ready access and removal of the entire unit and/or parts such as valves, filters, fan belts, motors, prime shafts, etc.

1.21 ELECTRICAL WIRING:

- A. All power conduit and wiring shall be furnished by the electrical contractor. All control and interlock conduit and wiring for mechanical systems is the responsibility of the Mechanical Contractor; however he may choose to hire an electrician to perform this work. All wiring shall be in conduit and in accordance with the National Electric Code.

1.22 REQUIRED CERTIFICATIONS

- A. Upon completion of the project, the Contractor shall deliver all inspection certificates acquired during the course of the project to the Owner for their records.
- B. The Contractor shall upon completion of the Final Punch list, deliver to Architect and Engineer a written certification that all systems and work has been completed in compliance with the plans and specifications. The Contractor also shall deliver over to the Owner all required maintenance manuals and phone numbers of the equipment suppliers. The delivery of these documents and certifications will be required prior to final payment and release of retainage.

1.23 INDEMNIFICATION

- A. The Contractor(s) shall hold harmless and indemnify the Engineer, employees, officers, agents and consultants from all claims, loss, damage, actions, causes of actions, expense and/or liability resulting from, brought for, or on account of any personal injury or property damage received or sustained by any person, persons, (including third parties), or any property growing out of, occurring, or attributable to any work performed under or related to this contract, resulting in whole or in part from the negligence of the Contractor, any subcontractor, any employee, agent or representative.

PART 2 - PRODUCTS

NONE

PART 3 - EXECUTION

NONE

END OF 230500

230533 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

- A. Extent of mechanical identification work required by this sections indicated on drawings and/or specified in other Division 15 sections. Systems which must be identified are as follows:

- 1. Rooftop Units
- 2. Exhaust Fans

- B. Type of identification devices specified in this section include the following:

- 1. Engraved Plastic-Laminate Signs

1.2 SUBMITTALS

- A. Product Data: Submit product specifications and installation instructions for each identification material and device required.

PART 2 - PRODUCTS

2.1 MECHANICAL IDENTIFICATION MATERIALS:

- A. ENGRAVED PLASTIC-LAMINATE SIGNS:

- 1. General: Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate. Thickness: 1/16" for units up to 20 sq. in. or 8" length; 1/8" for larger units. Fasteners: Self-tapping stainless steel screws, expect contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

2.2 LETTERING AND GRAPHICS:

- A. General: Coordinate names, abbreviations and other designations used in mechanical identification work, with corresponding designations shown, specified or scheduled.

Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturer's or as required for proper identification and operation/maintenance of mechanical systems and equipment. Lettering in no case shall be less than 1/2" in height.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION:

- A. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.2 MECHANICAL EQUIPMENT:

- A. Mechanical Equipment Identification, General: Install engraved plastic laminate sign on or near each major item of mechanical equipment and each operational device, as specified herein.

END OF 220533

230548 - VIBRATION AND SOUND CONTROLS FOR PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

- A. Extent of vibration isolation work required by this section is indicated on drawings and schedules, and/or specified in other Division 15 sections.
- B. Types of vibration isolation products specified in this section include the following:
 - 1. Flexible Duct Connectors.
- C. Vibration isolation products furnished as part of factory-fabricated equipment, are specified as part of the equipment assembly in other Division 23 sections.

1.2 QUALITY ASSURANCE:

- A. Product Qualification: Provide each type of vibration isolation unit produced by specialized manufacturer, with not less than 5 years' successful experience in production of units similar to those required for project.

1.3 QUALITY ASSURANCE:

- A. Product Qualification: Provide each type of vibration isolation unit produced by specialized manufacturer, with not less than 5 years' successful experience in production of units similar to those required for project.

PART 2 - PRODUCTS

2.1 ISOLATION MATERIALS AND SUPPORT UNITS:

- A. Fiberglass Pads and Shapes: Glass fiber of not more than 0.18 mil diameter, produced by multiple-flame attenuation process, molded with manufacturer's standard fillers and binders through 10 compression cycles at 3 times rated load bearing capacity, to achieve natural frequency of not more than 12 Hertz, in thickness and shapes required for use in vibration isolation units.
- B. Neoprene Pads: Oil-resistant neoprene sheets, of manufacturer's standard hardness and cross-ribbed pattern, designed for neoprene-in-shear-type vibration isolation, and in thicknesses required.

- C. Flexible Duct Connectors: Laminated flexible sheet of cotton duct and sheet elastomer (butyl, neoprene or vinyl), reinforced with steel wire mesh where required for strength to withstand duct pressure indicated. Form connectors with full-faced flanges and accordion bellows to perform as flexible isolators unit, and of manufacturer's standard length for each size unless otherwise indicated. Equip each unit with galvanized steel retaining rings for airtight connection with ductwork.
- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering vibration isolation products, which may be incorporated in the work include, but are not limited to the following:
 - 1. Peabody Noise Control, Inc.
 - 2. Korfund Dynamics Corp.
 - 3. Mason Industries, Inc.
 - 4. Vibration Eliminator Co., Inc.

PART 3 - EXECUTION

3.1 APPLICATIONS:

- A. General: Except as otherwise indicated on drawings, apply the following types of vibration isolators at indicated locations or for indicated items of equipment. Selection is Installer's option where more than one type is indicated.
- B. Flexible Duct Connectors: Install at the following ductwork connections:
 - 1. Connections with vibration-isolation-mounted air handling equipment (i.e. Rooftop Unit Curb Plenum, Fan Powered Boxes, Vent Fans, etc.).
 - 2. Provide flexible duct connections wherever ductwork connects to vibration isolated equipment or as indicated on the Drawings. 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 Duro-Dyne, Elgen, Ventfabric or equal. All canvas connections shall have a flame spread of 25 or less and smoke developed rating not higher than 50.
- C. Isolation Hangers: Install where the following suspended equipment is indicated:
 - 1. All Furnaces
 - 2. Energy Recovery Units

END OF 230548

230593 - TESTING, ADJUSTING AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of testing, adjusting, and balancing work is indicated by requirements of this section, and also by drawings and schedules, and is defined to include, but is not necessarily limited to, air distribution systems, hydronic distribution systems and associated equipment and apparatus of mechanical work. The work consists of pressure testing, setting speed and volume (flow) adjusting facilities provided for systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to work as required by contract documents.
- B. Component types of testing, adjusting, and balancing specified in this section includes the following as applied to mechanical equipment:
 - 1. HVAC Rooftop Units
 - 2. Exhaust/Ventilation Fans
 - 3. Air terminals

1.3 QUALITY ASSURANCE:

- A. Installer: A firm certified by Associated Air Balance Council (AABC) or National Environmental Balance (NEBB) in those testing and balancing disciplines similar to those required for this project.
- B. Industry Standards: Comply with American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE) recommendations pertaining to measurements, instruments and testing, adjusting and balancing, except as otherwise indicated.

1.4 SUBMITTALS:

- A. Submit certified test reports signed by Test and Balance Supervisor who performed TAB work.
- B. Include identification and types of instruments used and their most recent calibration

date with submission of final test report.

1.5 JOB CONDITIONS:

- A. Do not proceed with testing, adjusting, and balancing work until work has been completed and is operable. Ensure that there is no latent residual work still to be completed.
- B. Do not proceed until work scheduled for testing, adjusting, and balancing is clean and free from debris, dirt and discharged building materials.
- C. HVAC Testing, Adjusting and Balancing:
 - 1. All equipment shall be adjusted to operate as intended by the specification. All bearings shall be lined up. Bearings that have dirt or foreign material in them shall be replaced with new bearings without additional cost to the owner. All thermostats and control devices shall be adjusted to operate as intended. Adjust burners, fans, etc. for proper and efficient operation. Certify to Engineer that all adjustments have been made and that system is operating satisfactorily. Adjust all supply outlets to supply the amount of air shown on the drawings. Further adjustments shall be made to obtain uniform temperature in all spaces. Calibrate, set, and adjust all automatic temperature controls. Check proper sequencing of all interlock systems, and operation of all safety controls.
 - 2. Contractor shall employ the services of a testing and balancing firm to take test readings on all fans and units, and to adjust fan speeds to deliver specified amounts of air. Testing and balancing report logs shall be made showing all air supply quantities, fan and unit test readings, etc.; (3) three copies of the log shall be submitted to the Engineer before final inspection of the project and is necessary for final payment. Log shall be listed by unit, and shall additionally indicate unit horsepower, motor nameplate amps, and actual amps draw after all adjustments are completed. Also each room shall be listed with total exhaust, supply and return air quantities listed.
 - 3. Patch holes in insulation, ductwork and housings, which have been cut or drilled for test purposes, in manner recommended by original installer.
 - 4. Prepare a report of recommendation for correcting unsatisfactory mechanical performances when system cannot be successfully balanced; including, where necessary, modifications which exceed requirements of contract documents for mechanical work.

5. Retest, adjust and balance systems subsequent to significant system modifications, and resubmit test results.

D. Additional Testing Requirements:

The certified test and balance company shall also perform the following tests in addition to the above test, and shall include the results of these tests with the test and balance report:

1. All rooftop units are to have the cooling capacities test and included in the report. The information shall include the following:
 - a. Entering air temperature and humidity
 - b. Leaving air temperature in cooling mode
 - c. Airflow
 - d. Exterior outdoor ambient temperature and humidity

END OF 230593

SECTION 230700: HVAC INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

- A. Extent of mechanical insulation required by this section is indicated on drawings, and by requirements of this section.
- B. Types of mechanical insulation specified in this section include the following:
 - 1. Ductwork Insulation:
 - a. Interior Supply Air Duct (where concealed)
 - b. Flexible duct to diffusers.
 - 2. Piping System Insulation:
 - a. Condensate Piping

1.2 QUALITY ASSURANCE:

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:
 - 1. Babcock & Wilcox Co., Insulating Products Div.
 - 2. Certainteed Corp.
 - 3. Johns-Manville Corp.
 - 4. Keene Corp.
 - 5. Knauf Fiber Glass
 - 6. Owens-Corning Fiberglass Corp.
- B. 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 E 84 (NFPA 255) method.

1.3 SUBMITTALS:

- A. Product Data: Submit manufacturer's specifications and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, thickness, and furnished accessories for each mechanical system requiring insulation.
- B. Certified Tests: With product data submit certified test reports on performances including burning characteristics and thermal insulating values.

1.4 DELIVERY, STORAGE AND HANDLING:

- A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard ratings of products.
- B. Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged insulation; remove damaged insulation from project site.

PART 2 - PRODUCTS

2.1 PIPING INSULATION:

- A. All interior condensate piping is to be insulated with ½" thick, pipe insulation with a K factor .22 at 75°F mean temperature. The insulation shall be wrapped with a vapor barrier jacket with self-sealing lap, equal to Certain-teed, Mansville, Owens-Corning. Cover fittings with Zeston or equal premolded insulating fittings. Insulation shall be installed in a professional, neat appearing manner; poor workmanship shall be corrected at the Contractor's expense.

2.2 INSULATION SHIELDS

- A. Metal insulation shields are required at all pipe hangers where the piping is insulated. Metal shields shall be constructed of galvanized steel, formed to a 180 degree arc with lengths equal to at least twice the pipe diameter.

2.3 DUCT INSULATION

- A. Flexible Fiberglass Ductwork Insulation (Outside of Attic): FS HH-I-558, Form B, Type I. Insulation to have a density of 1.5 pcf density and shall have a "k" value of 0.28 maximum at 75 deg. F. Provide all-service insulation jacket with vapor barrier.
- B. Flexible Fiberglass Ductwork Insulation (In Attic): FS HH-I-558, Form B, Type I. Insulation to have a density of 3.0 pcf density and shall have a "k" value of 0.28 maximum at 75 deg. F. Provide all-service insulation jacket with vapor barrier.
- C. Application: Provide thicknesses of insulation on ductwork as follows:
 - 1. Supply Air Duct (where concealed): 1.5" thick
- D. Ductwork Insulation Accessories: Provide staples, bands, wires, tape, anchors, corner and angles and similar accessories as recommended by insulation manufacturer for applications indicated. Provide cements, adhesives, coatings, sealers, protective finishes and similar compounds as recommended by insulation manufacturer for applications indicated.
- E. All insulating materials, adhesives, coatings, etc., shall have a flame spread of 25 or less and smoke developed rating not higher than 50. All containers for mastics and adhesives shall have U.L. Label.

PART 3 - EXECUTION

3.1 INSTALLATION OF INSULATION:

- A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose. All ductwork shall be externally insulated unless otherwise indicated.
- B. Install insulation materials with smooth and even surfaces.
- C. Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- D. Maintain integrity of vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage.
- E. Extend ductwork insulation without interruption through walls, floors and similar ductwork penetrations, except at penetrations through exterior building barriers and where otherwise indicated.

3.2 PROTECTION AND REPLACEMENT:

- A. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
- B. 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 230700

233113 – METAL DUCTS AND FANS

PART 1 - GENERAL

1.1 QUALITY ASSURANCE:

- A. SMACNA Compliance: Comply with applicable portions of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) HVAC duct construction standards, latest edition.
- B. Industry Standards: Comply with American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE) recommendations pertaining to construction of duct accessories, except as otherwise indicated.
- C. UL Compliance: Construct, test, and label fire dampers in accordance with Underwriters Laboratories (UL) Standard 555 "Fire Dampers and Ceiling Dampers".
- D. NFPA Compliance: Comply with applicable provisions of ANSI/NFPA 90A "Air Conditioning and Ventilating Systems", pertaining to installation of duct accessories.

1.2 SUBMITTALS:

- A. Product Data: Submit manufacturer's data for each type of duct accessory, including dimensions, capacities, and materials of construction; and installation instructions.
- B. Submit assembly-type shop drawings for each type of duct assembly showing interfacing requirements with ductwork, and method of fastening or support.

PART 2 - PRODUCTS

2.1 DUCTWORK MATERIALS:

- A. Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ANSI/ASTM A 527, lockforming quality, with ANSI/ASTM A 525, G90 zinc coating; mill phosphatized for exposed locations.

2.2 FILTERS:

- A. Two Types of filters shall be used where indicated on the drawings: 1" throwaway, and 2" pleated MERV 13 high efficiency throwaway.
- B. All air units shall have filters installed any time they are operated before final

acceptance. Provide extra set of filters and install in units just before turning over building to owner. Manufactured by Duststop, Farr, Cambridge, or approved equal.

2.3 DUCTWORK:

- A. Furnish and install all galvanized steel ductwork and housings as shown on drawings. All ducts shall be in conformance with current SMACNA Standards relative to gauge, bracing, joints, etc. Reinforce all housings and all ducts over 30" with 1¼" angles not less than 5'-6" on centers, and closer if required for sufficient rigidity to prevent vibration. Provide airtight joints and blade elbows. Support horizontal runs of duct on not to exceed 8'-0" centers from strap iron hangers.
- B. All offsets in ducts of 45 degrees or more shall have turning vanes of same gauge as duct and shall be rigidly fastened with guide strips. Vanes in ducts over 30" deep shall be installed in multiple sections with vanes not over 30" long and shall be rigidly fastened.
- C. Provide balancing dampers in all supply runouts, where shown on drawings and wherever necessary for complete control of air flow. Where access to dampers through a suspended ceiling is required, coordinate the proper location of the access doors. Provide "Spin-in" fitting and double bearing volume dampers for all round duct branch takeoffs to individual air devices. Spin-in fittings shall be installed with a minimum of (5-6) five to six sheet metal screws regardless of manufacturer's recommended screw layout.
- D. 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.
- E. 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.
- F. Ductwork Support Materials: Except as otherwise indicated, provide hot dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.

2.4 FLEXIBLE DUCT:

- A. Flexible duct shall be Class 1, insulation type, polymeric liner with steel wire helix core duct, fiberglass insulation 1½" thick and outer fiberglass vapor barrier jacket. Flexible

duct run shall not exceed 10 feet in length, and be installed in as straight a line as possible. Manufactured by Thermaflex "M-KE", Certainteed, Flexmaster.

2.5 DAMPERS:

- A. Low Pressure Manual Dampers: Provide dampers of single blade or multiblade type, constructed in accordance with SMACNA "Low Pressure Duct Standards". Volume dampers shall be opposed blade interlocking type, factory made by Ruskin, APC, Air Balance, or approved equal.

2.6 TURNING VANES:

- A. Fabricated Turning Vanes: Provide fabricated turning vanes and vane runners, constructed in accordance with SMACNA "Low Pressure Duct Standards".
- B. Manufactured Turning Vanes: Provide turning vanes constructed of 1½" wide curved blades set at 1 1/2" o.c., and set into side strips suitable for mounting in ductwork, per SMACNA Standards for low pressure duct.

