SPECIFICATIONS &

CONTRACT DOCUMENTS

FOR

ALTERATIONS / MODERNIZATION
CITY OF MORAINE
MUNICIPAL BUILDING

CITY OF MORAINE, OHIO

MONTGOMERY COUNTY

AUGUST 30, 2024

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BIDDING REQUIREMENTS

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LEGAL NOTICE

ADVERTISEMENT FOR BIDS

The City of Moraine will receive sealed bid proposals for ***ALTERATIONS / MODERNIZATION CITY OF MORAINE MUNICIPAL BUILDING PROJECT FOR CITY OF MORAINE*** until **OCTOBER 1, 2024** at ***10:00 a.m.*** local time, at the Moraine Municipal Building, 4200 Dryden, Moraine, Ohio, 45439 at which time and place they will be publicly opened and read aloud.

Copies of the specifications, proposal and contract forms are available on the City's website: www.ci.moraine.oh.us, "About the City" tab, "Legal Notices" on dropdown menu.

A pre-bid meeting for this project will be held on SEPTEMBER 10, 2024 at 10:00 a.m. local time at the Moraine Municipal Building.

Each proposal shall be signed with the full name and business address of each interested company and shall be accompanied by a security bond issued by a bonding company authorized to do business in the State of Ohio, or by a certified check on a solvent bank in the amount of ten percent (10%) of the amount of the submitted main contract proposal. Bond or certified check must be payable to the City of Moraine as a guarantee that if the proposal is accepted, a contract will be executed and its performance secured by a satisfactory bond in the amount of one hundred percent (100%) of the contract price or irrevocable letter of credit.

The proposal must be made on the forms provided in the Contract Documents, or a copy thereof, with a price quoted for the proposed maintenance services.

City Council reserves the right to accept or reject any or all proposals, to waive any informalities or irregularities in the bids received, or to accept any proposal which is deemed most favorable to the City of Moraine.

_____

Mike Davis, City Manager

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BIDDING INFORMATION

All bids must be submitted on forms provided in this packet. Bids must be regular in every respect and no changes, deletions, or special conditions shall be made or included in the bid form.

Bid documents shall be submitted in a sealed envelope, marked with the Bidder's return address, and be labeled "Bid Documents for Phase 1 Modernization City of Moraine Municipal Building" and addressed as follows:

To: Mike Davis
City Manager
City of Moraine
4200 Dryden Road
Moraine, OH 45439

Bid Opening: OCTOBER 1, 2024 at 10:00 a.m. local time.

No Bidder may withdraw its bid after the specified time of the opening of the bids.

Project Estimated Amount: $4,800,000 for the base bid scope of work, inclusive of allowances, not factoring alternates.

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INSTRUCTIONS TO BIDDERS

1. Bidding documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Legal Notice or Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders, the bid for, and contract forms. The proposed Contract Documents consist of the form of agreement between the Owner and Contractor, Conditions of the Contract (General, Supplemental, and other Provisions), Specifications and all Addenda issued prior to the execution of this Contract.

2. The Bidder, by making a Bid, represents that:

   A. The Bidder has read and understands the Bidding Documents and the Bid is made in accordance herewith.

   B. The Bidder has read and understands the Bidding Documents or contract documents to the extent that such documentation relates to the work for which the Bid is submitted.

   C. The Bidder has visited sites, become familiar with local conditions, become familiar with the equipment listed in the Contract Documents, and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents and shall report to the Superintendent errors, inconsistencies or ambiguities discovered.

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

3. Interpretations, corrections and changes of the Bidding Documents will be made by Addendum. Interpretations, corrections and changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon them.

4. Addenda

   A. Addenda will be mailed or delivered to all who are known by the issuing office to have received a complete set of Bidding Documents.

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

   C. No Addenda will be issued later than four (4) days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one that includes postponement of the date for receipt of Bids.

D. Each Bidder shall ascertain prior to submitting a Bid that the Bidder has received all Addenda issued, and Bidder shall acknowledge receipt in the Bid.

5. Bidding Procedures – Form and Style of Bids

A. Bids shall be submitted on forms identical to the form included with the Bidding Documents.

B. All blanks on the bid form shall be filled in by typewriter or manually in ink.

C. Where indicated by the makeup of the bid form, sums shall be expressed in both words and figures, and in case of discrepancy between the two, the amount written in words shall govern.

D. The signer of the Bid must initial alterations and erasures.

E. Each copy of the Bid shall include the legal name of the Bidder and a statement that the Bidder is a sole proprietor, partnership, corporation, or other legal entity. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A bid by a corporation shall further give the State of incorporation and have the corporate seal affixed. A bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

6. Bidding Procedures – Submission of Bids

A. All copies of the Bid and other documents required for submission with the Bid shall be enclosed in a sealed envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the project name, and the Bidder's name and address. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

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

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

D. Oral, telephonic or telegraphic Bids are invalid and will not receive consideration.

E. A Bid must remain open for acceptance for a period of sixty (60) days from the date of bid opening. A bid may be extended thereafter upon mutual agreement of the Owner and the Bidder.

7. Bidding Procedures – Modification or Withdrawal of Bid

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

B. Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of such Bids. Such notice shall be in writing over the signature of the Bidder or by telegram. If by telegram, written confirmation over the signature of the Bidder shall be mailed and postmarked on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

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

8. The Owner is soliciting Bids pursuant to the bid process. If the Owner awards a Contract, it shall be to the lowest responsible Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive informalities or irregularities in a Bid. The Owner shall have the right to reject any or all Bids, reject a Bid not accompanied by any data required by the Bidding Documents, or reject a Bid that is in any way incomplete or irregular.

9. The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the bidding Documents, and to determine the low Bidder on the basis of the sum of the base Bid and Alternates accepted.

10. Bidders to whom award of a Contract is under consideration shall submit a Contractor's Qualification Statement.

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

12. This is a prevailing wage job and the successful Bidder must comply with all applicable laws, rules and regulations applicable thereto.

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Contractor's and Subcontractor's Insurance

SECTION 11. The Contractor and/or subcontractor on this work will be required to take out and maintain during the life of this Contract, the comprehensive commercial insurance listed below, and approval of the insurance by the Owner shall not relieve or decrease the liability of the Contractor hereunder. The Contractor shall purchase the insurance listed below to protect the Owner and authorized representatives from all claims incurred by the action(s) of the Contractor and/or subcontractors in completion of this work.

I. Compensation and Employees' General Liability Insurance

The Contractor shall procure and shall during the life of this Contract hold Workers Compensation coverage for all of Contractor's employees to be engaged in work under this Contract; and in case any such work is sublet, the Contractor shall require the subcontractor similarly to provide Workers Compensation coverage for all of the latter's employees to be engaged in such work, unless such employees are covered by the protection afforded by the Contractor's Workers Compensation coverage. The Employees Liability limit shall be as provided by statutory requirements of the State. In case any class of employees is engaged in hazardous work protected under the Workers Compensation statute, the Contractor shall provide and shall cause each subcontractor to provide Employer's General Liability Insurance for the protection of such of his employees not otherwise protected.

II. Public Liability and Owner's or Contractor's Protective Insurance

The Contractor shall take out and maintain this type of insurance and shall require any of his subcontractors performing work covered by the Contract to do the same in order to protect themselves from claims for damage to property which may arise from operations under this Contract, whether such operations be by Contractor or by any Subcontractor or by anyone directly or indirectly employed by either of them.

A. (Comprehensive) Automobile Liability Coverage:

i. Bodily injury including wrongful death in an amount not less than Five Hundred Thousand Dollars ($500,000.00) for each person and One Million Dollars ($1,000,000.00) for each accident.

ii. Property damage in an amount not less than One Hundred Thousand Dollars ($100,000.00) for each accident.