2.7 DUCT HARDWARE:

- A. 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.
- B. Concealed Damper regulators: For dampers located above inaccessible plaster or gypsum board ceilings, provide Young Regulator Co. Model No. 301 CDS concealed regulators with cover plates. Units shall be flush with finished surface. Key shall operate damper rod. Lock nut and spring washer shall hold damper in fixed position.
- C. Bowden Cable Control Dampers: Where indicated on the drawings, (or in lieu of the type 301 system) Bowden cable control dampers (by Young Regulator) are to be provided to control inaccessible manual dampers above inaccessible ceilings. Cable controllers shall be locking with rack and pinion holding damper securely at setting. The control system to consist of a concealed damper regulator, sheathed stainless steel cable system, rack and pinion controller, worm gear actuator and damper compatible with system. Concealed cup regulator to be Young 270-301(FS) with coverplate. System specialties must be submitted for review prior to purchase.

2.8 DUCT ACCESS DOORS:

- A. Construction: Construct of same or greater gate 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 1 handle type latch for doors 12" high and smaller, 2 handle type latches for larger doors.

2.9 DUCT SEALANT

- A. 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.
- B. 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.

2.10 EXHAUST FANS (EF):

- A. Provide tubular centrifugal fan, belt driven, vertical or horizontal mount, as scheduled. Jenn-air, Penn, Greenheck, Acme, Aerolator, Aerovent, Dayton, Cook or equal. Provide aluminum housings as scheduled, with the appropriate spark resistant construction. Provide capacitor-start, induction run type motor for belt driven fans.
- B. Provide fans with inlet and outlet flanges with mounting holes. All fans are to receive a corrosion resistant; refer to Drawings for type and application.
- C. Each fan to be provided with either spring mount vibration isolation or neoprene mounts; Refer to Drawings.
- D. Motors to be high efficiency.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Install duct 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.
- B. Support ducts rigidly with suitable ties, braces, hangers, and anchors of type which will hold ducts true to shape and to prevent buckling.
- C. Seal ductwork, to seal class recommended, and method prescribed in SMACNA "HVAC

Duct Construction Standards" Latest Edition.

- D. Complete fabrication of work at project as necessary to match shop fabricated work and accommodate installation requirements.
- E. Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations, or if not otherwise indicated, run ductwork in shortest route which does not obstruct unusable 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 clearances to ½" where furring is shown for enclosure of 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. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.
- F. Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct over duct-plus-insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1½".
- G. Where ducts pass thru block walls, ensure that a lintel sized per the structural specifications is provide above penetration.
- H. Install turning vanes in all rectangular supply, return and outside air duct turns 45 deg. or greater.
- I. Coordinate duct installations with installation of accessories, dampers, equipment, controls and other associated work of ductwork system.
- J. Support ductwork in manner complying with SMACNA "HVAC Duct Construction Standards – Latest Edition".

3.2 CLEANING AND PROTECTION:

- A. 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.

3.3 TESTING FOR LEAKAGE:

- A. General: After each duct system is completed, test for duct leakage in accordance with

SMACNA "High Pressure Duct Standards - Latest Edition, Chapter 10 - Testing and Leakage". Repair leaks and repeat tests until total leakage is less than 3% maximum of system design air flow.

END OF 233113

233713 - GRILLES, REGISTERS, DIFFUSERS, & LOUVERS

PART 1 - GENERAL

1.1 SUBMITTALS:

- A. Product Data: Submit manufacturer's data on outlets and inlets including the following:
- B. Schedule of outlets and inlets indicating drawing designation, room location, number furnished, model number, size and accessories furnished.
- C. Data sheet for each type of outlet and inlet, and accessory furnished; indicating construction, finish, and mounting details.
- D. Performance data for each type of outlet and inlet furnished, velocity traverse, throw and drop, and noise criteria ratings. Indicate selections on data.
- E. Ratings are to be certified by ADC or AMCA.

1.2 PRODUCT DELIVERY, STORAGE, AND HANDLING:

- A. Deliver outlets and inlets wrapped in factory fabricated fiberboard type containers. Identify on outside of container type of outlet or inlet and location to be installed. Avoid crushing or bending and prevent dirt and debris from entering and settling in devices.
- B. Store outlets and inlets in original cartons and protect from weather and construction work traffic. Where possible, store indoors; when necessary to store outdoors, store above grade and enclose with waterproof wrapping.

PART 2 - PRODUCTS

2.1 CEILING AIR DIFFUSERS:

- A. General: Except as otherwise indicated, provide manufacturer's standard ceiling air diffusers where shown; of size, capacity, direction of throw, and type indicated; constructed of materials and components as specified in this section and as required for complete installation.
- B. Types: Provide ceiling diffusers of type, capacity, and with accessories and finishes as indicated and as specified in this section. The following requirements shall apply:
- C. Diffuser Faces:

1. Square: Square housing, core of concentric louvers, square or round duct connection, housing extended to form panel to fit in ceiling module.
 2. Rectangular: Rectangular housing, core of rectangular concentric louvers, square or rectangular duct connection.
- D. 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.
- E. Dampers:
1. Opposed Blade: Adjustable opposed blade damper assembly, key operated from face of diffuser.
 2. Butterfly: 2 semi-circular flaps connected to linkage adjustable from face of diffuser with key, and with straightening grid.
- F. Diffuser Accessories:
1. Operating Keys: Tools designed to fit through diffuser face and operate volume control device and/or pattern adjustment.
- G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering diffusers which may be incorporated in the work include, but are not limited to the following:
1. Airguide Corp.
 2. Anemostat Products Div., Dynamics Corp. of America
 3. Carnes Co., Div. of Wehr Corp.
 4. Barber-Colman Co., Air Distribution Div.
 5. Environmental Elements Corp., Subs. Koppers Co.
 6. Krueger Mfg. Co.
 7. Tuttle & Bailey Div. of Interpace Corp.
 8. Titus Co.

2.2 CEILING RETURN, EXHAUST AND TRANSFER AIR REGISTERS AND GRILLES:

- A. General: Except as otherwise indicated, provide manufacturer's standard ceiling registers and grilles, where shown, of size, capacity and type indicated; constructed of materials and components as specified in this section; and as required for complete

installation.

- B. Ceiling Compatibility: Provide registers and grilles 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 register or grille.
- C. Register and Grille Materials:
 - 1. Aluminum Construction: Manufacturer's standard extruded aluminum frames and adjustable blades, unless noted otherwise.
- D. Register and Grille Faces:
 - 1. Horizontal Straight Blades: Horizontal blades, individually adjustable, at manufacturer's standard spacing.
 - 2. Vertical Straight Blades: Vertical blades individually adjustable at manufacturer's standard spacing.
- E. Register Dampers:
 - 1. Opposed Blade: Adjustable opposed blade damper assembly, key operated from face of register.
- F. Register and Grille Accessories:
 - 1. Operating Keys: Tools designed to fit through register or grille face and operate volume control device and/or pattern adjustment.
- G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering registers and grilles which may be incorporated in the work include, but are not limited to the following:
 - 1. Airguide Corp.
 - 2. Anemostat Products Div., Dynamics Corp. of America
 - 3. Barber Colman Co., Air Distribution Div.
 - 4. Carnes Co., Div. of Wehr Corp.
 - 5. Environmental Elements Corp., Subs, Koppers Co.
 - 6. Tempmaster Corp.
 - 7. Titus Co.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Examine areas and conditions under which outlets and inlets are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION:

- A. General: Install all outlets and inlets as recommended by the manufacturer; in accordance with recognized industry practices; to insure that products serve intended functions.
- B. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of outlets and inlets with other work.
- C. Provide transition ductwork as required to mate to the device inlet/outlet.

END OF 233713

238127 - UNITARY HVAC EQUIPMENT

PART 1 - GENERAL

1.1 QUALITY ASSURANCE:

- A. Manufacturers: Firms regularly engaged in manufacturer of terminal units, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. ARI Compliance: Test and rate heat pump units in accordance with Air Conditioning and Refrigeration Institute (ARI) Standards.
- C. UL or ETL Compliance: Construct and install heat pump units in compliance with applicable standards.

1.2 SUBMITTALS:

- A. Shop Drawings: Submit assembly type shop drawings showing unit dimensions, construction details, and field connection details.
- B. Maintenance Data: Submit maintenance instructions, including lubrication instructions, filter replacement, motor, and drive replacement, and spare parts lists. Include this data in maintenance manuals.

PART 2 - PRODUCTS

2.1 COOLING ONLY EXTERIOR CONDENSING UNITS (CU):

- A. The exterior condensing units shall be Trane, Carrier, Daikin, Mitsubishi, York, Lennox, or approved equal split system condensing unit as listed on the drawings. Units shall be UL and ARI listed.
- B. Provide unit with compressor mounted on vibration isolators, 5 year warranty, suction accumulator, loss of charge protection, high pressure cut-out, low suction pressure protection, external service valves, test port, and liquid line filter-drier, crankcase heater, thermostatic expansion valves, and hard-start kits. Unit to utilize R410A refrigerant.
- C. Provide unit with time delay relay, low voltage controls and transformers. Provide unit with heavy ga. chassis and weather resistant coating.
- D. Provide units with accessories as indicated on the Drawings.

2.2 HEAT PUMP CONDENSING UNITS (HP):

- A. The exterior condensing units shall be Trane, York, Daikin, Mitsubishi, Carrier, Lennox, or approved equal. Provide split system heat pump service or cooling only service as listed on the drawings. Units shall be UL and ARI listed.
- B. Provide unit with compressor mounted on vibration isolators, suction accumulator, loss of charge protection, high pressure cut-out, low suction pressure protection, external service valves, test port, crankcase heater, liquid line solenoid valve, thermostatic expansion valve, and liquid line filter-drier.
- C. Provide unit with reversing valve, low voltage controls, defrost controls, crankcase heaters, and required transformers.
- D. Provide unit with heavy ga. chassis and weather resistant coating, and full charge of R-410A refrigerant.
- E. Provide unit with accessories and additional requirements as listed on the drawings.

2.3 AIR HANDLING UNITS (AHU)

- A. Provide ductless air handling units equal to Trane, Daikin, Mitsubishi, Carrier, York, Lennox or equal as scheduled on the drawings. Orientations shall be as indicated. Unit construction shall be listed by U.L. Provide washable filter and condensate lift pump integral within chassis.
- B. Unit casing shall be heavy gauge steel with baked enamel finish, or heavy durable plastic within integral colored finish.
- C. Unit shall be provided with standard factory controls. Provide "auto-on-off" automatic change-over thermostat. Provide all control transformers and relays as required.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install units as indicated and in accordance with manufacturer's installation instructions.
- B. Uncrate units and inspect for damage. Verify that nameplate data corresponds with unit designation.
- C. Protect units with protective covers during balance of construction.

3.2 ADJUSTMENT AND CLEANING OF UNITS:

- A. General: After construction is completed, including painting, clean unit exposed surfaces, vacuum clean terminal coils and inside of cabinets.
- B. Retouch any marred or scratched surfaces of factory finished cabinets, using finish materials furnished by manufacturer.

END OF 238127

Division 26 & 28
Electrical

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sleeves for raceways and cables.
 - 2. Sleeve seals.
 - 3. Grout.
 - 4. Common electrical installation requirements.

1.2 SUBMITTALS

- A. Product Data: For sleeve seals.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel.
 - 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

- a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
- 3. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 4. Pressure Plates: Stainless steel. Include two for each sealing element.
 - 5. Connecting Bolts and Nuts: Stainless steel]of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items unless noted otherwise on the drawings.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetration unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 260500

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.
 - 3. Sleeves and sleeve seals for cables.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Copper Conductors: Comply with NEMA WC 70.
- B. Conductor Insulation: Comply with NEMA WC 70 for Types THW, XHHW, THHN and THWN.

2.2 CONNECTORS AND SPLICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Hubbell Power Systems, Inc.
 - 3. O-Z/Gedney; EGS Electrical Group LLC.

4. 3M; Electrical Products Division.
 5. Tyco Electronics Corp.
- C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral water-stop, unless otherwise indicated.
- C. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.4 SLEEVE SEALS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 1. Advance Products & Systems, Inc.
 2. Calpico, Inc.
 3. Metraflex Co.
 4. Pipeline Seal and Insulator, Inc.
- D. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
 1. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 2. Pressure Plates: Stainless steel. Include two for each sealing element.
 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type XHHW-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-THWN, single conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- I. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- J. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Sections "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."
- G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

- H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
 - 1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
- I. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.4 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- D. Cut sleeves to length for mounting flush with both wall surfaces.
- E. Extend sleeves installed in floors 2 inches above finished floor level.
- F. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and cable unless sleeve seal is to be installed.
- G. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."
- I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 07 Section "Penetration Firestopping."
- J. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.
- K. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- L. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.5 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground exterior-wall penetrations.

- B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.6 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding critical equipment and service for compliance with requirements.
 - 2. Perform visual inspections, mechanical inspections, and finally electrical megger testing for insulation integrity of the above item #1 conductors. Certify compliance with results of accepted testing parameters with documentation on standard megger testing forms, including weather conditions, meter utilized and the signature of the person performing the testing along with their qualifications to perform this testing.
 - 3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.
 - a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - b. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- C. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
 - a. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad, 3/4-inch by 10 feet in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- D. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.

4. Single-phase motor and appliance branch circuits.
 5. Three-phase motor and appliance branch circuits.
 6. Flexible raceway runs.
 7. Armored and metal-clad cable runs.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 26 Section "Underground Ducts and Raceways for Electrical Systems," or as detailed on the drawings, shall be at least 12 inches deep, with cover.
1. Test Wells: Install at least one test well for each service, unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
 3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.
- E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Test completed grounding system at service disconnect enclosure grounding terminal, and at ground rods..
 - a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
- B. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.
 2. Power Distribution Panelboards Serving Electronic Equipment: 3 ohm(s).
- C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

Hangers and supports for electrical equipment and systems.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design:** Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B.** Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C.** Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength:** Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.3 SUBMITTALS

- A. Product Data:** For steel slotted support systems.
- B. Shop Drawings:** Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Equipment supports.
- C.** Welding certificates.

1.4 QUALITY ASSURANCE

- A. Welding:** Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B.** Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - 3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 6. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit
- 2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
- 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
- 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
- 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
- 6. Toggle Bolts: All-steel springhead type.
- 7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted [or other] support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. See Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior duct banks and manholes, and underground handholes, boxes, and utility construction.

1.2 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, details, and attachments to other work.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. IMC: ANSI C80.6.
- C. EMT: ANSI C80.3.
- D. FMC: Zinc-coated steel.
- E. LFMC: Flexible steel conduit with PVC jacket.
- F. Fittings for Conduit (Including all Types and Flexible and Liquid tight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
 - 2. Fittings for EMT: Steel or compression type.

2.2 NONMETALLIC CONDUIT AND TUBING

- A. ENT: NEMA TC 13.
- B. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- C. LFNC: UL 1660.
- D. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.
- E. Fittings for LFNC: UL 514B.

2.3 BOXES, ENCLOSURES, AND CABINETS

- A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.
- C. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- D. Metal Floor Boxes: Cast metal, fully adjustable, rectangular.
- E. Nonmetallic Floor Boxes: Nonadjustable, round.
- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- G. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Plastic.
- I. Cabinets:
 - 1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
 - 1. Exposed Conduit: Rigid steel conduit or IMC.

2. Concealed Conduit, Aboveground: rigid steel conduit, IMC or EMT.
3. Underground Conduit: RNC, Type EPC-40PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFNC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit or IMC. Includes raceways in the following locations:
 - a. Mechanical rooms.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: Rigid steel conduit or IMC.
7. Raceways for Optical Fiber or Communications Cable: EMT.
8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- H. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Installation at right angles to reinforcement, EC shall place conduit close to slab support.
 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
- I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- K. Raceways for Communications Cable: Install as follows:
1. 3/4-Inch Trade Size and Smaller: Install raceways in maximum lengths of 50 feet.
 2. 1-Inch Trade Size and Larger: Install raceways in maximum lengths of 75 feet.
 3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.
- L. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 2. Where otherwise required by NFPA 70.
- M. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet.
1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
 2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change.
 3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.
- N. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- O. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.
- P. Set metal floor boxes level and flush with finished floor surface.
- Q. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Division 31 Section "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
4. Install rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
 - a. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
5. Warning Planks: Bury underground line warning tape or warning planks approximately 12 inches above direct-buried conduits, placing them 24 inches on center. Align planks along the width and along the centerline of conduit.

3.4 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly

END OF SECTION 260533

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.2 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
1. Black letters on an orange field.
 2. Legend: Indicate voltage and system or service type.