B. (Comprehensive) General Liability Coverage:

i. Bodily injury including wrongful death in an amount not less than Five Hundred Thousand Dollars ($500,000.00) for

each person and One Million Dollars ($1,000,000.00) for each accident, and

ii. Property damage in an amount not less than One Hundred Thousand Dollars ($100,000.00) for each accident, and an aggregate liability of Two Hundred Fifty Thousand Dollars ($250,000.00).

III. Scope of Insurance and Special Hazards

The insurance required under paragraph II hereof shall be primary insurance and provide adequate protection for the Owner, its elected officials, employees, or volunteers, Contractor and subcontractor respectively, against damage claims which may arise from operations under this Contract, whether such operations are by the insured or by anyone directly or indirectly employed by Contractor, and also against any of the special hazards which may be encountered in the performance of the Contract. Each of the aforesaid policies shall include the Owner as named insured and will provide that such policy will not be canceled until after the Owner shall have been given twenty (20) business days written notice of the proposed cancellation. Contractor's insurance shall be the primary insurance, and any insurance maintained by Owner, its elected officials, employees, or volunteers shall be excess to the Contractor's insurance and shall not contribute to it.

Contractor agrees to hold Owner harmless and indemnify Owner, its elected officials, employees, and volunteers for any and all claims resulting from the actions of the Contractor, its officials, employees, volunteers, and any subcontractors.

CONTRACTOR'S ALERT

REMINDER

If you are the successful bidder for work on any state, county, township, municipal corporation, school district, or other political subdivision of the State of Ohio, please keep in mind that if after award of the contract you are required to perform additional work as a result of the enactment or amendment of any statutes, ordinances, and regulations, including but not limited to those dealing with prevention of environmental pollution, then you are entitled to a change order for the cost of said additional work plus reasonable profit. The owner must issue a change order describing said additional work to you. **NOTE: You are not entitled to payment until an approved change order has been issued.**

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Bid Guaranty and Contract Bond

(ORC 153.571)

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned

_____, as Principal, and

_____, as Surety, are hereby

held and firmly bound unto the *City of Moraine* as Obligee in the penal sum of the dollar amount of the bid submitted by the Principal to the Obligee on

_____ to undertake the Project known as the

ALTERATIONS / MODERNIZATION – CITY OF MORAINE MUNICIPAL BUILDING

The penal sum referred to herein shall be the dollar amount of the Principal's bid to the Obligee, incorporating any additive or deductive alternate proposals made by the Principal on the date referred to above to the Obligee, which are accepted by the Obligee. In no case shall the penal sum exceed the amount of

_____ dollars

($_____).

(If above line is left blank, the penal sum will be the full amount of the Principal's bid, including alternates. Alternatively, if completed, the amount stated must not be less than the full amount of the bid, including alternates, in dollars and cents. A percentage is not acceptable.)

For the payment of the penal sum well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

Signed this_____day of_____, 2024.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH that whereas the above named Principal has submitted a bid for _____

_____

NOW, THEREFORE, if the Obligee accepts the bid of the Principal and the Principal fails to enter into a proper contract in accordance with the bid and specifications; and in the event the Principal pays to the Obligee the difference not to exceed ten percent of the penalty hereof between the amount specified in the bid and such larger amount for which the Obligee may in good faith contract with the next lowest bidder to perform the work covered by the bid; or in the event the Obligee does not award the contract to the next lowest bidder and resubmits the project for bidding, the Principal pays to the Obligee the difference not to exceed ten percent of the penalty hereof between the amount specified in the bid, or the costs, in connection with resubmission, of printing new contract documents, required advertising, and printing and mailing notices to prospective bidders, whichever is less, then this obligation shall be null and void, otherwise to remain in full force and effect. If the Obligee accepts the bid of the Principal and the Principal within ten days after award of the contract enters into a proper contract in accordance with the bid and specifications, which said contract is made a part of this bond the same as though set forth herein; and

IF THE SAID_____shall well and faithfully do and perform the things agreed by the *City of Moraine, Ohio* to be done and performed according to the terms of said contract; and shall pay all lawful claims of

subcontractors, materialmen, and laborers, for labor performed and materials furnished in the carrying forward, performing, or completing of said contract; we agreeing and assenting that this undertaking shall be for the benefit of any materialman or laborer having a just claim, as well as for the Obligee herein; then this obligation shall be void; otherwise the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

THE SAID Surety hereby stipulates and agrees that no modifications, omissions, or additions in or to the terms of said contract or in or to the plans or specifications therefore shall in any way affect the obligations of said Surety on its bond.

Principal:	Surety:
_____	_____
By:_____	By:_____
Title:_____	Title:_____

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AFFIDAVIT

Regarding payment of Montgomery County Personal Property Taxes (Bidder to complete and execute either Part A or Part B).

STATE OF_____)

) SS:

COUNTY OF_____)

Part A. That_____, being duly sworn, affirms that as of

_____, 2024,_____is not charged with any delinquent personal property taxes on the general tax list of personal property of Montgomery County, Ohio.

_____

Bidder

OR ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

Part B. That_____, being duly sworn, affirms that

_____ is currently charged with Montgomery County delinquent personal property taxes in the amount of $_____with interest in the amount of _____, and penalties in the amount of $_____, due to said Montgomery County, Ohio.

_____

Bidder

SWORN TO and subscribed before me this_____day of_____, 2024.

_____

Notary Public in and for

_____ County, Ohio.

My commission expires: _____

NOTE: If this statement indicates that the taxpayer was charged with any such taxes, a copy of the statement shall be transmitted by the Director of Finance to the County Treasurer within thirty (30) days of the date it is submitted.

NOTE: A copy of this statement shall be incorporated into the contract, and no payment shall be made with respect to said contract unless such statement has been incorporated as a part thereof.

Affidavit of Compliance

NON-COLLUSION AFFIDAVIT

STATE OF_____)

) SS:

COUNTY OF_____)

_____, being first duly sworn, deposes and says that he/she is the

_____ (sole owner, partner, president, secretary, etc.) of

_____, the party making the foregoing proposal or bid; that such bid is genuine and not collusive or sham; and that said bidder has not colluded, conspired, connived or agreed, directly or indirectly, with any other bidder or person, to put in a sham bid, or that such other person shall refrain from bidding, and has not in any manner, directly or indirectly, sought by agreement or collusion or communication or conference, with any person, to fix the bid price of affiant or any other bidder, or to fix any overhead, profit, or cost element of said bid price, or of that of any other bidder, or to secure any advantage against any company, person or persons interested in the proposed contract; and that all statements contained in said proposal or bid are true. Further, that such bidder has not, directly or indirectly, submitted this bid, or the contents thereof, or divulged information or data relative thereto to any association or to any member or agent thereof.

_____

Affiant

SWORN TO and subscribed before me this_____day of_____, 2024.

_____

Notary Public in and for

_____ County, _____

state

My commission expires: _____

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AFFIDAVIT

(TO BE COMPLETED IF THE CONTRACTOR IS A CORPORATION)

STATE OF_____)

) SS:

COUNTY OF_____)

_____, being duly sworn, deposes and says that he/she is

_____ (president, secretary, etc.) of

_____, a corporation organized and existing under and by virtue of

the laws of the State of_____, and having its principal office at

_____,

(number and street)

_____,_____.

(city) (state)

Affiant further states that he is familiar with the records, minute books and by-laws of

_____.

(name of corporation)

Affiant further states that_____,_____,

(name) (title)

of the corporation, is duly authorized to sign the contract for the provision of services for the ***ALTERATIONS / MODERNIZATION - CITY OF MORAINE MUNICIPAL BUILDING*** or said corporation by virtue of

_____

(State whether a provision of bylaws or a resolution of the Board of Directors. If by resolution, give date of adoption.)

_____

Affiant

SWORN TO and subscribed before me this_____day of_____, 2024.