- C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- F. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - 2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Colors for Raceways Carrying Circuits at 600 V and Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.
- D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- D. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.5 FLOOR MARKING TAPE

- A. 2-inch wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.6 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
 1. Comply with ANSI Z535.1 through ANSI Z535.5.
 2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.

3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

2.7 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Baked-Enamel Warning Signs:
 1. Preprinted aluminum signs punched or drilled for fasteners, with colors, legend, and size required for application.
 2. 1/4-inch grommets in corners for mounting.
 3. Nominal size, 7 by 10 inches.
- D. Metal-Backed, Butyrate Warning Signs:
 1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
 2. 1/4-inch grommets in corners for mounting.
 3. Nominal size, 10 by 14 inches.
- E. Warning label and sign shall include, but are not limited to, the following legends:
 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.8 INSTRUCTION SIGNS

- A. Engraved laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
 1. Engraved legend with black letters on white face.
 2. Punched or drilled for mechanical fasteners.
 3. Framed with mitered acrylic molding and arranged for attachment to applicable equipment.
- B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. The minimum letter height shall be 3/8 inch.
- C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.9 EQUIPMENT IDENTIFICATION LABELS

- A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. The minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.
- B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. The minimum letter height shall be 3/8 inch.
- C. Stenciled Legend: In nonfading, waterproof, black ink or paint. The minimum letter height shall be 1 inch.

2.10 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
- G. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30A, and 120v to ground: Install labels at 30-foot maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Emergency Power.
 - 2. Power.
 - 3. UPS.
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction (AHJ) permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- E. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.
- F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
 - 1. Limit use of underground-line warning tape to direct-buried cables.
 - 2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

- H. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning sign.
 - 1. Comply with 29 CFR 1910.145.
 - 2. Identify system voltage with black letters on an orange background.
 - 3. Apply to exterior of door, cover, or other access.
 - 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
- J. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment as noted on the drawings.
- L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
 - 1. Labeling Instructions:
 - a. Indoor Equipment: engraved limacoid label, unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label Stenciled legend 4 inches high.
 - c. Elevated Components: Increase the sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION 260553

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following lighting control devices:
 - 1. Time switches.
 - 2. Outdoor photoelectric switches.
 - 3. Indoor occupancy sensors.
 - 4. Outdoor motion sensors.
 - 5. Lighting contactors.
 - 6. Emergency shunt relay.
- B. See Division 26 Section "Network Lighting Controls" for low-voltage, manual and programmable lighting control systems.
- C. See Division 26 Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.
- C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - 1. Area Lighting Research, Inc.; Tyco Electronics.
 - 2. Intermatic, Inc.
 - 3. Leviton Mfg. Company Inc.
 - 4. Lithonia Lighting; Acuity Lighting Group, Inc.
 - 5. Paragon Electric Co.; Invensys Climate Controls.

6. Sensor Switch
 7. Watt Stopper (The).
- B. Electronic Time Switches: Electronic, solid-state programmable units with alphanumeric display; complying with UL 917.
1. Contact Configuration: SPST.
 2. Contact Rating: 30-A inductive or resistive, 240-V ac.
 3. Program: 8 on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.
 4. Program: 2 on-off set points on a 24-hour schedule, allowing different set points for each day of the week and an annual holiday schedule that overrides the weekly operation on holidays.
 5. Programs: channels; each channel shall be individually programmable with 8 on-off set points on a 24-hour schedule.
 6. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on selected channels.
 7. Astronomic Time: All channels.
 8. Battery Backup: For schedules and time clock.

2.2 INDOOR OCCUPANCY SENSORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
1. Hubbell Lighting.
 2. Leviton Mfg. Company Inc.
 3. Lithonia Lighting; Acuity Lighting Group, Inc.
 4. Novitas, Inc.
 5. RAB Lighting, Inc.
 6. Sensor Switch, Inc.
 7. TORK.
 8. Watt Stopper (The).
- D. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.
1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
 3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
 4. Mounting:

- a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
- 5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
- 6. Bypass Switch: Override the on function in case of sensor failure.
- 7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; Provide 0-10vdc dimming control with adjustable daylighting discount factor.
- E. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.
 - 1. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.
 - 2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft when mounted on a 96-inch-high ceiling.
 - 3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot-high ceiling.

2.3 OUTDOOR PHOTOELECTRIC SWITCHES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - 1. Area Lighting Research, Inc.; Tyco Electronics.
 - 2. Grasslin Controls Corporation; a GE Industrial Systems Company.
 - 3. Intermatic, Inc.
 - 4. Lithonia Lighting; Acuity Lighting Group, Inc.
 - 5. Novitas, Inc.
 - 6. Paragon Electric Co.; Invensys Climate Controls.
 - 7. Square D; Schneider Electric.
 - 8. TORK.
 - 9. Touch-Plate, Inc.
 - 10. Watt Stopper (The).
- D. Description: Solid state, with SPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.
 - 1. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
 - 2. Time Delay: 15-second minimum, to prevent false operation.

3. Surge Protection: Metal-oxide varistor, complying with IEEE C62.41.1, IEEE C62.41.2, and IEEE 62.45 for Category A1 locations.
 4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.
- E. Description: Solid state, with SPST dry contacts rated for 1800 VA to operate connected load, relay, or contactor coils; complying with UL 773.
1. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
 2. Time Delay: 30-second minimum, to prevent false operation.
 3. Lightning Arrester: Air-gap type.
 4. Mounting: Twist lock complying with IEEE C136.10, with base.

2.4 LIGHTING CONTACTORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
1. Allen-Bradley/Rockwell Automation.
 2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
 3. Eaton Electrical Inc.; Cutler-Hammer Products.
 4. GE Industrial Systems; Total Lighting Control.
 5. Grasslin Controls Corporation; a GE Industrial Systems Company.
 6. Hubbell Lighting.
 7. Lithonia Lighting; Acuity Lighting Group, Inc.
 8. MicroLite Lighting Control Systems.
 9. Square D; Schneider Electric.
 10. TORK.
 11. Touch-Plate, Inc.
 12. Watt Stopper (The).
- B. Description: Electrically operated and electrically held, combination type with fusible switch, complying with NEMA ICS 2 and UL 508.
1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
 2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
 3. Enclosure: Comply with NEMA 250.
 4. Provide with control and pilot devices as indicated on Drawings matching the NEMA type specified for the enclosure.

2.5 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
- B. When requested within 12 months of the date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

3.2 CONTACTOR INSTALLATION

- A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

- A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be 1/2 inch.
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."
 - 1. Identify controlled circuits in lighting contactors.
 - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
 - 2. Operational Test: Verify operation of each lighting control device, and adjust time delays.
- B. Lighting control devices that fail tests and inspections are defective work and shall be replaced.

END OF SECTION 260923

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detailed bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Include evidence of NRTL listing for series rating of installed devices.
 - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 7. Include wiring diagrams for power, signal, and control wiring.
 - 8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.
- C. Field quality-control reports.
- D. Panelboard schedules for installation in panelboards.
- E. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

- 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- B. Enclosures: Flush- and surface-mounted cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 - 4. Directory Card: Inside panelboard door, mounted in transparent card holder.
- C. Incoming Mains Location: Top and bottom.
- D. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.
- E. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Main and Neutral Lugs: Compression type.
 - 3. Ground Lugs and Bus Configured Terminators: Compression type.
 - 4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 - 5. Sub feed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- F. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.
- G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- H. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, and listed and labeled for series-connected short-circuit rating by an NRTL.

- I. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker or lug.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.
- F. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- C. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 - 3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replaceable electronic trip; and the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.

- d. Ground-fault pickup level, time delay, and I^2t response.
- 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
- 5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
- 6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
- 7. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
- 8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.
 - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
 - d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - e. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Division 26 Section "Electrical Power Monitoring and Control."
 - f. Shunt Trip: The trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
 - g. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
 - h. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.
- D. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
- 1. Fuses, and Spare-Fuse Cabinet: Comply with requirements specified in Division 26 Section "Fuses."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Receive, inspect, handle, store and install panelboards and accessories according to NECA 407.
- B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- C. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- E. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.

- F. Install filler plates in unused spaces.
- G. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- H. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- I. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads and **incorporate Owner's final room designations**. Obtain owner's approval before installing. Use a computer or typewriter to create directories; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical megger testing.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace them with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Wall-box motion sensors.
 - 3. Snap switches and wall-box dimmers.
 - 4. Solid-state fan speed controls.
 - 5. Wall-switch and exterior occupancy sensors.
 - 6. Communications outlets.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.
- C. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Leviton Mfg. Company Inc. (Leviton).
 - 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 5351 (single), 5352 (duplex).
 - b. Hubbell; HBL5351 (single), CR5352 (duplex).
 - c. Leviton; 5891 (single), 5352 (duplex).
 - d. Pass & Seymour; 5381 (single), 5352 (duplex).

2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, feed through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; GF20.
 - b. Pass & Seymour; 2084.

2.4 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
 - b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
 - c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
 - d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).

2.5 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic 0.035-inch.
3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
4. Material for Damp and wet Locations: cast aluminum with spring-loaded lift "in use lockable "cover, listed and labeled for use in "wet locations."

2.6 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
 1. Wiring Devices Connected to Normal Power System: **As selected by Architect**, unless otherwise indicated or required by NFPA 70 or device listing.
 2. Wiring Devices Connected to Emergency Power System: Red.
 3. TVSS Devices: Blue.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 4. Existing Conductors:
 - a. Cut back and pigtail or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pig-tailing existing conductors is permitted provided the outlet box is large enough.
- D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the left.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Verify that dimmers used for LED luminaire control are listed for that application.
4. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with white-filled lettering on the face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace them with new, and retest as specified above.

END OF SECTION 262726

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Non-fusible switches.
 - 3. Receptacle switches.
 - 4. Shunt trip switches.
 - 5. Molded-case circuit breakers (MCCBs).
 - 6. Enclosures.

1.2 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to **ASCE/SEI 7**.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.4 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.
- C. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
- D. Field quality-control reports.
- E. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide **product indicated on Drawings** or comparable product by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with cartridge fuse interiors to accommodate **indicated** fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- C. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 - 4. Lugs: Suitable for number, size, and conductor material.
 - 5. Service-Rated Switches: Labeled for use as service equipment.

2.2 MOLDED-CASE CIRCUIT BREAKERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide **product indicated on Drawings** or comparable product by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

- D. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
 - 1. Instantaneous trip.
 - 2. Long- and short-time pickup levels.
 - 3. Long- and short-time time adjustments.
 - 4. Ground-fault pickup level, time delay, and I^2t response.
- E. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- F. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Lugs: Suitable for number, size, trip ratings, and conductor material.
 - 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
 - 4. Ground-Fault Protection: Comply with UL 1053; **integrally mounted, self-powered** type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
 - 5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
 - 6. Auxiliary Contacts: **One SPDT switch** with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
 - 7. Alarm Switch: One **NO** contact that operates only when circuit breaker has tripped.

2.3 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, **Type 1**.
 - 2. Outdoor Locations: NEMA 250, **Type 3R**.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262816

SECTION 265100 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior lighting fixtures.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

B. Related Sections:

1. Division 26 Section "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Division 26 Section "Wiring Devices" for manual wall mounted dimmers, motion detectors and on-off controls.

1.2 SUBMITTALS

- A. Product Data:** For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, and finishes.
- B. Shop Drawings:** Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.
- C. Field quality-control reports.**

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories:** Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.**

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Drawings].

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Metal Parts: Free of burrs and sharp corners and edges.
- C. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit cleaning and maintenance without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during cleaning and maintenance and when secured in operating position.
- E. Diffusers and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least [0.125-inch minimum unless otherwise indicated.
 - b. UV stabilized.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.

2.3 EMERGENCY POWER UNIT

- A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with driver. Comply with UL 924.
 - 1. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
 - a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 - 2. Battery: Sealed, maintenance-free, nickel-cadmium type.
 - 3. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
 - 4. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.4 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Lamps for AC Operation: Fluorescent, two for each fixture, 20,000 hours of rated lamp life.

2. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
3. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - a. Battery: Sealed, maintenance-free, nickel-cadmium type.
 - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, the relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.5 EMERGENCY LIGHTING UNITS

- A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
 1. Battery: Sealed, maintenance-free, lead-acid type.
 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. The lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
 7. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports, and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
- F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Comply with NFPA 70 for minimum fixture support.
- C. Suspended Lighting Fixture Support:
 - 1. Pendants and Rods: Where longer than 48 inches brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
- D. Adjust aimable lighting fixtures to provide required light intensities.
- E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to the lighting system, retest to demonstrate compliance with standards.

END OF SECTION 265100

SECTION 265600 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior luminaires with lamps and ballasts.
 - 2. Luminaire-mounted photoelectric relays.
 - 3. Poles and accessories.

1.2 SUBMITTALS

- A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, and finishes.
- B. Shop Drawings: Anchor-bolt templates keyed to specific poles and certified by manufacturer.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with IEEE C2, "National Electrical Safety Code."
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, product(s) indicated in the Drawings.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

- A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
- B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- C. Metal Parts: Free of burrs and sharp corners and edges.

- D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions. Doors shall be removable for cleaning or replacing lenses.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.
- J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
- M. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
 - 2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color: As **selected by the Architect**, from manufacturer's standard catalog of colors.
- N. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
 - 2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.

3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
 - a. Color: **shall be selected by architect at time of shop drawing submittals**—provide color samples with shop drawing submittals on similar metal as luminaire that is to be provided.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

- A. Fasten luminaire to structural supports as indicated on the drawings.
 1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- B. Adjust luminaires that require field adjustment or aiming.

3.2 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Division 26 Section "Raceway and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.3 GROUNDING

- A. Ground metal poles and support structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."
 1. Install grounding electrode for each pole unless otherwise indicated.
 2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

END OF SECTION 265600

282300 - AUDIO / VIDEO SYSTEM-MULTI-PURPOSE ROOM

PART 1 – GENERAL

1.1 SCOPE

This section details product and execution requirements for AUDIO / VIDEO SYSTEM for the project.

Work includes furnishing all labor, materials, tools and equipment, and documentation required for a complete turnkey working system as specified in this Section. A/V system shall consist of but not be limited to,

A/V Controller, Network Switch, Cameras, Cables, Touch Screens, Controls, Microphones, Speakers, Monitors, Monitor/TV Mounting Brackets, A/V Mobile Endorsed Rack/Cabinet, Cable, and Wired Devices. Programming work sheets and camera view setup is considered part of installation as well as coordination with Health Dept.

Unless noted otherwise, "Contractor" shall refer to A/V & Installer.

Communications routing from controllers/switches to existing network shall be via Owner LAN.

Coordinate with any and all trade contractors as required to provide a fully functioning system.

Unless noted otherwise, "Contractor" shall refer to A/V & installer.

Applicable provisions of Division 1 shall govern all work under this section.

The A/V System and associated components manufactured by Cisco Electronics is the basis of design for the system specified herein . Acceptable manufacturers, Crestron Electronics and Extron Electronics will be considered as equal to satisfy the requirements of this specification. If either is proposed as an alternate to the Cisco system as specified, the shop drawing submittal shall be submitted with a line-by-line specification compliance document included. This document details technical considerations only. It is assumed that registration, licensing, policies regarding disclosure and privacy (notification, processing of images, time, and date stamping, recording of sound, etc.), and or legal obligations are the responsibility of Owner.

1.2 Supplementary Conditions, and sections under Division 1 General Requirements.

All work and materials shall conform in every detail to rules and requirements of National Fire Protection Association, the National Electrical Code and the Kentucky Building Code.

All materials shall be listed by UL and shall bear UL label. If UL has no published standards for a particular item, then other national independent testing standards shall apply, and such items shall bear those labels. Where UL has an applicable system listing and label entire system shall be so labeled. Other applicable standards are as follows:

1. ANSI/IEEE C2 - National Electrical Safety Code

2. NFPA 70-1999 - National Electrical Code

3. IEEE/ANSI 142-1982 – Recommendations for Grounding of Industrial & Commercial Power Systems.

4. IEEE 802.3 standards for CSMA/CD (Ethernet) based LANs.

5. Emissions: FCC 15, Class A; CE: EN55022 (Emissions)

6. CE: EN50082-01 (Immunity)

7. CE, UL 1950; CUL 1950 CE: EN60950 (Safety)

8. State of Kentucky

9. City of Corbin KY

1.3 DEFINITIONS AND ABBREVIATIONS

A/V – Audio/Video System

LAN – Local Area Network

1.4 WORK BY OWNER

Owner shall provide:

1. Verify exact monitor, camera, microphones, speaker mounting locations.

2. Verify Acceptable per-camera field-of-view information.

4. Cross-connections from A/V components to building LAN, contractor provides all interconnection cables (Patch Cables) as needed but may not connect to LAN without ITS oversight and approval.