_____

Notary Public in and for

_____ County, _____

state

My commission expires: _____

AFFIDAVIT

Drug and Alcohol Abuse Prevention and Testing Policy and Procedure

This Affidavit is required when needed regarding existence of a program and compliance with the Omnibus Transportation Employee Testing Act of 1991 (the "Act"). The Act requires that any bidder who supplies operators of safety sensitive equipment provide a **Drug and Alcohol Abuse Prevention and Testing Policy and Procedure.** The program shall provide the minimal standards as stated in the Act and cover such issues as pre-employment, reasonable suspicion, random, post-accident, return-to-work, and follow-up testing of safety-sensitive employees.

The bidder is to complete and have notarized this Affidavit if successful in receiving the contract and may be required to provide a copy of the policy.

STATE OF_____)

) SS:

COUNTY OF_____)

_____, being duly sworn, affirms that as of_____, 20____,

_____ has developed and implemented a Drug and Alcohol Abuse Prevention and Testing Policy and Procedure in compliance with the Act.

_____

Affiant

SWORN TO and subscribed before me this_____day of_____, 2024.

_____

Notary Public in and for

_____County, _____

state

My commission expires: _____

NOTE: A copy of this statement shall be incorporated into the contract, and no payment shall be made with respect to said contract unless such statement has been incorporated as a part thereof.

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AFFIDAVIT IN COMPLIANCE WITH SECTION 3517.13 OF THE OHIO REVISED CODE

STATE OF _____

COUNTY OF_____SS:

Personally appeared before me the undersigned, as an individual or as a

representative of_____for a
(Name of Entity)

contract for ***ALTERATIONS / MODERNIZATION – CITY OF MORAINE MUNICIPAL BUILDING*** to be let by the City of Moraine, who, being duly cautioned and sworn, make the following statement with respect to prohibited activities constituting a conflict of interest or other violations under Ohio Revised Code Section 3517.13, and further states that the undersigned has the authority to make the following representation on behalf of himself or herself or of the business entity:

1) That none of the following have **individually** made within the previous twenty-four months and that, if awarded a contract for the purchase of goods or services aggregating more than $10,000 in a calendar year, none of the following Individually will make, beginning on the date the contract is awarded and extending until one year following the conclusion of the contract, as an individual, one or more campaign contributions totaling in excess of $1,000, to any member of the City of Moraine Council or their individual campaign committees:
   a) myself;
   b) any partner or owner of the partnership or other unincorporated business (if applicable);
   c) any shareholder of the professional association organized under Chapter 1785 of the Ohio Revised Code (if applicable);
   d) any trustee of the trust (if applicable);
   e) any administrator or executor of the estate (if applicable);
   f) any owner of more than 20% of the corporation or business trust (if applicable);
   g) each spouse of any person identified in (a) through (f) of this section;
   h) each child seven years of age to seventeen years of age of any person identified in divisions (a) through (f) of this section;
2) That none of the following have **collectively** made within the previous twenty-four months, and that, if awarded a contract for the purchase of goods or services aggregating more than $10,000 in a calendar year, none of the following **collectively** will make, beginning on the date the contract is awarded and extending until one year following the conclusion of the contract, one or more campaign contributions totaling in excess of $2,000, to any member of the City of Moraine Council or their individual campaign committees:
   a) myself;

b) any partner or owner of the partnership or other unincorporated business (if applicable);

c) any shareholder of the professional association organized under Chapter 1785 of the Ohio Revised Code (if applicable);

d) any trustee of the trust (if applicable);

e) any administrator or executor of the estate (if applicable);

f) any owner of more than 20% of the corporation or business trust (if applicable);

g) each spouse of any person identified in (a) through (f) of this section;

h) each child seven years of age to seventeen years of age of any person identified in divisions (a) through (f) of this section;

i) any political action committee affiliated with the corporation, business trust, partnership or other unincorporated business, association, estate or trust identified in (a) through (f) of this section;

j) Any combination of persons identified in (a) through (i) of this section;

3) I do hereby acknowledge that to knowingly make any false statement herein may subject me and/or the above-named entity to the penalties set forth in Section 3517.992 of the Ohio Revised Code.

Further, Affiant sayeth naught.

Signature _____

Title _____

Sworn to before me and subscribed in my presence this_____day of

_____, 2024.

_____
Notary Public

My Commission Expires: _____

The requirements of Ohio Revised Code Section 3517.13 are only applicable to contributions made **on or after April 4, 2007** (Section 631.05, Amended Substitute Ohio House Bill 119).

Affidavit of Insurance

STATE OF_____)

) KNOW ALL MEN BY THESE PRESENTS

COUNTY OF_____)

BEFORE ME, the undersigned authority, on this day, personally appeared

_____, who being duly sworn, stated that he/she is

(Affiant)

_____, of_____,

(Title) (Contractor's Company Name)

the Contractor named and referred to within the Contract Documents; that he/she is fully competent and authorized to give this affidavit and that the attached original insurance certificate truly and accurately reflects the insurance coverage that is now available and will be available during the term of the Contract.

_____

Affiant

SWORN AND SUBSCRIBED before me on the_____day of_____, 2024.

_____

Notary Public

In and for the County of _____

State of_____

My commission expires:_____

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Department of Commerce
Division of Industrial Compliance

Bureau of Wage and Hour Administration
6606 Tussing Road - PO Box 4009
Reynoldsburg, OH 43068-9009
Phone 614-644-2239 | Fax 614-728-8639
TTY/TDD 800-750-0750
www.com.ohio.gov
An Equal Opportunity Employer and Service Provider

John R. Kasich, Governor
Andre T. Porter, Director

Affidavit Of Compliance

PREVAILING WAGES

I, _____
(Name of person signing affidavit) (Title)

do hereby certify that the wages paid to all employees of

_____
(Company Name)

for all hours worked on the

_____
(Project name and location)

project, during the period from _____ to _____ are in
(Project Dates)

compliance with prevailing wage requirements of Chapter 4115 of the Ohio Revised Code. I further certify that no rebates or deductions have been or will be made, directly or indirectly, from any wages paid in connection with this project, other than those provided by law.

_____
(Signature of Officer or Agent)

Sworn to and subscribed in my presence this _____ day of _____,

20_____.

_____ (Notary Public)

The above affidavit must be executed and sworn to by the officer or agent of the contractor or subcontractor who supervises the payment of employees. This affidavit must be submitted to the owner (public authority) before the surety is released or final payment due under the terms of the contract is made.

LAW1003

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**********FOR INSTRUCTIONAL USE ONLY **********

READ BEFORE COMPLETING YOUR DMA FORM

Forms not conforming to the specifications listed below or not submitted to the appropriate agency or office will not be processed.

To complete this form, you will need a copy of the Terrorist Exclusion List for reference. The Terrorist Exclusion List can be found on the Ohio Homeland Security Web site at the following address:
http://www.homelandsecurity.ohio.gov/dma/dma.asp
Be sure you have the correct DMA form. If you are applying for a state issued license, permit, certification or registration, the "State Issued License" DMA form must be completed (HLS 0036). If you are applying for employment with a government entity, the "Public Employment" DMA form must be completed (HLS 0037). If you are obtaining a contract to conduct business with or receive funding from a government entity, the "Government Business and Funding Contracts" DMA form must be completed (HLS 0038).
Your DMA form is to be submitted to the issuing agency or entity. "Issuing agency or entity" means the government agency or office that has requested the form from you or the government agency or office to which you are applying for a license, employment or a business contract. For example, if you are seeking a business contract with the Ohio Department of Commerce's Division of Financial Institutions, then the form needs to be submitted to the Department of Commerce's Division of Financial Institutions. Do NOT send the form to the Ohio Department of Public Safety UNLESS you are seeking a license from or employment or business contract with one of its eight divisions listed below.
Department of Public Safety Divisions:
Administration
Ohio Bureau of Motor Vehicles
Ohio Emergency Management Agency
Ohio Emergency Medical Services Ohio Homeland Security*
Ohio Investigative Unit
Ohio Criminal Justice Services
Ohio State Highway Patrol

* DO NOT SEND THE FORM TO OHIO HOMELAND SECURITY UNLESS OTHERWISE DIRECTED. FORMS SENT TO THE WRONG AGENCY OR ENTITY WILL NOT BE PROCESSED.

**********FOR INSTRUCTIONAL USE ONLY**********

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GOVERNMENT BUSINESS AND FUNDING CONTRACTS

In accordance with section 2909.33 of the Ohio Revised Code

DECLARATION REGARDING MATERIAL ASSISTANCE/NONASSISTANCE TO A TERRORIST ORGANIZATION

This form serves as a declaration by an applicant for a government contract or funding of material assistance/non-assistance to an organization on the U.S. Department of State Terrorist Exclusion List ("TEL"). Please see the Ohio Homeland Security Division Web site for a copy of the TEL.

Any answer of "yes" to any question, or the failure to answer "no" to any question on this declaration shall serve as a disclosure that material assistance to an organization identified on the U.S. Department of State Terrorist Exclusion List has been provided. Failure to disclose the provision of material assistance to such an organization or knowingly making false statements regarding material assistance to such an organization is a felony of the fifth degree.

For the purposes of this declaration, "material support or resources" means currency, payment instruments, other financial securities, funds, transfer of funds, financial services, communications, lodging, training, safe houses, false documentation or identification, communications equipment, facilities, weapons, lethal substances, explosives, personnel, transportation, and other physical assets, except medicine or religious materials.

COMPLETE THIS SECTION ONLY IF YOU ARE AN INDEPENDENT CONTRACTOR

LAST NAME	FIRST NAME	
HOME ADDRESS		
CITY	STATE	ZIP	COUNTY
HOME PHONE ( )	WORK PHONE ( )	

COMPLETE THIS SECTION ONLY IF YOU ARE A COMPANY, BUSINESS OR ORGANIZATION

BUSINESS/ORGANIZATION NAME	PHONE ( )
BUSINESS ADDRESS	
CITY	STATE	ZIP	COUNTY
BUSINESS/ORGANIZATION REPRESENTATIVE NAME	TITLE

DECLARATION

In accordance with section 2909.32 (A)(2)(b) of the Ohio Revised Code

For each question, indicate either "yes," or "no" in the space provided. Responses must be truthful to the best of your knowledge.

1. Are you a member of an organization on the U.S. Department of State Terrorist Exclusion List? Yes No
2. Have you used any position of prominence you have with any country to persuade others to support an organization on the U.S. Department of State Terrorist Exclusion List? Yes No
3. Have you knowingly solicited funds or other things of value for an organization on the U.S. Department of State Terrorist Exclusion List? Yes No
4. Have you solicited any individual for membership in an organization on the U.S. Department of State Terrorist Exclusion List? Yes No
5. Have you committed an act that you know, or reasonably should have known, affords "material support or resources" to an organization on the U.S. Department of State Terrorist Exclusion List? Yes No
6. Have you hired or compensated a person you knew to be a member of an organization on the U.S. Department of State Terrorist Exclusion List, or a person you knew to be engaged in planning, assisting, or carrying out an act of terrorism? Yes No

If an applicant is prohibited from receiving a government contract or funding due to a positive indication on this form, the applicant may request the Ohio Department of Public Safety to review the prohibition. Please see the Ohio Homeland Security Web site for information on how to file a request for review.

CERTIFICATION

I hereby certify that the answers I have made to all of the questions on this declaration are true to the best of my knowledge. I understand that if this declaration is not completed in its entirety, it will not be processed and I will be automatically disqualified. I understand that I am responsible for the correctness of this declaration. I understand that failure to disclose the provision of material assistance to an organization identified on the U.S. Department of State Terrorist Exclusion List, or knowingly making false statements regarding material assistance to such an organization is a felony of the fifth degree. I understand that any answer of "yes" to any question, or the failure to answer "no" to any question on this declaration shall serve as a disclosure that material assistance to an organization identified on the U.S. Department of State Terrorist Exclusion List has been provided by myself or my organization. If I am signing this on behalf of a company, business or organization, I hereby acknowledge that I have the authority to make this certification on behalf of the company, business or organization referenced on page 1 of this declaration.

APPLICANT SIGNATURE **X**	DATE

CERTIFICATE OF FISCAL OFFICER

As Fiscal Officer for the City of Moraine, Montgomery County, Ohio, I hereby certify that funds in the amount of_____Dollars have been lawfully appropriated for the purpose of meeting the obligations of this contract with_____duly authorized by Resolution No._____approved by the City of Moraine Council, Montgomery County, Ohio, and that they are in the treasury or in the process of collection to the credit of the City of Moraine free from any previous encumbrances.

Signed this_____day of_____, 2024.

_____,
Fiscal Officer for the City of Moraine,
County of Montgomery,
State of Ohio

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PROPOSAL for:

Alterations / Modernization

City of Moraine Municipal Building
City of Moraine

The undersigned,_____, having carefully inspected the sites and locations of the work proposed to be performed, and also the premises at and adjacent to the location of the proposed work and specified equipment and conditions thereof, and having also carefully examined the "Notice to Contractor," "Instruction to Bidders," "Form of Contract," "General Provisions," and the detailed specifications which shall govern the work to be done, NOW PROPOSES to furnish any and all materials, tools, labor, transportation, machinery, appliances and/or necessary appurtenances, and to prosecute to full completion the work called for under the Contract Documents, all upon the terms and the conditions and provisions set forth in the "Instructions to Bidder," "Form of Contract," "Contract Bond," and "General Provisions," detailed specifications of this Proposal; and in consideration thereof to accept from the Owner as full payment for the completion of each specified item and any required maintenance thereof as hereinafter provided, the price quoted for each item for work completed, the price of labor and materials to be stated separately.

The undersigned_____agrees that if this Proposal shall be accepted, he will be prepared to discuss with the Owner in detail any matters relating to special features and the methods he proposes to follow for the general conduct of the work; that he will within twenty (20) business days after notice of acceptance of bid, complete the Contract Form with the Owner for the performance of the work and furnish evidence of required insurance policies.

The undersigned_____hereby certifies that no person interested in this Proposal is directly or indirectly interested in or connected with any other bid or proposal for the said work and no member of the City of Moraine or any other person in the employ of said City is directly or indirectly interested therein, or in any portion thereof, and he will, if required by the Owner, execute and submit from himself as Principal Contractor and from any subcontractor, the non-collusion affidavits as provided herein.

SUM PROPOSAL PRICE FOR: Alterations / Modernization - City of Moraine Municipal Building

And having inspected the premises and all conditions affecting the work, the undersigned proposes to furnish all materials and perform all labor necessary for the performance and completion of the work indicated below, all in compliance with the documents named above, and further agrees that each separate item of trade or employment further agrees that, if any or all of said bids are accepted, he will enter into a Contract according to the form required by the Owner for the faithful performance of the labor and the furnishing of all materials included in such bid or bids so accepted.