5. All active LAN components (switches, routers) as required for A/V function.

6. IP-address allotment and management for A/V devices as needed.

1.5 SUBMITTALS

Product Data: For each type of product indicated.

System Design drawings with cable routing, device location and labeling.

Communication and Security Closet layouts.

1.6 QUALITY ASSURANCE

Manufacturer shall:

- a. Shall have a minimum of ten (10) years' experience in the manufacture and design of VMS products.

Installer shall:

- b. Shall have Minimum of five (5) years' experience installing VMS products. All installation, configuration, setup, programming and related work shall be performed by technicians thoroughly trained by the manufacturer in the installation and service of the equipment provided

A/V System Contractor shall:

- a. Shall have successfully completed projects of equal magnitude and function ,of the system specified in following sections.

b. Shall have available a fully operable installation similar to the AV system specified here-in, that is available, for demonstration of all functions specified here-in ,to the FCHD representatives within a 100 mile radius of Corbin, Kentucky.

1.7 GUARANTEE

Warranty requirements for A/V System shall be two (2) years on all parts and labor commencing on Date of Substantial Completion. Those requirements apply to all components covered in this section.

1.8 SINGLE SOURCE RESPONSIBILITY AND OBSOLETE EQUIPMENT

Except where specifically noted otherwise, all equipment supplied by the Contractor shall be the standard products of a single manufacturer of known reputation and experience in the industry. Only equipment, components and accessories in current production for at least five (5) years beyond the completion date of this system shall be used and installed. Any equipment found to be obsolete or not in future production will be removed and replaced at Contractor's expense. This includes all equipment, materials and labor.

PART 2 – PRODUCTS

2.1 GENERAL

A/V system shall deliver high quality.

- Full HD video conference device bundle optimized for large workspaces,
- Intelligent collaboration kit solution including the intelligent Quad Camera, the AI-powered Codec EQ, and optional room peripherals, integrating with up to three external screens
- Integrated 80 MP camera system, loudspeaker system, and microphones (for speaker tracking) in the Quad Camera; can be extended with external microphones, speakers, touch controller, and other room peripherals
- Platform independence to run the native Cisco RoomOS or Microsoft Teams Rooms experience. When configured for RoomOS, seamless meeting-join experience for Webex meetings and third-party video interoperability with Microsoft Teams, Zoom, and Google Meet
- Sleek, elegant hardware design and intuitive software experience for more engaging and productive meetings
- Brings optimized, inclusive camera views for more equitable video meetings:
 - Frames camera mode: Automatically captures a condensed view of in room participants and frames them individually or in smaller groups for more equitable meetings, on Webex and when using third-party meetings
 - People focus: When the device is used with Webex, it uses advanced camera intelligence to dynamically update the screen layout to ensure everyone is equally framed in the meeting
 - Speaker tracking: When enabled, it uses a dedicated microphone array to detect and provide a prominent view for the active speaker

- Automatic, machine learning–based noise removal blocks out disruptive sounds coming from the meeting room (e.g., typing, paper rustling)
- 4K wireless content sharing via Webex, Miracast, and Apple AirPlay for exceptional presentations, or via USB and HDMI passthrough

Workspace intelligence

- Uses ultrasound technology to automatically activate when someone walks into the room, and recognizes them through their mobile device
- Supports the Cisco Room Navigator control unit: can be paired either with a table-stand controller, a wall-mount touch panel, or both in parallel for native conference controls, room controls, environmental monitoring, and room booking, and even direct access to your third-party workspace experience applications for space reservation, wayfinding, and digital signage
- Provides intelligent people count based on presence sensors and custom macros, enabling alignment with safety guidelines and analytics for better resource planning
- Enables smart customizations via macros and custom APIs, such as digital signage, custom alerts, and more to support internal communications, visitor management, safety, and well-being
- Can be paired with up to three screens to infuse full HD video and 4K content sharing into a cohesive experience
- Connect your laptop with Codec EQ via a single USB-C to use the camera, microphones, and speakers of the device for an instant BYOD experience
- Supports dual content sources for local meetings
- View whiteboard content and annotations shared from Cisco Board Series, Cisco Desk Series, or the Webex App
- Automatic screen/display integration through HDMI CEC
- Supports Cisco and third-party cameras, microphones, speakers, and other collaboration peripherals via PoE, USB, and analogue ports
- Supports Wi-Fi and Bluetooth® - Not available on Non-Radio Version*
- Optimized for pairing with the Cisco Room Navigator touch panel to control the video conference, control room peripherals, add smart room booking, and run third-party workspace management applications
- Unified management, provisioning, monitoring, troubleshooting, analytics, and workspace insights in Control Hub
- Flexibility to register on-premises or in the Webex Cloud

- Hardware is optimized to run on a cloud platform for great experiences in shared rooms and spaces with easy access to hosted conferences
- Secure management, with end-to-end encryption when using Webex

2.2 MULTI-PURPOSE ROOM CAMERAS

Conference Room Camera shall be: Cisco C5-CAM-PTZ4K

Ceiling Mounting Bracket shall be: CTZ-PTZ4K-CLNGMNT

Cisco SmartNET Total Care Service Agreement for Camera 36 Months shall be: CON-SNT-CSIF4KCA

Camera shall:

1. Be ceiling / wall mountable dome-type.

- 4x CMOS image sensors with machine intelligent switching (up to 20MP resolution per sensor)
- The camera generates frames from the 4 sensors simultaneously to provide a single HD output at 1080p
- Support up to 60 fps
- 1/1.7 CMOS
- 7x zoom (5x native optical zoom with digital zoom enhancement)
- f/2.0 aperture
- 83° horizontal field of view on wide lens
- 50° horizontal field of view on 3 tele-lenses
- Automatic group framing (audio + face detect)
- Speaker tracking
- Frames camera mode: intelligent people framing for equitable views
- 5056 x 3888 pixel resolution
- Auto focus, brightness, and white balance
- Focus distance 1 m to inf

Bandwidth

- Up to 20 Mbps

- Minimum bandwidth:
- 720p30 from 768 kbps
- 720p60 from 1152 kbps

- 1080p30 from 1472 kbps
 - 1080p60 from 2560 kbps

Minimum bandwidth for resolution/frame rate

- 1920 x 1080 at 60 fps from 2560 kbps

Firewall traversal

- Cisco Expressway™ technology
- H.460.18, H.460.19 firewall traversal

Video standards

- H.264, H.265, and H.263

2.3 A/V CONTROLLER:

AV CONTROLLER

AV Controller shall be CISCO CS-CODEC-EQ-K9+

Platform compatibility

- RoomOS 11.1.2 and later (for native Webex meetings and video interoperability for Microsoft Teams, Zoom, and Google Meet)
 - Microsoft Teams Rooms (also featuring native Webex meetings when registered in Control Hub)
- Available bundle solutions

- Cisco Room Kit EQ (featuring the Cisco Quad Camera)
- Cisco Room Kit EQ PTZ 4K (featuring the Cisco PTZ 4K Camera)
- Cisco Codec EQ Stand-alone

Default components

- Cisco Codec EQ
- Cisco Quad Camera or the Cisco PTZ 4K Camera
- Wall mount for Quad Camera
- Power adapter (for Quad Camera)
- Region-specific power cord
- Selection of one Cisco Room Navigator table-stand or wall-mount control unit

Optional hardware components

- Cisco PTZ 4K Camera
- Cisco Precision 60 Camera
- Cisco Room Navigator table-stand (additional unit)
- Cisco Room Navigator wall-mount (additional unit)
- Cisco Table Microphone
- Cisco Ceiling Microphone
- Cisco Table Microphone Pro
- Wall mount for Cisco Codec EQ
- Rack ears for Cisco Codec EQ
- Cisco Active USB-C Cable, 9m
- Cisco Multi-head Cable 4K
- Network cable

Video inputs

- 1x USB-C input supports formats up to maximum 3840 x 2160 at 30 fps (USB-C port has charging capability with a maximum of 15W power output)
- 3x HDMI inputs support formats up to maximum 3840 x 2160 at 30 fps including 1920 x 1080 at 60 fps; support for HDCP 1.4 on 1x HDMI input
- Extended Display Identification Data (EDID)
- Consumer Electronics Control (CEC) 2.0

Video outputs

- 3x HDMI outputs support formats up to 3840 x 2160 at 60 fps
- Consumer Electronics Control (CEC) 2.0
- Connectivity with an interactive touch screen via HDMI out and USB-A*

Encode and decode

- Main video: 1920 x 1080 at 60 fps
- Presentation channel: 3840 x 2160 at 15 fps

Audio standards

- G.711, G.722, G.722.1, G.729, AAC-LD, and Opus

Audio features

- High-quality 20kHz full-band audio
- Prepared for inductive loop (line out)
- Acoustic Echo Cancellation (AEC)
- Active Lip Synchronization
- AI-Powered, Adaptive Noise Removal
- Automatic Gain Control (AGC)
- Full Duplex
- Self-Hear
- Ultrasound Technology
- The full Audio API and Audio Console application for advanced audio

setup and customizations with the Codec EQ can be unlocked with an AV Integrator option key.

Audio inputs

- 3x mini-Jack analog audio input
- 3x HDMI input
- 1x USB-C audio input
- 1x USB-A audio input
- 4x PoE++ Ethernet for audio over IP
- Connectivity with up to 3x digital Cisco Table Microphone Pro devices by default, or up to 8x units with an AV integrator license
- Connectivity with third-party audio systems via AES67

Audio outputs

- 1x analog line out
- 3x HDMI audio out
- 1x USB-A audio out
- 1x USB-C audio out
- 4x PoE++ Ethernet for audio over IP
- Connectivity with third-party audio systems via AES67

Loudspeakers (Quad Camera)

- High-quality loudspeaker system with a single full-range driver and dual low-frequency drivers
- Frequency response: 100Hz to 20kHz
- Max output level: SPL 90dB
- 1 RCA output for subwoofer (Quad Camera)

Camera modes (Quad Camera)

- Group view: Automatically detects meeting participants and provides ideal group framing for the best view
- Speaker view: Uses a dedicated, built-in microphone array to detect and provide a prominent view for the active speaker
- Frames: Captures a condensed view of in-room participants and frames them individually or in smaller groups for more equitable meetings, on Webex and when using third-party meetings
- Manual with the option for presets

Video stream layouts

- Supporting available Webex video stream layouts and meeting features, including focus, grid, prominent, stack, and overlay. For more information, please consult the Webex Help Center.
- People Focus helps create an optimized view of every participant in Webex meetings via smart cropping to remove excess real estate

Speaker tracking (Quad Camera)

- 8-element built-in microphone array for accurate speaker tracking
- Quad Camera can support intelligent framing and dynamic speaker tracking with 7x zoom capability
- For an optimal speaker-tracking experience for people joining remotely, it is recommended that the furthest in-room participant is located within less than 9 meters from the video device. Please note that

the best overview (automatic group framing) camera mode can support an extended distance from the Quad Camera.

- Multi-camera speaker view (coming soon): allows for an extended camera reach by zooming on the active speaker and providing an optimal view in very long conference rooms with participants over 9 meters from the device. Requires the combined deployment of the Room Kit EQ, the Cisco PTZ 4K Camera, and Cisco Table Microphone Pro units for the extended, directional voice capture range.

Presenter tracking

- Presenter tracking available with the Cisco PTZ 4K Camera or the Precision 60 Camera
- AI-powered face and upper-body detection capability
- Camera automatically follows the active presenter within a defined zone and helps ensure an optimized view
- Cinematic presenter and audience view: intelligent framing and dynamic switching can be enabled with a combination of the Quad Camera bar and the PTZ 4K Camera

Cinematic cross-view

- Multi-camera cross-view (coming soon): Using Codec EQ and the combined deployment of the front-of-the-room Quad Camera bar with two side-cameras to provide AI-directed, cinematic cross-view of conversations happening across the conference table

Content stream

- H.239 (H.323) dual stream
- Binary Floor Control Protocol (BFCP) (SIP) dual stream
- Support resolutions up to 3840 x 2160 at 15 fps and 1920 x 1080 at 60 fps

Wireless sharing

- Webex App (up to 3840 x 2160 at 7.5 fps)
- Cisco Intelligent Proximity client (up to 1920 x 1080 at 3 fps)
- Miracast (1920 x 1080 at 30 fps) – Not available on non-radio version. Apple AirPlay wireless sharing:
- Screen mirroring up to 1920 x 1080 at 60 fps
- Extended desktop (Mac only) - up to 1920 x 1080 at 60 fps
- Video streaming up to 3840 x 2160 at 30 fps

MultiSite features (embedded multipoint) (optional upgrade)

- Adaptive SIP/H.323** MultiSite:
- 3-way resolution up to 1080p30 plus content up to 4Kp15
- 4-way resolution up to 720p30 plus content up to 4Kp15
- 5-way resolution up to 720p30 plus content up to 4Kp15
- Full individual audio and video transcoding
- H.323**/SIP/VoIP in the same conference
- Support for presentation (H.239/BFCP) from any participant at resolutions up to 3840 x 2160 at 15 fps
- Best Impression (automatic continuous presence layouts)
- Encryption and dual stream from any site

Protocols

- WPA3™ and WPA3-Enterprise with CCMP128 Wi-Fi® security
- Password protection to access administration available on Room Navigator controller

- Network settings protection

Certificate management

- Certificate Authority Proxy Function (CAPF) support for additional security
- Manufacturer-Installed Certificates (MIC)
- Locally Significant Certificates (LSC)
- X.509 Digital Certificates (DER encoded binary); both DER and Base-64 formats are acceptable for the client and server certificates; certificates with a key size of 1024, 2048, and 4096 are supported

Other interfaces

- 4x USB 3.0 ports, up to 1.5A charging capability per port. Connectivity for external USB microphones, keyboards, headsets, touch display, and future integrations
- Micro USB port (for service)
- Factory reset pinhole

Network interfaces (Codec EQ)

- Ethernet (RJ-45) 10/100/1000 for LAN
- 4x PoE++ (802.3bt) Ethernet (RJ-45) 10/100/1000 with a total power budget of up to 90W for
- Camera control and powering
- Room Navigator touch controller
- AV over IP room peripherals (including the multi-directional Table Microphone Pro)
- Wi-Fi 802.11a/b/g/n/ac/ax 2.4 GHz and 5 GHz also supported for LAN - not available in non-radio versions; Wi-Fi 6E support coming soon
- 2x2 Multiple Input and Multiple Output (MIMO)

Note: Due to compliance regulations, it is required that 802.11d is enabled in the access point for the product to operate properly within 5725 to 5875 MHz.

Using a Wi-Fi connection is a flexible option; however, an Ethernet connection is always preferred for high performance.

Power supplies

- 100 to 240 VAC, 50/60 Hz
- Average 20 W
- Quad Camera must be used with power supply PSU-12VDC-70W-GR=
- PTZ 4K Camera power supply (PSU-12VDC-40W2=) is optional

2.4 WIRE AND CABLE

General

1. Provide and install all device DATA and A/V cables for a complete system

2.5 NETWORK SWITCH

AV Network switch shall be Cisco C9200CX-8P-2X2G-E

- Full Power over Ethernet Plus (PoE+) capability for up to 48 ports for C9200. Power over Ethernet Plus (PoE+) capability for up to 12 ports, IEEE 802.3bt class 6 and Cisco UPOE capability for up to 8 ports for C9200CX.
- Resiliency with Field-Replaceable Units (FRU) and redundant power supply, fans, and modular uplinks for C9200 models. C9200CX models are fanless and are powered by internal fixed power supply or optional power adapters, when not powered by upstream IEEE 802.3bt class 6 60W PSE
- Flexible power source options from line voltage AC, low voltage DC to High Voltage DC (HVDC) in C9200CX models provide the choices for customers to migrate to efficient DC micro grid powered by renewable energy sources for a sustainable future.
- Flexible downlink options with data, PoE+, UPOE, UPOE with mGig for Wi-Fi 6/6E.
- Operational efficiency with optional backplane stacking, supporting stacking bandwidth up to 160 Gbps.
- UADP 2.0 Mini with integrated CPU offers customers optimized scale with better cost structure.
- Enhanced security with AES-128 MACsec encryption on C9200 and AES-256 MACsec encryption for C9200CX models, policy-based segmentation, and trustworthy solutions for the whole Catalyst 9200 Series.
- Layer 3 <https://apps.cisco.com/Commerce/> and CLI operations options
- Cisco Software-Defined Access (SD-Access).
 - Simplified operations and deployment with policy-based automation from edge to cloud managed with Cisco Identity Services Engine (ISE).
 - Network assurance and improved resolution time through Cisco Catalyst Center.
- Plug and Play (PnP) enabled: A simple, secure, unified, and integrated offering to ease new branch or campus device rollouts or updates to an existing network.
- Cisco IOS XE: A Common Licensing based operating system for the enterprise Cisco Catalyst 9000 product family with support for model-driven programmability and streaming telemetry.
- ASIC with programmable pipeline and micro-engine capabilities, along with template-based, configurable allocation of Layer 2 and Layer 3 forwarding, Access Control Lists (ACLs), and Quality of Service (QoS) entries.
- Cloud monitoring for Catalyst on Meraki dashboard.