Submitted by: _____

Contracting Firm

Having read and examined the Contract Documents, prepared by the Associate for the above-referenced Project, and the following Addenda:

Addendum No.	Date of Receipt
_____	_____
_____	_____
_____	_____

The undersigned Bidder having full knowledge of the site and the requirements of the Project proposes to perform all Work in accordance with the Contract Documents for the Sums as indicated on this Bid Form:

Base Bid Item 1 – General Trades / Renovation, ALL LABOR, MATERIALS, EQUIPMENT and PERMIT FEES for the total sum of

Base Bid Amount:	$_____
Contingency Allowance:	$300,000
Door Access Control Allowance:	$20,000
Permit Allowance:	$10,000

Total Bid Amount including All Allowances

$_____ $_____
[FIGURES] [WORDS]

Alternate Deduct 01 – Remove interior painting of selected areas of the building from the project. Refer to drawings. DEDUCT from the base bid amount:

$_____ $_____
[FIGURES] [WORDS]

Alternate Deduct 02 – Remove exterior façade improvements from the project. Existing curtainwall to remain, Refer to drawings. DEDUCT from the base bid amount:

$_____ $_____
[FIGURES] [WORDS]

Alternate Deduct 03 – Remove installation of spray foam insulation at the underside of the metal roof deck at Building Area B from the project. Refer to drawings. DEDUCT from the base bid amount:

$_____ $_____
[FIGURES] [WORDS]

Alternate Deduct 04 – Remove alterations at the Police Department Toilet Rooms [Building Area C] from the project. Refer to drawings. DEDUCT from the base bid amount:

$_____ $_____
[FIGURES] [WORDS]

Alternate Deduct 05 – Remove exterior site lighting from the project. Refer to drawings. DEDUCT from the base bid amount:

$_____ $_____
[FIGURES] [WORDS]

Signed at_____this_____day of_____, 2024.

Firm: _____

By: _____

Title:_____

(SEAL)

Official Address:

_____

_____

_____

_____
(Telephone Number)

PREVAILING WAGE REQUIREMENTS

This project is subject to Prevailing Wages.
Contractor to comply with all applicable requirements.

Refer to wagehour.com.ohio.gov

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CONTRACT

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FORM OF CONTRACT

THIS AGREEMENT, entered into this____day of_____, 2024, by and between the *City of Moraine, Ohio*, hereinafter called the "Owner" and _____ hereinafter called the "Contractor."

WITNESSETH: That the said Contractor has agreed and by these presents does agree with the said Owner for the consideration hereinafter named, to furnish all the materials and do all of the work of whatever kind necessary to complete, in a good, substantial, and workmanlike manner, ready for use, and in strict accordance with the specifications on file in the office of the Maintenance Superintendent, and subject to all the terms and conditions of said specifications, and to the approval of said Superintendent, for the provision of services for the

ALTERATIONS / MODERNIZATION – CITY OF MORAINE MUNICIPAL BUILDING CONTRACT FOR CITY OF MORAINE

in accordance with the Contract Documents dated August 2024, and Addenda thereto numbered and dated___, for

The sum of**_____thousand Dollars, ($,000.00)** for Renovation Project.

The Owner agrees to pay, and the Contractor agrees to accept as full compensation, satisfaction, and discharge for all work done and material furnished, and also for all costs and expenses incurred and losses or damages sustained by reason of the action of the elements or because of the nature of the work or because of any unforeseen obstruction or difficulty encountered in the prosecution of the work, herein as specified and also for well and faithful completion of the work, and the whole thereof, in accordance with the terms, conditions and provisions of this contract and the instructions, orders, and directions of the Superintendent hereunder, and also for maintaining the work in good condition, except extra work which shall be paid for as provided in the General Conditions and except as in this Contract otherwise specifically provided, a sum of money equal to the amount of the actual work furnished, as determined by the Superintendent, as set forth in the Proposal attached hereto.

WITNESSETH, that in consideration of the sums of money herein specified to be paid by the

CONTRACTOR:	OWNER:
_____ (name of company)	City of Moraine
By: _____	By: _____
_____ (title)	_____ (title)

Contract approved as to form _____

TECHNICAL SPECIFICATIONS

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Contract Documents for:

Alterations / Modernization
City of Moraine
Municipal Building

4200 Dryden Road
Moraine, OH 45439

Prepared for:

City of Moraine
4200 Dryden Road
Moraine, OH 45439

Prepared by:

RDA GROUP ARCHITECTS
7662 PARAGON ROAD | DAYTON, OH 45459 | 937.610.3440

BID SET
August 30, 2024

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DOCUMENT 00 01 10 - TABLE OF CONTENTS

DRAWINGS

END OF DOCUMENT

SECTION 01 00 00 - GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 DESCRIPTION OF THE PROJECT DOCUMENTS

A. The work covered by these specifications consists of furnishing all labor, equipment and materials necessary in connection with the Alterations / Modernization Project at the City of Moraine Municipal Building for the City of Moraine. Work includes items as shown, subject to the terms and conditions of the contract, specifications and the drawings as listed.

1.2 CONTRACT DESCRIPTION

A. Project Identification: **Alterations / Modernization**
City of Moraine Municipal Building

B. Project Location: City of Moraine Municipal Building
4200 Dryden Road
Moraine, OH 45439

C. Owner: City of Moraine
4200 Dryden Road
Moraine, OH 45439

D. Architect: RDA Group Architects, LLC
7662 Paragon Road
Dayton, OH 45459
937.610.3440

E. Structural Engineer: Shell & Meyer Associates, Inc.
2202 S. Patterson Blvd.
Dayton, OH 45409
937.298.4631 phone

F. PME Engineer: Helmig Lienesch, LLC
410 S. Jefferson Street
Dayton, OH 45402
937.228.4007 phone

G. Environmental Consultant: mac paran consulting, Inc.
3959 Fulton Grove Road
Cincinnati, OH 45245

H. Perform Work of Contract under a stipulated sum contract with Owner in accordance with Conditions of Contract.

1.3 CONTRACTOR'S USE OF PREMISES

A. The Municipal Building will be partially vacated throughout the duration of the construction project.
1. Owner will vacate portions of the Municipal Building in Phases during the course of the project. Staff will be present in adjacent portions of the building so exits must be maintained and construction schedule must be coordinated with the Owner.

B. The project will need to be sequenced / phased to allow continued operations. Develop a plan and strategy to accomplish the goal. All additional efforts, scheduling, construction duration, etc. shall be considered and included in the bid amount.

C. Coordinate all applicable life safety aspects of the project to ensure the existing building is safe for continued use.

D. The Owner will coordinate relocation of loose furnishings, equipment, etc. out of the work area as necessary to facilitate work.

E. Work Hours: 7am – 5pm Monday thru Friday. Extended work hours thru the week and weekend work is permitted upon acceptance of the Owner.
   1. There are no specific limits on work hours as long as access to the building may be coordinated with the Owner. It is anticipated that the work will substantially occur during first shift hours, some work may be required to be accomplish off first shift hours to maintain operations of other portions of the building.
   2. The burden for scheduling and coordinating work efforts shall be on the General Contractor.
   3. It is the Contractor's responsibility to determine how the various disciplines work together and are scheduled to permit the work as outlined.
   4. Coordinate with Owner for Owner provided equipment installation as applicable.
   5. Accomplish utility shutdowns off hours as applicable to maintain operations, coordinate with Owner.
   6. Additional weekend and overtime work, supplementation of the Crews, etc. may be required by the Owner at no additional cost if the Contractor fails to meet milestone dates as prescribed in the contract.

F. Coordinate work of this contract with other work that will be occurring by the Owner. Coordinate work schedules to minimize impact to the extent possible.

1.4 CONTRACT PERIOD

A. Date of Commencement: approximately November 1, 2024, as outlined in Supplementary Conditions. A Notice to Proceed will be issued establishing the agreed upon construction start date.

B. Date of Substantial Completion: 300 calendar days from the Date of Commencement

C. A contract will be issued in November 2024 after approval by City Council.
   1. The Contractor will be responsible to execute the project to allow shop drawings and product submittals to be prepared as quickly as possible such that the materials can be ordered with sufficient lead time to permit the work to be executed as scheduled prior to the date of substantial completion.