Supply C9200CX Cisco DNA Essentials, 3Y Term License, 8P for network Switch

Supply Cisco Collaboration Flex Plan 3.0 -- A-FLEX-3 for Network Switch

2.6 RACK

- EIA compliant 19" mobile furniture equipment rack shall be Middle Atlantic Products model #RFR-__28__ (Model # RFR-1628-BR). Overall dimensions of RFR shall be __"H x 27.3" W x 27.55" D (refer to chart). Useable height of RFR shall be __rack spaces, useable depth shall be 23.31". RFR shall come equipped with one pair of adjustable steel rack rail with tapped 10-32 mounting holes in universal EIA spacing, black e-coat finish and numbered rack spaces. RFR shall have bolt through 4" height casters. RFR shall have 4 casters total, with locking front casters. RFR shall have internal steel bracing. RFR shall be constructed of melamine and have a __ finish (refer to chart). RFR shall have an undersized top. RFR shall include a locking and latching IR friendly tempered glass front door. RFR shall include a locking and latching melamine rear door. RFR shall have rear venting, cable entry and cable spools. RFR shall have a 60 MM (2.375 in.) cable grommet on top, that accepts a monitor mount. RFR shall accept patent-

pending LeverLock™ tool free and hardware free internal cable and device management system accessories. RFR shall provide a UL Listed load capacity of 350 lbs. mounted in the rack, 50 lbs. on top of the rack and 35 lbs. on the optional monitor mount. RFR shall be UL Listed in the US and Canada. RFR shall be manufactured by an ISO 9001 and ISO 14001 registered company. RFR enclosure shall be warranted to be free from defects in material or workmanship under normal use and conditions 7 years

PART 3 – EXECUTION

GENERAL

- 3.1 Work performed for installation of VMS A/V system shall be performed by an A/V System “Integrator –Contractor”.

Provide equipment as indicated on Drawings and specified herein.

Provide all labor and materials necessary to construct systems as described herein to include furnishing and installing all system equipment, interconnecting cabling, programming and start-up, software (including software upgrades and reprogramming as necessary), termination components, mounting hardware, incidentals, accessories, testing, labeling, documentation, and training as detailed in following sections.

1. Neatly lace, dress, and support cabling.
2. Coordinate any downtime with Owner.

Prior to installation:

3. Conduit and equipment back boxes are as required. Contractor is responsible for coordination with all trades to ensure that conduit and back boxes are correctly placed for A/V use. Contractor is responsible for coordinating installation of conduit and boxes to make sure they are installed on schedule with other trades and are coordinated as to not interfere with other systems or pathways.
 4. 120V AC Power is as required and is properly located.
 5. LAN structured cabling is as required and properly located, and installation has been coordinated with other trades.
 6. Coordinate all devices and locations prior to equipment installation with owner.
 7. Coordinate Owner-desired camera views, providing camera modeling prior to installation.
 8. Coordinate Camera housing and mount finishes with Architect and Owner.
- Install and wire equipment in accordance with BICSI Installation Standards, manufacturer’s recommendations, and accepted engineering and installation practices.
Mount system components as recommended by manufacturer.
9. Arrange equipment to facilitate permanent access for use and maintenance.

CABLE INSTALLATION

- 3.2 Neatly lace, dress, and support cabling.

Pull cables in accordance with cable manufacturer's recommendations and ANSI/EEE C2 Standards.

1. Do not exceed manufacturer's recommended pulling tensions.
2. Do not install bruised, kinked, scored, deformed, or abraded cable.
3. Do not splice cable between indicated termination, tap, or junction points.
4. Remove and discard cable where damaged during installation and replace it with new cable.
5. Pull all cable by hand unless installation conditions require mechanical assistance.

Run all wire and cable continuous from device location to final point of termination. No mid-run cable splices shall be allowed.

Furnish and install all cable such that ample slack is supplied at device terminating end of cable to compensate for any final field modifications in camera location.

6. Loosely coil slack in "Figure-eight" in a manner that prevents kinking.

7. Loop radius shall be at least 4X minimum bend radius for cable.

8. Slack length of cable shall be 4 feet (minimum).

Provide code compliant fire proofing techniques for all penetrations of fire rated partitions and slabs, where penetrations are made by or used for installation of A/V System.

Coordinate routing of wire and cable requiring isolation from power, radio frequency (RF), electromagnetic interference (EMI), telephone, etc. with Engineer.

At no time shall any cable be subjected to a bend less than manufacturer's specified minimum radius.

Provide grommets and strain relief material where necessary to avoid abrasion of wire and excess tension on Wire and Cable.

Make connections with solder-less devices, mechanically and electrically secured in accordance with manufacturers' recommendations. Wire nuts shall not be an acceptable means of connecting wire and cable.

3.3 A/V SYSTEM

Mount A/V System per project drawings.

Field-verify exact locations and field-of-views with Owner prior to installation.

- Large MULTI-PURPOSE ROOM will be split into (4) large rooms that will be bisected with modular walls.
- Each of the referenced (#2, #3 and #4) rooms will have a new quad capable display at the front of the rooms and conference room #1 will have a new quad capable display.
- The quad monitors will mirror conference room # 1 display when the modular wall is open between #1 and #2 conference areas and when #3 and/or #4 is being used for overflow.
- When the modular wall is closed, the monitors will be controlled from the two (2) controllers.
- Cameras are to point towards the speaker area in each section.
- The cameras will be used for a zoom meeting and to be projected onto the monitors.
- Cameras in audience area will be for the zoom meetings so the person speaking can be seen.

Coordinate with Owner prior to installation to confirm required parameters.

3.4 NETWORK CONNECTION

Cross-connections to building LAN by Owner, NO EQUIPMENT MAY BE CONNECTED TO FAYETTE COUNTY HEALTH DEPT. NETWORKS BY ANY SUBCONTRACTOR, ONLY BY FAYETTE COUNTY HEALTH DEPT. ITS personnel.

3.5 LABELING AND IDENTIFICATION

1. Cabling, Hardware, and Equipment shall be clearly labeled using a Code identifying each piece as

unique throughout A/V System. This code will aid in identifying hardware for servicing and maintenance.

2. Labels and Tags shall be machine-generated using English character set in black ink on white background labels and Tags.

a. Self-laminating permanent labels are required on cables; permanent non-marring labels are required on all other hardware/cabinets.

b. No hand-written Labels or Tags shall be allowed.

c. Dymo or Kroy type adhesive backed lettering is not acceptable.

Identify and tag all cables to denote function.

a. System of which cable is a part,

b. Indication of cable destination (e.g., room or component), and

c. Unique alpha-numeric identifier that distinguishes cable from all others in system.

All labels shall be machine generated. Handwritten labeling is not acceptable.

3.6 SYSTEM TESTING AND ACCEPTANCE

System shall be complete and fully operational before requesting final acceptance a

Installation of all field devices will be inspected by Owner or Owner's representative. Inspection will consider overall neatness and quality of installation, functionality of each individual device, mounting, wiring and labeling.

Provide written notification to Owner that system is completely installed, integrated, and is fully functional as specified herein.

3.7 OWNER TRAINING

Training course for system covered in this section shall be a minimum of 6-hours.

Maximum number of students to be (10).

1. Training materials shall be provided to all students.

Record, label, and catalog all training on DVD Videodiscs. Provide discs to Owner for future in-house training sessions and / or reviews. Furnish all temporary equipment necessary for taping all training sessions. Maintain accurate and up-to-date time sheets of all training sessions.

Contractor shall be on call during Warranty period to answer any questions Owner might have. The Owner reserves the right to use any excess training hours, not used by time of system completion, for future training as requested by Owner until total number of training hours has been completed.

3.8 DOCUMENTATION

All Owners manuals and or maintenance information shall be provided in printed form as well as electronic PDF format to the owner and owner representative.

3.9 WARRANTY AND SUPPORT

Unless otherwise noted, Contractor shall guarantee all materials, equipment, etc., two (2) years from date of final Owner acceptance of system. This guarantee shall include all labor, material, and travel time.

Contractor/Integrator and/or manufacturer(s) of system equipment must offer:

1. Technical Support Capabilities (Technician onsite) response time onsite within 4 hours, 24- hours/7- days per week ("24/7"), and 365 days per year.

END OF SECTION

Division 28
Safety and Communication

282300 - AUDIO / VIDEO SYSTEM-MULTI-PURPOSE ROOM

PART 1 – GENERAL

1.1 SCOPE

This section details product and execution requirements for AUDIO / VIDEO SYSTEM for the project.

Work includes furnishing all labor, materials, tools and equipment, and documentation required for a complete turnkey working system as specified in this Section. A/V system shall consist of but not be limited to,

A/V Controller, Network Switch, Cameras, Cables, Touch Screens, Controls, Microphones, Speakers, Monitors, Monitor/TV Mounting Brackets, A/V Mobile Endorsed Rack/Cabinet, Cable, and Wired Devices. Programming work sheets and camera view setup is considered part of installation as well as coordination with Health Dept.

Unless noted otherwise, "Contractor" shall refer to A/V & Installer.

Communications routing from controllers/switches to existing network shall be via Owner LAN.

Coordinate with any and all trade contractors as required to provide a fully functioning system.

Unless noted otherwise, "Contractor" shall refer to A/V & installer.

Applicable provisions of Division 1 shall govern all work under this section.

The A/V System and associated components manufactured by Cisco Electronics is the basis of design for the system specified herein . Acceptable manufacturers, Crestron Electronics and Extron Electronics will be considered as equal to satisfy the requirements of this specification. If either is proposed as an alternate to the Cisco system as specified, the shop drawing submittal shall be submitted with a line-by-line specification compliance document included. This document details technical considerations only. It is assumed that registration, licensing, policies regarding disclosure and privacy (notification, processing of images, time, and date stamping, recording of sound, etc.), and or legal obligations are the responsibility of Owner.

1.2 Supplementary Conditions, and sections under Division 1 General Requirements.

All work and materials shall conform in every detail to rules and requirements of National Fire Protection Association, the National Electrical Code and the Kentucky Building Code.

All materials shall be listed by UL and shall bear UL label. If UL has no published standards for a particular item, then other national independent testing standards shall apply, and such items shall bear those labels. Where UL has an applicable system listing and label entire system shall be so labeled. Other applicable standards are as follows:

1. ANSI/IEEE C2 - National Electrical Safety Code

2. NFPA 70-1999 - National Electrical Code

3. IEEE/ANSI 142-1982 – Recommendations for Grounding of Industrial & Commercial Power Systems.

4. IEEE 802.3 standards for CSMA/CD (Ethernet) based LANs.

5. Emissions: FCC 15, Class A; CE: EN55022 (Emissions)

6. CE: EN50082-01 (Immunity)

7. CE, UL 1950; CUL 1950 CE: EN60950 (Safety)

8. State of Kentucky

9. City of Corbin KY

1.3 DEFINITIONS AND ABBREVIATIONS

A/V – Audio/Video System

LAN – Local Area Network

1.4 WORK BY OWNER

Owner shall provide:

1. Verify exact monitor, camera, microphones, speaker mounting locations.

2. Verify Acceptable per-camera field-of-view information.

4. Cross-connections from A/V components to building LAN, contractor provides all interconnection cables (Patch Cables) as needed but may not connect to LAN without ITS oversight and approval.

5. All active LAN components (switches, routers) as required for A/V function.

6. IP-address allotment and management for A/V devices as needed.

1.5 SUBMITTALS

Product Data: For each type of product indicated.

System Design drawings with cable routing, device location and labeling.

Communication and Security Closet layouts.

1.6 QUALITY ASSURANCE

Manufacturer shall:

- a. Shall have a minimum of ten (10) years' experience in the manufacture and design of VMS products.

Installer shall:

- b. Shall have Minimum of five (5) years' experience installing VMS products. All installation, configuration, setup, programming and related work shall be performed by technicians thoroughly trained by the manufacturer in the installation and service of the equipment provided

A/V System Contractor shall:

- a. Shall have successfully completed projects of equal magnitude and function ,of the system specified in following sections.

b. Shall have available a fully operable installation similar to the AV system specified here-in, that is available, for demonstration of all functions specified here-in ,to the FCHD representatives within a 100 mile radius of Corbin, Kentucky.

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- Platform independence to run the native Cisco RoomOS or Microsoft Teams Rooms experience. When configured for RoomOS, seamless meeting-join experience for Webex meetings and third-party video interoperability with Microsoft Teams, Zoom, and Google Meet
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 - Frames camera mode: Automatically captures a condensed view of in room participants and frames them individually or in smaller groups for more equitable meetings, on Webex and when using third-party meetings
 - People focus: When the device is used with Webex, it uses advanced camera intelligence to dynamically update the screen layout to ensure everyone is equally framed in the meeting
 - Speaker tracking: When enabled, it uses a dedicated microphone array to detect and provide a prominent view for the active speaker

- Automatic, machine learning–based noise removal blocks out disruptive sounds coming from the meeting room (e.g., typing, paper rustling)
- 4K wireless content sharing via Webex, Miracast, and Apple AirPlay for exceptional presentations, or via USB and HDMI passthrough

Workspace intelligence

- Uses ultrasound technology to automatically activate when someone walks into the room, and recognizes them through their mobile device
- Supports the Cisco Room Navigator control unit: can be paired either with a table-stand controller, a wall-mount touch panel, or both in parallel for native conference controls, room controls, environmental monitoring, and room booking, and even direct access to your third-party workspace experience applications for space reservation, wayfinding, and digital signage
- Provides intelligent people count based on presence sensors and custom macros, enabling alignment with safety guidelines and analytics for better resource planning
- Enables smart customizations via macros and custom APIs, such as digital signage, custom alerts, and more to support internal communications, visitor management, safety, and well-being
- Can be paired with up to three screens to infuse full HD video and 4K content sharing into a cohesive experience
- Connect your laptop with Codec EQ via a single USB-C to use the camera, microphones, and speakers of the device for an instant BYOD experience
- Supports dual content sources for local meetings
- View whiteboard content and annotations shared from Cisco Board Series, Cisco Desk Series, or the Webex App
- Automatic screen/display integration through HDMI CEC
- Supports Cisco and third-party cameras, microphones, speakers, and other collaboration peripherals via PoE, USB, and analogue ports
- Supports Wi-Fi and Bluetooth® - Not available on Non-Radio Version*
- Optimized for pairing with the Cisco Room Navigator touch panel to control the video conference, control room peripherals, add smart room booking, and run third-party workspace management applications
- Unified management, provisioning, monitoring, troubleshooting, analytics, and workspace insights in Control Hub
- Flexibility to register on-premises or in the Webex Cloud

- Hardware is optimized to run on a cloud platform for great experiences in shared rooms and spaces with easy access to hosted conferences
- Secure management, with end-to-end encryption when using Webex

2.2 MULTI-PURPOSE ROOM CAMERAS

Conference Room Camera shall be: Cisco C5-CAM-PTZ4K

Ceiling Mounting Bracket shall be: CTZ-PTZ4K-CLNGMNT

Cisco SmartNET Total Care Service Agreement for Camera 36 Months shall be: CON-SNT-CSIF4KCA

Camera shall:

1. Be ceiling / wall mountable dome-type.

- 4x CMOS image sensors with machine intelligent switching (up to 20MP resolution per sensor)
- The camera generates frames from the 4 sensors simultaneously to provide a single HD output at 1080p
- Support up to 60 fps
- 1/1.7 CMOS
- 7x zoom (5x native optical zoom with digital zoom enhancement)
- f/2.0 aperture
- 83° horizontal field of view on wide lens
- 50° horizontal field of view on 3 tele-lenses
- Automatic group framing (audio + face detect)
- Speaker tracking
- Frames camera mode: intelligent people framing for equitable views
- 5056 x 3888 pixel resolution
- Auto focus, brightness, and white balance
- Focus distance 1 m to inf

Bandwidth

- Up to 20 Mbps

- Minimum bandwidth:
- 720p30 from 768 kbps
- 720p60 from 1152 kbps

- 1080p30 from 1472 kbps
 - 1080p60 from 2560 kbps

Minimum bandwidth for resolution/frame rate

- 1920 x 1080 at 60 fps from 2560 kbps

Firewall traversal

- Cisco Expressway™ technology
- H.460.18, H.460.19 firewall traversal

Video standards

- H.264, H.265, and H.263

2.3 A/V CONTROLLER:

AV CONTROLLER

AV Controller shall be CISCO CS-CODEC-EQ-K9+

Platform compatibility

- RoomOS 11.1.2 and later (for native Webex meetings and video interoperability for Microsoft Teams, Zoom, and Google Meet)
 - Microsoft Teams Rooms (also featuring native Webex meetings when registered in Control Hub)
- Available bundle solutions

- Cisco Room Kit EQ (featuring the Cisco Quad Camera)
- Cisco Room Kit EQ PTZ 4K (featuring the Cisco PTZ 4K Camera)
- Cisco Codec EQ Stand-alone

Default components

- Cisco Codec EQ
- Cisco Quad Camera or the Cisco PTZ 4K Camera
- Wall mount for Quad Camera
- Power adapter (for Quad Camera)
- Region-specific power cord
- Selection of one Cisco Room Navigator table-stand or wall-mount control unit

Optional hardware components

- Cisco PTZ 4K Camera
- Cisco Precision 60 Camera
- Cisco Room Navigator table-stand (additional unit)
- Cisco Room Navigator wall-mount (additional unit)
- Cisco Table Microphone
- Cisco Ceiling Microphone
- Cisco Table Microphone Pro
- Wall mount for Cisco Codec EQ
- Rack ears for Cisco Codec EQ
- Cisco Active USB-C Cable, 9m
- Cisco Multi-head Cable 4K
- Network cable

Video inputs

- 1x USB-C input supports formats up to maximum 3840 x 2160 at 30 fps (USB-C port has charging capability with a maximum of 15W power output)
- 3x HDMI inputs support formats up to maximum 3840 x 2160 at 30 fps including 1920 x 1080 at 60 fps; support for HDCP 1.4 on 1x HDMI input
- Extended Display Identification Data (EDID)
- Consumer Electronics Control (CEC) 2.0

Video outputs

- 3x HDMI outputs support formats up to 3840 x 2160 at 60 fps
- Consumer Electronics Control (CEC) 2.0
- Connectivity with an interactive touch screen via HDMI out and USB-A*

Encode and decode

- Main video: 1920 x 1080 at 60 fps
- Presentation channel: 3840 x 2160 at 15 fps

Audio standards

- G.711, G.722, G.722.1, G.729, AAC-LD, and Opus

Audio features

- High-quality 20kHz full-band audio
- Prepared for inductive loop (line out)
- Acoustic Echo Cancellation (AEC)
- Active Lip Synchronization
- AI-Powered, Adaptive Noise Removal
- Automatic Gain Control (AGC)
- Full Duplex
- Self-Hear
- Ultrasound Technology
- The full Audio API and Audio Console application for advanced audio

setup and customizations with the Codec EQ can be unlocked with an AV Integrator option key.

Audio inputs

- 3x mini-Jack analog audio input
- 3x HDMI input
- 1x USB-C audio input
- 1x USB-A audio input
- 4x PoE++ Ethernet for audio over IP
- Connectivity with up to 3x digital Cisco Table Microphone Pro devices by default, or up to 8x units with an AV integrator license
- Connectivity with third-party audio systems via AES67

Audio outputs

- 1x analog line out
- 3x HDMI audio out
- 1x USB-A audio out
- 1x USB-C audio out
- 4x PoE++ Ethernet for audio over IP
- Connectivity with third-party audio systems via AES67

Loudspeakers (Quad Camera)

- High-quality loudspeaker system with a single full-range driver and dual low-frequency drivers
- Frequency response: 100Hz to 20kHz
- Max output level: SPL 90dB
- 1 RCA output for subwoofer (Quad Camera)

Camera modes (Quad Camera)

- Group view: Automatically detects meeting participants and provides ideal group framing for the best view
- Speaker view: Uses a dedicated, built-in microphone array to detect and provide a prominent view for the active speaker
- Frames: Captures a condensed view of in-room participants and frames them individually or in smaller groups for more equitable meetings, on Webex and when using third-party meetings
- Manual with the option for presets

Video stream layouts

- Supporting available Webex video stream layouts and meeting features, including focus, grid, prominent, stack, and overlay. For more information, please consult the Webex Help Center.
- People Focus helps create an optimized view of every participant in Webex meetings via smart cropping to remove excess real estate

Speaker tracking (Quad Camera)

- 8-element built-in microphone array for accurate speaker tracking
- Quad Camera can support intelligent framing and dynamic speaker tracking with 7x zoom capability
- For an optimal speaker-tracking experience for people joining remotely, it is recommended that the furthest in-room participant is located within less than 9 meters from the video device. Please note that

the best overview (automatic group framing) camera mode can support an extended distance from the Quad Camera.

- Multi-camera speaker view (coming soon): allows for an extended camera reach by zooming on the active speaker and providing an optimal view in very long conference rooms with participants over 9 meters from the device. Requires the combined deployment of the Room Kit EQ, the Cisco PTZ 4K Camera, and Cisco Table Microphone Pro units for the extended, directional voice capture range.

Presenter tracking

- Presenter tracking available with the Cisco PTZ 4K Camera or the Precision 60 Camera
- AI-powered face and upper-body detection capability
- Camera automatically follows the active presenter within a defined zone and helps ensure an optimized view
- Cinematic presenter and audience view: intelligent framing and dynamic switching can be enabled with a combination of the Quad Camera bar and the PTZ 4K Camera

Cinematic cross-view

- Multi-camera cross-view (coming soon): Using Codec EQ and the combined deployment of the front-of-the-room Quad Camera bar with two side-cameras to provide AI-directed, cinematic cross-view of conversations happening across the conference table

Content stream

- H.239 (H.323) dual stream
- Binary Floor Control Protocol (BFCP) (SIP) dual stream
- Support resolutions up to 3840 x 2160 at 15 fps and 1920 x 1080 at 60 fps

Wireless sharing

- Webex App (up to 3840 x 2160 at 7.5 fps)
- Cisco Intelligent Proximity client (up to 1920 x 1080 at 3 fps)
- Miracast (1920 x 1080 at 30 fps) – Not available on non-radio version. Apple AirPlay wireless sharing:
- Screen mirroring up to 1920 x 1080 at 60 fps
- Extended desktop (Mac only) - up to 1920 x 1080 at 60 fps
- Video streaming up to 3840 x 2160 at 30 fps

MultiSite features (embedded multipoint) (optional upgrade)

- Adaptive SIP/H.323** MultiSite:
- 3-way resolution up to 1080p30 plus content up to 4Kp15
- 4-way resolution up to 720p30 plus content up to 4Kp15
- 5-way resolution up to 720p30 plus content up to 4Kp15
- Full individual audio and video transcoding
- H.323**/SIP/VoIP in the same conference
- Support for presentation (H.239/BFCP) from any participant at resolutions up to 3840 x 2160 at 15 fps
- Best Impression (automatic continuous presence layouts)
- Encryption and dual stream from any site

Protocols

- H.323
- SIP
- Webex
- WebRTC

Embedded encryption

- H.323** and SIP point-to-point
- Standards-based: H.235 v3 and Advanced Encryption Standard (AES)
- Automatic key generation and exchange

IP network features

- DNS lookup for service configuration
- Differentiated services (Quality of Service [QoS])
- IP-adaptive bandwidth management (including flow control)
- Automatic gatekeeper discovery
- Dynamic playout and lip-sync buffering
- H.245 Dual-Tone Multi-Frequency (DTMF) tones in H.323
- RFC 4733 DTMF tones in SIP
- Date and time support using Network Time Protocol (NTP)
- Uniform Resource Identifier (URI) dialing
- Dynamic Host Configuration Protocol (DHCP)
- 802.1X network authentication
- 802.1Q Virtual LAN
- 802.1p [QoS and Class of Service (CoS)]
- Cisco Media Assure and ClearPath, including packet loss-based downspeeding

Call control

- Native registration on Cisco Unified Communications Manager (CUCM)
- Requires CUCM version 12.5 or later with device pack for Room Kit EQ
- Native registration with Cisco Expressway
- Webex
- Third-party H.323 Gatekeepers and standards-based SIP proxies

IPv6 network support

- Single call stack support for both H.323 and SIP
- Dual-stack IPv4 and IPv6 for DHCP, SSH, HTTP, HTTPS, DNS, DiffServ
- Support for both static and automatic IP configuration (stateless address auto configuration)

Security features

- Secure management using HTTPS and SSH protocols
- End-to-end encryption for calls and meetings on Webex
- Standards-based media encryption on all back-ends (Secure Real-time

Transport Protocol [SRTP], using AES-128-GCM or AES-256-GCM)

- WPA3™ and WPA3-Enterprise with CCMP128 Wi-Fi® security
- Password protection to access administration available on Room Navigator controller

- Network settings protection

Certificate management

- Certificate Authority Proxy Function (CAPF) support for additional security
- Manufacturer-Installed Certificates (MIC)
- Locally Significant Certificates (LSC)
- X.509 Digital Certificates (DER encoded binary); both DER and Base-64 formats are acceptable for the client and server certificates; certificates with a key size of 1024, 2048, and 4096 are supported

Other interfaces

- 4x USB 3.0 ports, up to 1.5A charging capability per port. Connectivity for external USB microphones, keyboards, headsets, touch display, and future integrations
- Micro USB port (for service)
- Factory reset pinhole

Network interfaces (Codec EQ)

- Ethernet (RJ-45) 10/100/1000 for LAN
- 4x PoE++ (802.3bt) Ethernet (RJ-45) 10/100/1000 with a total power budget of up to 90W for
- Camera control and powering
- Room Navigator touch controller
- AV over IP room peripherals (including the multi-directional Table Microphone Pro)
- Wi-Fi 802.11a/b/g/n/ac/ax 2.4 GHz and 5 GHz also supported for LAN - not available in non-radio versions; Wi-Fi 6E support coming soon
- 2x2 Multiple Input and Multiple Output (MIMO)

Note: Due to compliance regulations, it is required that 802.11d is enabled in the access point for the product to operate properly within 5725 to 5875 MHz.

Using a Wi-Fi connection is a flexible option; however, an Ethernet connection is always preferred for high performance.

Power supplies

- 100 to 240 VAC, 50/60 Hz
- Average 20 W
- Quad Camera must be used with power supply PSU-12VDC-70W-GR=
- PTZ 4K Camera power supply (PSU-12VDC-40W2=) is optional

2.4 WIRE AND CABLE

General

1. Provide and install all device DATA and A/V cables for a complete system

2.5 NETWORK SWITCH

AV Network switch shall be Cisco C9200CX-8P-2X2G-E

- Full Power over Ethernet Plus (PoE+) capability for up to 48 ports for C9200. Power over Ethernet Plus (PoE+) capability for up to 12 ports, IEEE 802.3bt class 6 and Cisco UPOE capability for up to 8 ports for C9200CX.
- Resiliency with Field-Replaceable Units (FRU) and redundant power supply, fans, and modular uplinks for C9200 models. C9200CX models are fanless and are powered by internal fixed power supply or optional power adapters, when not powered by upstream IEEE 802.3bt class 6 60W PSE
- Flexible power source options from line voltage AC, low voltage DC to High Voltage DC (HVDC) in C9200CX models provide the choices for customers to migrate to efficient DC micro grid powered by renewable energy sources for a sustainable future.
- Flexible downlink options with data, PoE+, UPOE, UPOE with mGig for Wi-Fi 6/6E.
- Operational efficiency with optional backplane stacking, supporting stacking bandwidth up to 160 Gbps.
- UADP 2.0 Mini with integrated CPU offers customers optimized scale with better cost structure.
- Enhanced security with AES-128 MACsec encryption on C9200 and AES-256 MACsec encryption for C9200CX models, policy-based segmentation, and trustworthy solutions for the whole Catalyst 9200 Series.
- Layer 3 <https://apps.cisco.com/Commerce/> and CLI operations options
- Cisco Software-Defined Access (SD-Access).
 - Simplified operations and deployment with policy-based automation from edge to cloud managed with Cisco Identity Services Engine (ISE).
 - Network assurance and improved resolution time through Cisco Catalyst Center.
- Plug and Play (PnP) enabled: A simple, secure, unified, and integrated offering to ease new branch or campus device rollouts or updates to an existing network.
- Cisco IOS XE: A Common Licensing based operating system for the enterprise Cisco Catalyst 9000 product family with support for model-driven programmability and streaming telemetry.
- ASIC with programmable pipeline and micro-engine capabilities, along with template-based, configurable allocation of Layer 2 and Layer 3 forwarding, Access Control Lists (ACLs), and Quality of Service (QoS) entries.
- Cloud monitoring for Catalyst on Meraki dashboard.

Supply C9200CX Cisco DNA Essentials, 3Y Term License, 8P for network Switch

Supply Cisco Collaboration Flex Plan 3.0 -- A-FLEX-3 for Network Switch

2.6 RACK

- EIA compliant 19" mobile furniture equipment rack shall be Middle Atlantic Products model #RFR-__28__ (Model # RFR-1628-BR). Overall dimensions of RFR shall be __"H x 27.3" W x 27.55" D (refer to chart). Useable height of RFR shall be __rack spaces, useable depth shall be 23.31". RFR shall come equipped with one pair of adjustable steel rack rail with tapped 10-32 mounting holes in universal EIA spacing, black e-coat finish and numbered rack spaces. RFR shall have bolt through 4" height casters. RFR shall have 4 casters total, with locking front casters. RFR shall have internal steel bracing. RFR shall be constructed of melamine and have a __ finish (refer to chart). RFR shall have an undersized top. RFR shall include a locking and latching IR friendly tempered glass front door. RFR shall include a locking and latching melamine rear door. RFR shall have rear venting, cable entry and cable spools. RFR shall have a 60 MM (2.375 in.) cable grommet on top, that accepts a monitor mount. RFR shall accept patent-

pending LeverLock™ tool free and hardware free internal cable and device management system accessories. RFR shall provide a UL Listed load capacity of 350 lbs. mounted in the rack, 50 lbs. on top of the rack and 35 lbs. on the optional monitor mount. RFR shall be UL Listed in the US and Canada. RFR shall be manufactured by an ISO 9001 and ISO 14001 registered company. RFR enclosure shall be warranted to be free from defects in material or workmanship under normal use and conditions 7 years

PART 3 – EXECUTION

GENERAL

- 3.1 Work performed for installation of VMS A/V system shall be performed by an A/V System “Integrator –Contractor”.

Provide equipment as indicated on Drawings and specified herein.

Provide all labor and materials necessary to construct systems as described herein to include furnishing and installing all system equipment, interconnecting cabling, programming and start-up, software (including software upgrades and reprogramming as necessary), termination components, mounting hardware, incidentals, accessories, testing, labeling, documentation, and training as detailed in following sections.

1. Neatly lace, dress, and support cabling.
2. Coordinate any downtime with Owner.

Prior to installation:

3. Conduit and equipment back boxes are as required. Contractor is responsible for coordination with all trades to ensure that conduit and back boxes are correctly placed for A/V use. Contractor is responsible for coordinating installation of conduit and boxes to make sure they are installed on schedule with other trades and are coordinated as to not interfere with other systems or pathways.
 4. 120V AC Power is as required and is properly located.
 5. LAN structured cabling is as required and properly located, and installation has been coordinated with other trades.
 6. Coordinate all devices and locations prior to equipment installation with owner.
 7. Coordinate Owner-desired camera views, providing camera modeling prior to installation.
 8. Coordinate Camera housing and mount finishes with Architect and Owner.
- Install and wire equipment in accordance with BICSI Installation Standards, manufacturer’s recommendations, and accepted engineering and installation practices.
Mount system components as recommended by manufacturer.
9. Arrange equipment to facilitate permanent access for use and maintenance.

CABLE INSTALLATION

- 3.2 Neatly lace, dress, and support cabling.

Pull cables in accordance with cable manufacturer's recommendations and ANSI/EEE C2 Standards.

1. Do not exceed manufacturer's recommended pulling tensions.
2. Do not install bruised, kinked, scored, deformed, or abraded cable.
3. Do not splice cable between indicated termination, tap, or junction points.
4. Remove and discard cable where damaged during installation and replace it with new cable.
5. Pull all cable by hand unless installation conditions require mechanical assistance.

Run all wire and cable continuous from device location to final point of termination. No mid-run cable splices shall be allowed.

Furnish and install all cable such that ample slack is supplied at device terminating end of cable to compensate for any final field modifications in camera location.