D. Coordinate schedule / activities so as not to inconvenience the Owner unnecessarily.

1.5 PROJECT ALLOWANCES

A. Contingency Allowance: Include a cast contingency allowance in the amount of $300,000 in the base bid amount.

B. Access Control System Allowance: Include an access control allowance in the amount of $20,000 in the base bid amount.

C. Permit Allowance: Include a permit allowance in the amount of $10,000 in the base bid amount.

D. Contingency funds shall only be used at the approval of RDA and Owner.

E. Actual expenditures shall be tracked over the duration of the project with any unused funds deducted from the contract at the end of the project.

F. All expenditures shall be identified and documented as they occur, not afterward. Work commenced without the approval of the Owner shall be at the Contractor's risk.

1.6 INSTRUCTIONS/RESPONSBILITIES OF THE CONTRACTOR

A. Protect all finishes and equipment scheduled to remain.

B. Commence and complete work as noted in the contract.

C. Furnish labor, materials, equipment, and management required to complete the project, inclusive of all sub-contracted components.

D. Furnish all required logistics required to accomplish the work – including lifts, scaffolding, ladders, trash chutes, safety equipment, etc.
   1. Coordinate all Contractor staging areas and layout areas, etc. Receive approval from the Owner prior to the start of the project.
   2. Provide protection of all existing pavement, turf, etc. from lifts, lulls, etc. which may be utilized on the project.
   3. Provide temporary protection, barricades, enclosures at other building areas such to contain the construction area, and to minimize the transfer of dust, odors, etc.

E. Visit the site to become thoroughly familiar with all working conditions, check and verify all dimensions, and site conditions. Any dimensions given or referred to in the specification or drawing are to be used purely as approximate and not as a basis for exact amounts for bidding. Promptly advise the Architect of any discrepancies, errors with the specifications and drawings before bidding the work.

F. Provide a valid Certificate of Insurance, follow all Workman's Compensation requirements and regulations, and conduct all work according to OSHA recognized safe work practices.

G. Provide all bonds, payment schedule, insurance as noted in the contract documents.

H. The plans and specifications are intended to depict the general scope, layout and quality of workmanship required, they are not intended to show or describe in detail every item necessary for the proper installation of the work.

I. Take special care not to allow dust and debris to fall onto any equipment, material, personnel, or any room below the deck.
   1. Provide Safety Data Sheets (SDS) on all products used.

J. Submit directly to Owner. RDA does not review nor approve SDS.

K. The term 'Architect' as referenced in these contract documents is RDA Group Architects.

L. The term 'Owner' as referenced in this specification is City of Moraine.

1.7 WORK BY THE OWNER

A. Owner will clear all loose furnishings, equipment, and other materials from the work area prior to the start of the project.

B. Refer to the project phasing schedule to outline dates and specific requirements.

C. Owner will separately contract for the following work *[unless specifically noted to be within the scope of this project]*:
   1. Loose Furnishings [seating, desks, work tables, etc.]
   2. Door Access Control – final connections and system integration
   3. Security Cameras and associated wiring / system integration
   4. Data cabling [refer to Electrical drawings]
   5. Audio/visual equipment and accessories
   6. Finish Flooring Materials as outlined

D. Coordinate all aspects of Work by Owner as they interface with Work.

1.8 SPECIAL INSPECTIONS

A. Owner will contract directly with a third-party special inspection firm to provide the Code required special inspections for this project.

B. Coordinate, schedule, and manage inspections by Owner provided special inspection firm.

1.9 APPLICABLE REFERENCES, CODES, AND PERMITS

A. References will be found in each section that applies to that section. In addition, Contractor shall comply with the Ohio Building Code requirements as they relate to the work.

B. Procure at Contractor's expense all necessary permits from municipal or other agencies and give all notices required. Fines levied due to non-compliance shall be paid by the contractor.
   1. RDA will apply for the applicable building permits with City of Moraine.

1.10 WAGES

A. This project is subject to prevailing wage and/or reporting requirements.

B. Certified Payroll Reports will be required.

C. Employee interviews to confirm compliance with the prevailing wage requirements may be accomplished at any time by the Owner. Contractor shall not obstruct or otherwise prevent employee interviews.

1.11 TAXES

A. Any taxes paid by the contractor will be considered their expense for which no compensation will be made by the Owner. [Tax Exempt Project].

B. Owner will provide Tax Exempt forms upon request.

1.12 SMOKING

A. Smoking is not permitted on the property – inside or outside of any facility.

B. Contractor or crewmembers found to be smoking will be subject to a $500 fine per occurrence. Any habitual offenders will be dismissed from the project site.

1.13 CONTRACTOR / GENERAL REQUIREMENTS

A. Visit the project sites to verify general and pertinent conditions and take measurements necessary for bidding purposes.

B. Failure to show or mention petty details shall not be warranted for the omission of anything necessary for the proper completion of the work.

C. Do not take advantage of any clerical errors, omissions, contradictions, or conflicts that may develop in plans, specifications, or details. Such errors, ambiguities and discrepancies shall be reported to the Architect immediately for clarification, revision, or correction prior to the submission of bids. If no notification is given, it shall be assumed that all specifications and conditions will be met.

D. Remain in compliance with all OSHA STANDARD 1926 – REGULATIONS FOR CONSTRUCTION at all times during project. Comply with all applicable Safe Work Practices.

E. Contract Period
   1. If an extension of time is necessary, a request in writing must be submitted to the Owner at least [14] days prior to the contract completion date.
   2. Notify the Architect, in writing, upon determination of any delay in material delivery.

F. Security: Contractor's Liability for Vandalism

1. Secure and protect the project which is under the control of the Contractor. Include all such expenses for the securement and protection of the project and for the repair and replacement of the work until that portion of the work is accepted as complete by the Owner. Take all measures necessary to provide such security.

G. Qualifying Contractors and Sub-Contractors: The Owner may require the contractor/sub-contractor to provide references of similar projects, past performance, financial disclosures, etc. in the interest of selection of the lowest and best bidder for the project.
   1. The Contractor is responsible for all work performed by Sub-Contractors.
   2. The Owner has the final authority to request a particular sub-contract not be engaged in the project. If this occurs, The Owner and Contractor shall determine if there is an impact to the Contract amount, and negotiate, if necessary, to an adjustment in the Contract amount.
      a. No change to the Contract amount will be permitted if there is a change to the sub-contractor due to them utilizing alternate manufacturers or products that were not approved substitution requests.

1.14 SPECIFICATION CONVENTIONS

A. These specifications are written in imperative mood and streamlined form. This imperative language is directed to the Contractor, unless specifically noted otherwise. The words “shall be” are included by inference where a colon (:) is used within sentences or phrases.

1.15 APPLICATIONS FOR PAYMENT

A. Refer to Section 01 29 00.

1.16 CHANGE PROCEDURES

A. Architect or Owner may issue a Construction Bulletin / Proposal Request including a detailed description of proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change. Contractor will prepare and submit estimate within seven [7] days.

B. Stipulated Sum/Price Change Order: Based on Proposal Request and Contractor's fixed price quotation.

C. Change Order Forms: AIA G701.
   1. On Owner’s approval of a proposal from Contractor, RDA will issue a signed change proposal for items expended from the project allowances or a Change Order for all changes to Contract Sum and for all changes to the Contract Time.

D. Correlation Of Contractor Submittals:
   1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
   2. Promptly revise progress schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
   3. Promptly enter changes in Project Record Documents.

E. Architect will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions on a Construction Bulletin. Provide a no cost change proposal for such items.

F. Important: All change orders must be fully executed prior to beginning any work. Failure to comply will result in Contractor request being denied and completed at no cost to the Owner.

G. Maximum mark up for overhead and profit on change orders shall be 15%.

1.17 UNIT PRICES

A. Architect / Owner will take measurements and compute quantities accordingly. Provide and assist in taking of measurements.

B. Unit Price Schedule: None

C. Unit Price includes: Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, services, and incidentals; erection, application or installation of item of the Work; overhead and profit.

D. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Architect multiplied by unit price for Work incorporated in or made necessary by the Work.

1.18 ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option.

B. Coordinate related Work and modify surrounding Work as required.

C. Schedule of Alternates:
   1. Alternate Deduct 01: Remove interior painting of selected areas of the building from the project. Refer to Drawings.
   2. Alternate Deduct 02: Remove Exterior Façade Improvements from the project. Refer to Drawings.
   3. Alternate Deduct 03: Remove application of spray foam insulation at the underside of the roof deck at Building Area B from the project. Refer to Drawings.
   4. Alternate Deduct 04: Remove Police Department Toilet Room Alterations at Building Area C from the project. Refer to Drawings.
   5. Alternate Deduct 05: Remove exterior site lighting improvements from the project. Refer to Drawings.

1.19 COORDINATION

A. Coordinate scheduling, submittals, and Work of various sections of specifications to ensure efficient and orderly sequence of installation of interdependent construction elements.

B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, operating equipment.

C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. In finished areas, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.

E. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion.

F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.20 QUALITY CONTROL

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturer’s instructions.

C. When manufacturers' instructions conflict with Contract Documents, request clarification from Architect / Owner 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. Perform Work by persons qualified to produce required and specified quality.

F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.21 TOLERANCES

A. Monitor fabrication and installation tolerance control of installed Products over suppliers, manufacturers, Products, site conditions, and workmanship, to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply fully with manufacturer’s tolerances.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.22 REFERENCES

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standards by date of issue current as of date of Contract Documents.

C. When specified reference standard conflicts with Contract Documents, request clarification from Architect / Owner before proceeding.

1.23 LABELING

A. Attach label from agency approved by authority having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.

B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label.
   1. Model number.
   2. Serial number.
   3. Performance characteristics.

1.24 PRECONSTRUCTION MEETING

A. Architect / Owner will schedule preconstruction meeting after Notice of Award for affected parties.

B. Attendance: Architect, Owner, Contractor Project Manager, Superintendent / Foreman shall be in attendance.

C. Agenda:
   1. Scheduling of construction events, set-up, storage and etc.
   2. Project personnel with contact information.
   3. Sequence of construction, starting points, events and required resources.
   4. Subcontractors list with contact information.
   5. Temporary utilities.
   6. Inspection and acceptance of existing conditions.
   7. Owner’s requirements.
   8. Project Safety.

1.25 PROGRESS MEETINGS

A. Architect will be providing periodic observation of the work throughout construction.

1. Architect will issue field reports at each site visit.
2. Architect will be observing the work for compliance with the specifications and will not be responsible for the ways, means and methods of constructing the project or managing the day to day operations.

B. Schedule and administer progress meetings throughout the project at bi-weekly intervals.

C. Agenda:
1. Review of work progress and Owner's Requirements.
2. Field Observations of the completed work.
3. Identification of any problems and associated solutions.
4. Proposed changes.
5. Administrative issues – payment applications, change orders, etc.

D. Architect will record meeting minutes and will issue to the project team.

1.26 PRE-INSTALLATION MEETINGS

A. Determine any and all necessary pre-installation meetings and shall schedule the same.

B. When required in individual Specification Sections, convene preinstallation meetings at Project Site one week before starting Work of specific Section.

C. Require attendance of parties directly affecting, or affected by, Work of specific Section.

D. Prepare agenda and preside over meeting:

E. Review conditions of installation, preparation, and installation procedures.

F. Review coordination with related Work.

G. Record minutes and distribute to participants after meeting, and those affected by decisions made.

1.27 CONTRACT ADMINISTRATION

A. Architect is providing contract administration services for this project to the Owner. However, it shall be the responsibility of the Contractor and Owner to coordinate the proposed work, schedules, installations, permits, inspections, etc. as the Architect is not on-site every day.

B. Contact the Architect for clarification should there be questions regarding the interpretation or intent of the documents, field discovery, etc. that would impact or affect the work as proposed. Architect shall not be liable for deviations, field changes, and Owner changes during construction.

C. Field confirm all existing conditions, proposed installations and how they interface to ensure the systems can be installed per the intent of the documents and to meet applicable building and zoning codes, local requirements, Owner requirements, provide a watertight detail, meet aesthetic requirements, etc.

D. Meet all applicable building and zoning codes requirements whether specifically noted herein or not. Building codes represent the minimum acceptable standard, bid documents may represent additional work or higher quality than the minimum.

E. Install all products, materials, installations, and the like in accordance with applicable industry standards, applicable manufacturer's details and instructions, in accordance with best practices, and building code provisions. The manufacturer details / requirements are the minimum acceptable standard, bid documents may require additional work.

1.28 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching new Work; restore Work with new Products.

B. Submit written request in advance of cutting or altering elements affecting:
   1. Structural integrity of element.
   2. Integrity of weather-exposed or moisture-resistant elements.
   3. Efficiency, maintenance, or safety of element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate contractor.

C. Execute cutting, fitting, and patching [including excavation and fill,] to complete Work, and to:
   1. Fit several parts together, to integrate with other Work.
   2. Uncover Work to install or correct ill-timed Work.
   3. Remove and replace defective and non-conforming Work.
   4. Remove samples of installed Work for testing.
   5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Execute work by methods to avoid damage to other Work, and to provide proper surfaces to receive patching and finishing.

E. Cut masonry and concrete materials using masonry saw or core drill. Restore Work with new Products in accordance with requirements of Contract Documents.

F. Fit Work tight to adjacent elements. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

G. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated materials, to full thickness of penetrated element. Follow applicable UL assemblies.

J. Refinish surfaces to match adjacent finishes.
   1. For continuous surfaces, refinish to the nearest intersection; for assembly, refinish entire unit.
   2. For painted surfaces, paint entire wall from corner to corner, floor to ceiling.

K. Identify hazardous substances or conditions exposed during the Work to RDA for decision or remedy.

1.29 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial progress schedule in duplicate within 5 days after date of Owner-Contractor Agreement for Architect/Engineer review.

B. Prepare progress schedule using a bar chart of Critical Path chart to outline work and interrelated components.

C. Submit revised schedules as appropriate throughout the duration of the project.

D. Submit implementation plan indicating planned progress, sequencing, and order of operations.

1.30 SUBMITTAL PROCEDURES

A. Refer to Section 01 33 00.

1.31 MOCK-UPS

A. Accomplish mockups as directed by the Architect / Owner.

B. Accepted mock-ups are representative of quality required for the Work.

C. Where mock-up has been accepted by Architect / Owner and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so.

1.32 TEMPORARY UTILITIES

A. Owner will pay for the cost of temporary utilities throughout the duration of the project.

B. Utilize existing utilities at the building as required to facilitate work. Maintain existing utilities operational throughout the duration of the project.
   1. If systems need to be out of services, schedule this work for off-hours, coordinate with Owner.

C. Provide temporary lighting for construction operations as required by conditions and where existing lighting has been removed to facilitate work.

D. Provide temporary emergency egress and exit signage as required by conditions and where existing has been temporarily removed to facilitate work.

E. Coordinate with fire suppression and fire alarm system / monitoring company as applicable to facilitate work and accomplish modifications to the systems throughout the duration of the project. Maintain existing systems operational.

1.33 TEMPORARY HEATING / COOLING / VENTILATION

A. Provide and maintain temporary heating / cooling as required to facilitate the project.
   1. Provide adequate protection against distribution of dust / dirt into the HVAC ductwork, exhaust, etc.
   2. Do not let dust / dirt accumulate in the existing duct systems resultant from the project.

B. Provide and maintain filtration media [additional filters, charcoal filters, etc.] at all HVAC systems during the course of the project.