6. Loosely coil slack in "Figure-eight" in a manner that prevents kinking.

7. Loop radius shall be at least 4X minimum bend radius for cable.

8. Slack length of cable shall be 4 feet (minimum).

Provide code compliant fire proofing techniques for all penetrations of fire rated partitions and slabs, where penetrations are made by or used for installation of A/V System.

Coordinate routing of wire and cable requiring isolation from power, radio frequency (RF), electromagnetic interference (EMI), telephone, etc. with Engineer.

At no time shall any cable be subjected to a bend less than manufacturer's specified minimum radius.

Provide grommets and strain relief material where necessary to avoid abrasion of wire and excess tension on Wire and Cable.

Make connections with solder-less devices, mechanically and electrically secured in accordance with manufacturers' recommendations. Wire nuts shall not be an acceptable means of connecting wire and cable.

3.3 A/V SYSTEM

Mount A/V System per project drawings.

Field-verify exact locations and field-of-views with Owner prior to installation.

- Large MULTI-PURPOSE ROOM will be split into (4) large rooms that will be bisected with modular walls.
- Each of the referenced (#2, #3 and #4) rooms will have a new quad capable display at the front of the rooms and conference room #1 will have a new quad capable display.
- The quad monitors will mirror conference room # 1 display when the modular wall is open between #1 and #2 conference areas and when #3 and/or #4 is being used for overflow.
- When the modular wall is closed, the monitors will be controlled from the two (2) controllers.
- Cameras are to point towards the speaker area in each section.
- The cameras will be used for a zoom meeting and to be projected onto the monitors.
- Cameras in audience area will be for the zoom meetings so the person speaking can be seen.

Coordinate with Owner prior to installation to confirm required parameters.

3.4 NETWORK CONNECTION

Cross-connections to building LAN by Owner

3.5 LABELING AND IDENTIFICATION

1. Cabling, Hardware, and Equipment shall be clearly labeled using a Code identifying each piece as unique throughout A/V System. This code will aid in identifying hardware for servicing and maintenance.

2. Labels and Tags shall be machine-generated using English character set in black ink on white background labels and Tags.

a. Self-laminating permanent labels are required on cables; permanent non-marring labels are required on all other hardware/cabinets.

b. No hand-written Labels or Tags shall be allowed.

c. Dymo or Kroy type adhesive backed lettering is not acceptable.

Identify and tag all cables to denote function.

a. System of which cable is a part,

b. Indication of cable destination (e.g., room or component), and

c. Unique alpha-numeric identifier that distinguishes cable from all others in system.

All labels shall be machine generated. Handwritten labeling is not acceptable.

3.6 SYSTEM TESTING AND ACCEPTANCE

System shall be complete and fully operational before requesting final acceptance a

Installation of all field devices will be inspected by Owner or Owner's representative. Inspection will consider overall neatness and quality of installation, functionality of each individual device, mounting, wiring and labeling.

Provide written notification to Owner that system is completely installed, integrated, and is fully functional as specified herein.

3.7 OWNER TRAINING

Training course for system covered in this section shall be a minimum of 6-hours.

Maximum number of students to be (10).

1. Training materials shall be provided to all students.

Record, label, and catalog all training on DVD Videodiscs. Provide discs to Owner for future in-house training sessions and / or reviews. Furnish all temporary equipment necessary for taping all training sessions. Maintain accurate and up-to-date time sheets of all training sessions.

Contractor shall be on call during Warranty period to answer any questions Owner might have. The Owner reserves the right to use any excess training hours, not used by time of system completion, for future training as requested by Owner until total number of training hours has been completed.

3.8 DOCUMENTATION

All Owners manuals and or maintenance information shall be provided in printed form as well as electronic PDF format to the owner and owner representative.

3.9 WARRANTY AND SUPPORT

Unless otherwise noted, Contractor shall guarantee all materials, equipment, etc., two (2) years from date of final Owner acceptance of system. This guarantee shall include all labor, material, and travel time.

Contractor/Integrator and/or manufacturer(s) of system equipment must offer:

1. Technical Support Capabilities (Technician onsite) response time onsite within 4 hours, 24- hours/7-

days per week (“24/7”), and 365 days per year.

END OF SECTION

SECTION 283116 - FIRE ALARM SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Division 01 General Requirements
 - 2. Division 07 Thermal and Moisture Protection, Section 078413 Penetration Firestopping
 - 3. Division 08 Openings, Section 087100 Door Hardware
 - 4. Division 21 Fire Suppression
 - 5. Division 23 Heating Ventilating and Air Conditioning Monitoring & Control (HVAC).
 - 6. Division 26 Electrical, Section 260500 Common Work Results for Electrical

1.02 SUMMARY

- A. Section Includes:
 - 1. This specification describes the expansion to the existing facility's Fire -Lite, addressable Fire Detection and alarm signaling system, The existing control panel is an intelligent device addressable, analog detecting, low voltage and modular, with digital communication techniques, in full compliance with all applicable codes and standards. The additional features and capacities described in this specification and indicated on the drawings are required as a minimum for this project and shall be furnished by the successful contractor.
 - 2. The extended system installation shall be in full compliance with National and Local Codes.
 - 3. The system expansion shall include all required hardware, devices, raceways, interconnecting wiring and software to accomplish the requirements of this specification and the contract drawings, whether specifically itemized herein.
 - 4. All equipment furnished for this expansion shall be new and the latest state-of-the-art products compatible with the existing system.
 - 5. The system shall be expanded as specified and as shown on the drawings, and shall be installed, tested and approved by the local Authority Having Jurisdiction, and turned over to the owner in an operational condition.
 - 6. In the interest of job coordination and responsibilities, the installing contractor shall contract with a single supplier for fire alarm equipment, to provide engineering, procuring required Commonwealth of Ky approvals, programming, inspection and tests, and shall be capable of providing a "UL Listing Certificate" for the complete system.

1.03 DEFINITIONS

- A. ASME: American Society of Mechanical Engineers.
- B. FACP: Fire alarm control panel.
- C. FM: FM Global (Factory Mutual).
- D. Furnish: To supply the stated equipment or materials.
- E. Install: To set in position and connect or adjust for use.
- F. LED: Light-emitting diode.
- G. NCC: Network Command Center.
- H. NFPA: National Fire Protection Association. Definitions in NFPA 72 apply to fire alarm terms used in this Section.
- I. NICET: National Institute for Certification in Engineering Technologies.
- J. Provide: To furnish and install the stated equipment or materials.
- K. UL: Underwriters Laboratories.

1.04 SYSTEM DESCRIPTION

- A. The system shall be expanded and upon completion shall be a complete, electrically supervised fire detection and notification system, with the following capabilities, features, and capacities:
 - 1. The local system shall provide status indicators and control switches for all of the following functions:
 - a. Audible and visual notification alarm circuit zone control.
- Status indicators for sprinkler system water-flow and valve supervisory devices.

1.05 PERFORMANCE REQUIREMENTS

- A. General Performance: The installation shall comply with NFPA 72 and all contract documents and specification requirements.
- B. All interconnections between the new expansion system, the existing system and the monitoring system shall be arranged so that the entire system can be UL-Certificated.
- C. The final installation shall be a complete, supervised, non-coded, addressable multiplex fire alarm system conforming to NFPA 72.
- D. The system shall operate in the alarm mode upon actuation of any alarm initiating device. The system shall remain in the alarm mode until all initiating device(s) are reset and the fire alarm control panel is manually reset and restored to normal.

- E. The existing system shall be upgraded to insure it will provide the following functions and operating features upon completion of the expansion.
1. The FACP shall provide power, annunciation, supervision and control for the system.
 2. Provide Class B initiating device circuits.
 3. Provide two Class B notification appliance circuits. Arrange circuits to allow individual, selective, and visual notification by zone. Notification appliance circuits shall be zoned to correspond with the building fire barriers and other building features.
 4. Strobes shall be synchronized throughout the entire building including both existing center and the new expansion.
 5. Provide verification of the completed system for electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and proper placement of additional system modules required within the control panel.
- F. The expanded system shall provide a field test function where one person can test the complete system or a specific area while maintaining full operational function of other areas not being tested. Alarms, supervisory signals, trouble signals shall be logged in system history during the walk-test.
- G. Alarm functions shall override trouble or supervisory functions. Supervisory functions shall override trouble functions.
- H. Fire alarm signal initiation shall be by one or more of the following devices:
1. Manual pull station
 2. Heat detector
 3. Addressable area smoke detectors
 4. Standard Addressable Duct smoke detector
 5. Specialized Duct Smoke detector
 6. Automatic sprinkler system water flow switch.
- I. Activation of any system fire, security, supervisory, trouble, or status initiating device shall cause the following actions:
1. Fire Alarm Condition:
 - a. Sound an audible alarm and display a custom message defining the building in alarm and the specific alarm point initiating the alarm on an LCD display.
 - b. Sound the ANSI 117-1 signal with synchronized audible notification appliances and synchronized strobes throughout the facility.
 - c. Audible signals shall be silenced from the fire alarm control panel by an alarm silence switch. Visual signals shall be programmable to flash until the system reset or alarm silencing, as required.

- d. A signal dedicated to sprinkler system water flow alarm shall not be silenced while the sprinkler system is flowing at a rate of flow equal to a single head.
 - e. System operated duct detectors as per local requirements shall accomplish HVAC shut down.
2. Supervisory Condition:
- a. Display the origin of the supervisory condition report at the local fire alarm control panel LCD display.
 - b. Activate supervisory audible and dedicated visual signal.
 - c. Audible signals shall be silenced from the control panel by the supervisory acknowledge switch.
 - d. Record within system history the initiating device and time of occurrence of the event.
3. Trouble Condition
- a. Display at the local fire alarm control panel LCD display, the origin of the trouble condition report.
 - b. Activate trouble audible and visual signals at the control panel and as indicated on the drawings.
 - c. Audible signals shall be silenced from the fire alarm control panel by a trouble acknowledge switch.
 - d. Trouble conditions that have been restored to normal shall be automatically removed from the trouble display queue and not require operator intervention. This feature shall be software selectable and shall not preclude the logging of trouble events to the historical file.
 - e. Trouble reports for primary system power failure to the master control shall be automatically delayed for a period of time equal to 25% of the system standby battery capacity to eliminate spurious reports as a result of power fluctuations.
 - f. Record within system history, the occurrence of the event, the time of occurrence and the device initiating the event.
- J. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1.06 SUBMITTALS

- A. Product Data: For each type of product that is provided for this upgrade and expansion. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories. Complete manufacturer's catalog data including supervisory power usage, alarm power usage, physical dimensions, and finish and mounting requirements.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 2. Wiring Diagrams: For power, signal, and control wiring.
 3. Complete drawings covering the following shall be submitted by the contractor for the proposed system:
 - a. Floor plans in a CAD compatible format at a scale of 1/8" = 1'-0" showing all equipment and raceways, marked for size, conductor count with type and size, showing the percentage of allowable National Electric Code fill used.
 - b. Provide a fire alarm system function matrix as referenced by NFPA 72, Figure A-7-5.2.2 (9). Matrix shall illustrate alarm input/out events in association with initiation devices. Matrix summary shall include system supervisory and trouble output functions. Include any and all departures, exceptions, variances or substitutions from these specifications and/or drawings at time of bid.
 4. Installation drawings shop drawings, and as-built drawings shall be prepared by an individual experienced with the work specified herein.
 5. Incomplete submittals shall be returned without review, unless with prior approval of the Engineer.
- C. Qualification Data: For qualified Installer, manufacturer, fabricator, testing agency, and factory-authorized service representative.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Operation and Maintenance Data: For all additional fire alarm equipment provided for this expansion, to include in operation and maintenance manuals.
- G. Warranty: Sample of special warranty.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: The publications listed below form a part of this publication to the extent referenced. The publications are referenced in the text by the basic designation only. The latest version of each listed publication shall be used as a guide unless the authority having jurisdiction has adopted an earlier version.
1. FM Global (Factory Mutual (FM)):FM Approval Guide
 2. National Fire Protection Association (NFPA)
 - a. NFPA 70 National Electrical Code
 - b. NFPA 72 National Fire Alarm Code

- c. NFPA 90A Standard For The Installation of Air Conditioning and Ventilating Systems
 - d. NFPA 101 Life Safety Code
- 3. Underwriters' Laboratories, Inc. (UL) equipment standards, Latest Edition
 - a. UL Fire Protection Equipment Directory
 - b. UL Electrical Construction Materials Directory
 - c. UL 38 – Manually Actuated Signaling Boxes for Use With Fire Protection Signaling Systems
 - d. UL 228 – Door Holding Devices
 - e. UL 268 - Smoke Detectors for Fire Protective Signaling Systems
 - f. UL 268A - Smoke Detectors for Duct Application
 - g. UL 464 - Audible Signal Appliances
 - h. UL 497A – Secondary Protectors for Communications Circuits
 - i. UL 521 - Heat Detectors for Fire Protective Signaling Systems
 - j. UL 864 - Control Units for Fire Protective Signaling Systems
 - k. UL 1283 – Electromagnetic Interference Filters
 - l. UL 1449 - Transient Voltage Surge Suppressors
 - m. UL 1971 - Signaling Devices for the Hearing Impaired
- 4. International Code Council
 - a. International Building Code
 - b. International Fire Code.
- 5. State and Local Building Codes as adopted and/or amended by The Authority Having Jurisdiction, ADA, and/or State and local equivalency standards as adopted by The Authority Having Jurisdiction.
- 6. ISO 9002

B. Supplier Qualifications

- 1. The manufacturer of the supplied products must utilize multi-channel product distribution on a national basis to be considered for this bid. The manufacturer must have factory branches as well as independent distributors to allow the end user with the ability to utilize factory trained and authorized competitive service providers after system installation and commissioning.

2. Provide the services of a factory trained and certified representative or technician, experienced in the installation and operation of the type of system provided.
3. The technician shall supervise installation, software documentation, adjustment, preliminary testing, final testing and certification of the system. The technician shall provide the required instruction to the owner's personnel in the system operation and maintenance.
4. The suppliers shall furnish evidence they have an experienced service organization, which carries a stock of spare and repair parts for the system being furnished.
5. The equipment supplier shall be authorized and trained by the manufacturer to calculate, design, install, test, and maintain the air sampling system and shall be able to produce a certificate stating such upon request.

C. Installer Qualifications:

1. Before commencing work, submit data showing that the manufacturer has successfully installed fire alarm systems of the same scope, type and design as specified.
2. The contractor shall submit copies of all required Licenses and Bonds as required in the State having jurisdiction.
3. Contractors unable to comply with the provisions of Qualification of Installers shall present proof of engaging the services of a subcontractor qualified to furnish the required services.

D. Source Limitations for fire alarm equipment: Obtain fire alarm equipment from single source.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, and shelf life if applicable.
- B. Store materials inside, under cover, above ground, and kept dry and protected from physical damage until ready for use. Remove from site and discard wet or damaged materials.

1.09 PROJECT CONDITIONS

- A. Installed products or materials shall be free from any damage including, but not limited to, physical insult, dirt and debris, moisture, and mold damage.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire alarm equipment that fail(s) in materials or workmanship within specified warranty period.
 1. Labor Installation Warranty Period: 1 year from date of Substantial Completion.

2. Equipment warranty Period: 3 years from date of shipment, with a provision to extend the warranty to 7 years with a signed service agreement Warranty Period: 1 year from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 CONTROL PANEL

- A. The existing system to be expanded is manufactured by the Fire-Lite fire alarm company. All additions and expansions to this system shall be compatible with the existing system allowing the final installation to operate as a single complete system.
- B. System response time from alarm to output shall be an average of three (3) seconds.
- C. All system cards and modules shall have Flash memory for downloading the latest module firmware.

2.02 POWER SUPPLY

- A. The system existing Power Supply shall be up graded if necessary to support the additional expansion components and shall provide adequate power to supply all electronic components available with the panel and 6-amps of useable 24 vdc power for auxiliary needs and NACs. The power supply shall be filtered and regulated. The power supply provides power for all system operation, including signaling line circuits, notification appliance circuits, auxiliary power, battery charger, and all optional modules. The power supply shall be rated for 120/240 VAC 50/60 Hz.
- B. The battery charger shall be able to charge the system batteries up to 26 AH batteries. Battery charging shall be microprocessor controlled and programmed to select battery sizes.
- C. Power supplies that transfer from AC to DC on AC power failure shall not be accepted, system shall run off of battery power constantly for a smooth and undiscernible transfer when AC Power fails.

2.03 INTELLIGENT INITIATING DEVICES

- A. General
 1. All initiation devices shall be insensitive to initiating loop polarity. Specifically, the devices shall be insensitive to plus/minus voltage connections.
- B. Smoke Detectors – Standard Addressable
 1. The detector shall be guaranteed in writing not to false alarm when configured by the factory trained certified technician. The detector must provide up to 11 different environmental algorithms that allow the detector to provide superior false alarm immunity without the need for additional alarm verification delays.
 2. The detector shall have a multicolor LED to streamline system maintenance/inspection by plainly indicating detector status as follows: green for normal operation, amber for maintenance required, red for alarm.
 3. The multi-criteria smoke detector shall be an intelligent digital photoelectric detector with a programmable heat detector. Detectors shall be listed for use as open area

protective coverage, in duct installation and sampling assembly installation and shall be insensitive to air velocity changes. The detector communications shall allow the detector to provide alarm input to the system and alarm output from the system within four (4) seconds. So as to minimize the effort required by the installing and maintenance technician to appropriately configure the detector to ensure optimal system design, the detectors shall be programmable as application specific.

4. The detector shall be designed to eliminate the possibility of false indications caused by dust, moisture, RFI/EMI, chemical fumes and air movement while factoring in conditions of ambient temperature rise, obscuration rate changes and hot/cold smoke phenomenon into the alarm decision to give the earliest possible real alarm condition report.
5. The intelligent smoke detector shall be capable of providing three distinct outputs from the control panel. The outputs shall be from an input of smoke obscuration, a thermal condition or a combination of obscuration and thermal conditions. The detector shall be designed to eliminate calibration errors associated with field cleaning of the chamber.
6. The detector shall support the use of a relay, or LED remote indicator without requiring an additional software address.
7. For the detector where required, there shall be available a locking kit and detector guard to prevent unauthorized detector removal.

C. Heat Detectors – Addressable

1. Thermal Detectors shall be rated at 135 degrees fixed temperature and 15 degrees per minute rate of rise. Detectors shall be constructed to compensate for the thermal lag inherent in conventional type detectors due to the thermal mass, and alarm at the set point of 135 degrees Fahrenheit. The choice of alarm reporting as a fixed temperature detector or a combination of fixed and rate of rise shall be made in system software and be changeable at any time without the necessity of hardware replacement.
2. The detectors furnished shall have a listed spacing for coverage up to 2,500 square feet and shall be installed according to the requirements of NFPA 72 for open area coverage. The thermal detector shall be model number Siga-HRD
3. Heat detector shall have the following temperature settings:
 - a. Fixed temperature at 135°F, 145°F, 155°F, 165°F, 174°F
 - b. Rate of Rise at 15°F/ min (8.3°C) at 135°F (57°C)
 - c. Rate of Rise at 15°F/ min (8.3°C) at 174°F (79°C)
 - d. Low temperature warning at 40°F (4.4°C)

D. Duct Smoke Detectors – Addressable

1. For duct detector applications, the smoke detector shall be an intelligent digital photoelectric detector. Detectors shall be listed for use as open area protective coverage, in duct installation and sampling assembly installation and shall be insensitive to air velocity changes.
2. The detector communications shall allow the detector to provide alarm input to the system and alarm output from the system within four (4) seconds. The detector shall be mounted in a duct detector housing listed for that purpose. The duct detector shall

support the use of a remote test switch, relay or LED remote indicator. The duct detector shall be supplied with the appropriate sampling tubes to fit the installation.

3. Where duct detectors are exposed to the weather a weatherproof enclosure shall be available. The duct housing cover shall include a test port for functional testing of the detector without cover removal. The duct housing shall include a cover removal switch capable of indicating cover removal status to the fire alarm control panel.
4. Where required there shall be available a duct housing with an on-board relay. Also, where required, there shall be a stand-alone housing available with its own power supply and test/reset switch that does not require connection to a fire alarm control panel.
5. Duct smoke detector housing shall allow use in duct systems with air velocity ranging from 100 to 4,000 feet per minute, within temperature ranges of -20°F to 158°F per minute, and with relative humidity ranging from 0 to 93%.

E. Manual Pull Stations – Addressable

1. Provide addressable manual stations were shown on the drawings, to be flush or surface mounted as required. Manual stations shall contain the intelligence for reporting address, identity, alarm and trouble to the fire alarm control panel. The manual station communications shall allow the station to provide alarm input to the system and alarm output from the system within less than four (4) seconds.
2. The manual station shall be equipped with terminal strip and pressure style screw terminals for the connection of field wiring. Surface mounted stations were indicated on the drawings shall be mounted using a manufacturer's prescribed matching red enamel outlet box.
3. Where required, there shall also be available pull stations with break glass, capable of explosion proof installation, capable of weatherproof installation, reset key operation, and metal housings.

F. Addressable Interface Devices

1. Addressable Interface Devices shall be provided to monitor contacts for such items as water-flow, tamper, and PIV switches connected to the fire alarm system. These interface devices shall be able to monitor a single or dual contacts. An address will be provided for each contact. Where remote supervised relay is required, the interface shall be equipped with a SPDT relay rated for 2 amps resistive and 2 amps inductive. The addressable interface modules shall be model number CT1(single input) CT2 (dual input),io(single input, single output)series.
2. Where needed, a Conventional Zone Module shall connect to the Signal Line Circuit, which will allow the use of conventional initiation devices. This module shall have the ability to support up to 16 conventional smoke detectors and an unlimited number of contact devices. This module shall also be capable of monitoring Linear Beam detectors and conventional Flame detectors. The module shall be model #RZ116-2
3. Any field modules required to monitor points outside the building (sprinkler supervisory devices, etc...) shall have surge suppression with proper grounding and cabling installed in accordance with manufacturer's instructions at the point the wiring leaves the building. All underground wiring shall be rated for wet conditions.

4. All addressable interface modules shall be capable of being grouped together without the use of standard electrical boxes, trim rings, mounting plates and covers.

2.04 NOTIFICATION APPLIANCES

A. Strobes, Horns, Horn/Strobes

1. Audible/Visual notification appliances shall be listed for indoor use, and shall meet the requirements of FCC Part 15 - Class B
2. Appliances shall be listed under UL Standard 1971 (Standard for Safety Signaling Devices for Hearing Impaired) and UL Standard 464 (Fire Protective Signaling)
3. Appliances shall use a universal back plate, which shall allow mounting to a single-gang, double-gang, 4-inch-square, 4"-octal, or a 3-1/2"-octal backbox
4. Two-wire appliance wiring shall be capable of directly connecting to the mounting back plate
5. Continuity check shall occur for entire NAC circuit prior to attaching any audible / visual-notification appliances
6. Dust cover shall fit and protect the mounting plate
7. Dust cover shall be easily removed when the appliance is installed over the back plate
8. Removal of an appliance shall result in a trouble condition by the Fire Alarm Control Panel (FACP)
9. Strobe appliances shall produce a minimum flash rate of 60 flashes per minute (1 flash per second) over the Regulated Input Voltage Range, and shall incorporate a Xenon flashtube enclosed in a rugged Lexan® lens
10. Strobes shall be available with two or four field-selectable settings in one unit, and shall be rated – per UL 1971 – for up to:
 - a. 177cd for ceiling and wall mounting
11. Strobes shall operate over an extended temperature range of 32°F to 120°F (0°C to 49°C), and be listed for maximum humidity of 95% RH
12. Strobe inputs shall be polarized for compatibility with standard reverse-polarity supervision of circuit wiring by a Fire Alarm Control Panel (FACP)
13. Audibles and Audible/Strobe Combinations
 - a. Horns and horn / strobes shall be listed for Indoor use under UL Standard 464
 - b. Horns shall be able to produce continuous synchronized output or a temporal code-3 synchronized output
 - c. Horns shall have at least 2 sound-level settings of 90 and 95 dBA
14. The strobes shall not drift out of synchronization at any time during operation

15. Audibles and strobes shall be able to synchronize on a 2-wire circuit with the capability to silence the audible, if required
16. Strobes shall revert to a non-synchronized flash-rate, if the sync module or Power Supply should fail to operate (i.e. – contacts remain closed)
17. All notification appliances shall be listed for Special Applications: Strobes are designed to flash at 1-flash-per-second minimum over their “Regulated Input Voltage Range”

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Perform work in accordance with the requirements of NFPA 70, NFPA 72 and NECA 1-2006, Standard of Good Workmanship in Electrical Contracting.
- B. Fasten equipment to structural members of building or metal supports attached to structure, or to concrete surfaces.
- C. Wiring Method: Install fire alarm cables in raceways where exposed or routed thru inaccessible areas. Cables installed in accessible ceiling spaces may be installed on “J” hooks.
- D. All cable runs shall be run at right angles to building walls, supported from structure at intervals not exceeding 3 feet and where installed in environmental air plenums, be rated for such use and tied/supported by components listed for environmental air plenums installation.
- E. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
- F. Provide primary power for the fire alarm panel as indicated on the Electrical Power Plans. Power shall be 120 VAC service, transformed through a two-winding, isolation type transformer and rectified to low voltage DC for operation of all circuits and devices.

3.02 BOXES, ENCLOSURES AND WIRING DEVICES

- A. Boxes shall be installed plumb and firmly in position.
- B. Extension rings with blank covers shall be installed on junction boxes where required.
- C. Junction boxes served by concealed conduit shall be flush mounted.
- D. Upon initial installation, all wiring outlets, junction, pull and outlet boxes shall have dust covers installed. Dust covers shall not be removed until wiring installation when permanent dust covers or devices are installed.
- E. "Fire alarm system" decal or silk-screened label shall be applied to all fire alarm system junction box covers.

3.03 CONDUCTORS

- A. Each conductor shall be identified as shown on the fire alarm vendor's installation drawings at each with wire markers at terminal points. Attach permanent wire markers within 2 inches of the wire termination. Marker legends shall be visible.

- B. All wiring shall be supplied and installed in compliance with the requirements of the National Electric Code, NFPA 70, Article 760, and that of the manufacturer.
- C. Wiring for strobe and audible circuits shall be a minimum 14 AWG, signal line circuits minimum 18 AWG twisted.
- D. All splices shall be made using solder-less connectors. All connectors shall be installed in conformance with the manufacturer recommendations.
- E. Crimp-on type spade lugs shall be used for terminations of stranded conductors to binder screw or stud type terminals. Spade lugs shall have upset legs and insulation sleeves sized for the conductors.
- F. The installation contractor shall submit for approval prior to installation of wire, a proposed color code for system conductors to allow rapid identification of circuit types.
- G. Wiring within sub panels shall be arranged and routed to allow accessibility to equipment for adjustment and maintenance.

3.04 DEVICES

- A. Relays and other devices to be mounted in auxiliary panels are to be securely fastened to avoid false indications and failures due to shock or vibration.
- B. Wiring within panels shall be arranged and routed to allow accessibility to equipment for adjustment and maintenance.
- C. All devices and appliances shall be mounted to or in an approved electrical box.

3.05 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- B. Permanently label or mark each conductor at both ends with permanent alphanumeric wire markers.
- C. A consistent color code for fire alarm system conductors throughout the installation.

3.06 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: The installing electrical contractor shall engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Testing General:
 - 1. All Alarm Initiating Devices shall be observed and logged for correct zone and sensitivity. These devices and their bases shall be tagged with adhesive tags located in an area not visible when installed, showing the initials of the installing technician and date.
 - 2. Wiring runs shall be tested for continuity, short circuits and grounds before system is energized. Resistance, current and voltage readings shall be made as work progresses.

3. The fire alarm acceptance inspector shall be notified before the start of the required tests. All items found at variance with the drawings or this specification during testing or inspection by the acceptance inspector shall be corrected.
4. Test reports shall be delivered to the acceptance inspector as completed.
5. All test equipment, instruments, tools and labor required to conduct the system tests shall be made available by the installation contractor. The following equipment shall be a minimum for conducting the tests:
 - a. Ladders and scaffolds as required to access all installed equipment.
 - b. Multi-meter for reading voltage, current and resistance.
 - c. Two-way radios and flashlights.
 - d. A manufacturer recommended device for measuring air flow through air duct smoke detector sampling assemblies.
 - e. Decibel meter.
 - f. In addition to the testing specified above to be performed by the installation contractor, the installation shall be subject to test by the acceptance inspector.

3.07 ACCEPTANCE TESTING

- A. Preliminary Testing: Conduct preliminary tests to ensure that all devices and circuits are functioning properly. After preliminary testing is complete, provide a letter certifying that the installation is complete and fully operable. The letter shall state that each initiating and indicating device was tested in place and functioned properly. The letter shall also state that all panel functions were tested and operated properly. The Contractor and an authorized representative from each supplier of equipment shall attend the preliminary testing to make necessary adjustments.
- B. Final Acceptance Test: Notify the owner in writing when the system is ready for final acceptance testing. Submit request for test at least 14 calendar days prior to the test date. A final acceptance test will not be scheduled until meggar test results, and the submittals required in Part 1 are provided to the owner. Test the system in accordance with the procedures outlined in NFPA 72.
 1. Verify that the control unit is in the normal condition as detailed in the manufacturer's operating and maintenance manual.
 2. Test each initiating and indicating device and circuit for proper operation and response. Disconnect the confirmation feature for smoke detectors during tests to minimize the amount of smoke or test gas needed to activate the detector.
 3. Test the system for all specified functions in accordance with the contract drawings and specifications and the manufacturer's operating and maintenance manual.
 4. Visually inspect all wiring.
 5. Verify that all software control and data files have been entered or programmed into the FACP.

6. Verify that Shop Drawings reflecting as-built conditions are accurate.
 7. Measure the current in circuits to assure that there is the calculated spare capacity for the circuits.
 8. Measure voltage readings for circuits to assure that voltage drop is not excessive.
- C. The acceptance inspector shall use the system record drawings in combination with the documents specified in this specification during the testing procedure to verify operation as programmed. In conducting the ATP, the acceptance inspector shall request demonstration of any or all input and output functions. The items tested shall include but not be limited to the following:
1. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:
 - a. Open, shorted and grounded signal line circuits.
 - b. Open, shorted and grounded notification, releasing circuits.
 - c. Primary power or battery disconnected.
 2. System notification appliances shall be demonstrated as follows:
 - a. All alarm notification appliances actuate as programmed
 - b. Audibility and visibility at required levels.
 3. System indications shall be demonstrated as follows:
 - a. Correct message display for each alarm input at the control display.
 - b. Correct annunciator light for each alarm input at each annunciator and graphic display as shown on the drawings.
 - c. Correct history logging for all system activity.
 4. System off-site reporting functions shall be demonstrated as follows:
 - a. Correct zone transmitted for each alarm input
 - b. Trouble signals received for disconnect
 5. Secondary power capabilities shall be demonstrated as follows:
 - a. System primary power shall be disconnected for a period of time as specified herein. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period as specified.
 - b. System primary power shall be restored for forty-eight hours, and system-charging current shall be normal trickle charge for a fully charged battery bank.
 - c. System battery voltages and charging currents shall be checked at the fire alarm control panel.

3.08 DOCUMENTATION

- A. System documentation shall be furnished to the owner and shall include but not be limited to the following:
 - 1. PDF copy of fire alarm vendor's submittal of installation drawings and shop drawings with documentation indicating review and approval of the system by the Commonwealth of Kentucky's Fire Marshall's office.
 - 2. System operation, installation and maintenance manuals.
 - 3. System matrix showing interaction of all input signals with output commands.
 - 4. Documentation of system voltage, current and resistance readings taken during the installation, testing and ATP phases of the system installation.
 - 5. System program showing system functions, controls and labeling of equipment and devices.

3.09 PROTECTION

- A. Remove and replace devices and panel components that are wet, moisture damaged, or mold damaged.

3.10 DEMONSTRATION

- A. Instructor: Include in the project the services of an instructor, who shall have received specific training from the manufacturer for the training of other persons regarding the inspection, testing and maintenance of the system provided. The instructor shall train the employees designated by the owner, in the care, adjustment, maintenance, and operation of the fire alarm system.
- B. Required Instruction Time: Provide 8 hours of instruction after final acceptance of the system. The instruction shall be given during regular working hours on such dates and times as are selected by the owner. The instruction may be divided into two or more periods at the discretion of the owner.
- C. Provide a typeset printed or typewritten instruction card mounted behind a Lexan plastic or glass cover in a stainless steel or aluminum frame. Install the frame in a conspicuous location observable from the FACP. The card shall show those steps to be taken by an operator when a signal is received as well as the functional operation of the system under all conditions, normal, alarm, supervisory and trouble. The instructions shall be approved by the owner.
- D. All training sessions shall be conducted by an authorized fire alarm system distributor representative, who has received specific training from the manufacturer for the training of other persons regarding the inspection, testing, and maintenance of the system provided.

END OF SECTION