C. Shut down HVAC systems during dusty activities.

D. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.34 TEMPORARY SANITARY FACILITIES

A. Provide any and all necessary portable toilet facilities at the project site as applicable to the work. Owner facilities may not be utilized without Owner approval.
   1. Protect portable toilet facilities from vandalism.

1.35 TEMPORARY BARRICADES

A. Erect temporary barricades as applicable to the work to maintain security, dust control, etc.
   1. Minimum requirement of barricades: polyethylene zip walls, etc. as required to maintain dust control and/or limit access. Metal stud / gypsum board barricades may be required at certain areas in public facing spaces. Coordinate with Owner. Exact locations and type of barricade to be approved by Owner prior to installation.

B. Provide all applicable signage to limit non-construction personnel from entering the construction area.

1.36 STAGING AREA / MATERIAL STORAGE

A. Coordinate with Owner on acceptable location of project staging and material storage area.

B. Do not anticipate any space for storage of materials in the building / work areas or adjacent building areas.

C. Provide secured, portable storage containers for the temporary storage materials, fixtures, and equipment, etc. as required for the duration of the project. Coordinate location of storage containers with Owner. Protect / restore site as applicable to the conditions to original conditions.

D. Owner will make reasonable effort to provide suitable space on the site for the Contractor to set up operations. Moving from this space may be necessary when instructed by the Owner and shall be accomplished without charge to the Owner. Cooperate with Owner to minimize conflict from Owner's operations.

E. Enclose exterior project staging area, if provided, with a minimum of a 6' high chain link fence to the satisfaction of the Owner.

1.37 FIELD OFFICE

A. Owner will attempt to make space available for the Contractor / Project Team use over the course of the project. Relocate if directed by Owner or as required by work.

1.38 PARKING

A. Park Contractor vehicles in areas designated by the Owner.

B. Do not block access to existing parking lots with construction equipment, material laydown, or storage areas.

1.39 PROGRESS CLEANING AND WASTE REMOVAL

A. Collect and maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition to the satisfaction of the Owner. Clean up shall occur on a daily basis.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing spaces.

C. Failure to provide routine and daily cleanup may result in a back charge from the Owner to accomplish this work.

D. Provide dumpsters or trash containers needed for the proper removal of project materials, trash, or debris related to the Work. Keep all work areas and project sites neat and free of trash and clutter at all times. Take all considerations for safety.

1.40 FIRE PREVENTION FACILITIES

A. Establish fire watch for cutting and welding and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.

B. Portable Fire Extinguishers: NFPA 10; 10 pound capacity, 4A-60B: C UL rating.
   1. Provide one fire extinguisher at each project site during work operations.
   2. Supplement as necessary per the local fire department requirements for construction operations.

1.41 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. Protect finished pavement, concrete, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

D. Prohibit traffic or storage upon waterproofed or roofed surfaces, finished surfaces, etc as is applicable to the work. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer and provide all required protection as determined necessary. Any damage caused shall be repaired to like new condition.

E. Prohibit traffic from landscaped areas.

1.42 DUST CONTROL

A. Execute work by methods to minimize raising dust from Construction operations.

B. Provide positive means to prevent air-borne dust from dispensing into atmosphere and to other areas of the project as applicable.

C. Provide temporary visqueen dust control measures to minimize the spread of dust and debris. Provide drop cloths, protective coverings as necessary.

D. Provide protection of existing HVAC / distribution systems.

1.43 POLLUTION AND ENVIRONMENTAL CONTROL

A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

B. Provide dust control, erosion and sediment control, etc. to allow for proper execution of the Work.

C. Provide protective coverings, etc. as necessary to protect work.

1.44 DELIVERY, HANDLING, STORAGE, AND PROTECTION

A. Deliver, handle, store, and protect Products in accordance with manufacturer's instructions.

B. Contractor shall be responsible for storage and safekeeping of all materials, including company’s personal property. All damaged materials shall be removed from the site.

C. Coordinate material delivery to avoid Owner involvement.

1.45 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Clean interior and exterior surfaces exposed to view.
   1. Clean cabinets, fixtures, equipment.
   2. Clean glazing [new and existing].
   3. Vacuum carpeted and soft surfaces.

C. Replace filters of existing operating equipment.

D. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.46 STARTING OF SYSTEMS

A. Provide seven [7] days notification prior to start-up of each item.

B. Ensure each piece of equipment or system is ready for operation.

C. Execute start-up under supervision of responsible persons in accordance with manufacturer’s instructions.

D. Submit written report stating equipment or system has been properly installed and is functioning correctly.

1.47 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of Substantial Completion.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled times, at equipment location.

D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
   1. Prepare and insert additional data into the operations and maintenance manuals when the need for additional data becomes apparent during instruction.

1.48 TESTING, ADJUSTING, AND BALANCING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

B. Retain services of independent firm to perform testing, adjusting, and balancing. Include the cost for these services in the bid amount.
   1. Reports will be submitted by independent firm to Architect / Owner indicating observations and results of tests and indicating compliance or non-compliance with specified requirements and with requirements of Contract Documents.

C. Cooperate with independent firm; furnish assistance as requested. Make adjustments to systems to be in compliance with Contract Documents at no additional cost to Owner.

D. Re-testing required because of non-conformance to specified requirements is the responsibility of the Contractor.

1.49 CLOSE OUT PROCEDURES

A. Refer to Section 01 77 00

1.50 PROJECT RECORD DOCUMENTS

A. Refer to Section 01 77 00

1.51 OPERATION AND MAINTENANCE DATA

A. Refer to Section 01 77 00.

1.52 WARRANTIES

A. Refer to Section 01 77 00.

PART 2 PRODUCTS

2.1 MANUFACTURED PRODUCTS

A. Where a particular system, product, or material is specified by name it shall be considered a standard and most satisfactory for its particular purpose. Any other product or material considered equal or better in all respects must be approved by the Architect prior to bidding.

B. All products used on this project shall be new, unless otherwise noted on the drawings or as specified herein.

2.2 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components specifically identified for reuse.

B. Do not use materials and equipment removed from existing premises, except as specifically identified or allowed by the Contract Documents.

C. Provide interchangeable components of same manufacturer for components being replaced.

2.3 LABELING

A. Attach label from agency approved by Authority having Jurisdiction for products, assemblies, and systems required to be labeled by Applicable Code.

B. Label information: include manufacturer's or fabricator's identification, approved agency information, and the following information, as applicable, on each label.
   1. Model number
   2. Serial number
   3. Performance characteristics

2.4 DELIVERY, HANDLING, STORAGE, AND PROTECTION

A. Deliver, handle, store, and protect Products in accordance with manufacturer's instructions.

B. Manage and be responsible for storage and safekeeping of all materials, including company's personal property. All damaged materials shall be removed from the site.

C. Coordinate material delivery to avoid Owner involvement.

D. Locations of ground level storage and waste dumpster must be approved by the Owner.

E. Properly secure all materials to prevent blow over / blow off during weather / wind events, etc.

2.5 PRODUCT OPTIONS

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

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for manufacturers not named.

2.6 SUBSTITUTIONS

A. Refer to Section 01 25 00.

2.7 EXTRA MATERIALS

A. Provide attic stock of finish materials totaling 5% [or as noted below] of the total installation.
   1. Each finish floor type
   2. Each finish base type
   3. Each acoustic ceiling tile type – 3%

B. Provide minimum of [1] gallon of each finish paint color.

C. Coordinate turnover of extra materials to Owner, assist in placing materials in a location suitable to the Owner.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. **Beginning new Work means acceptance of existing/job-site conditions.**

B. Verify utility services are available, of correct characteristics, and in correct location.

C. Contact OUPS a minimum of 48 hours prior to beginning work to verify location of existing utilities, coordinate requirements as applicable.
   1. Contact private utility locating services as required by the conditions. It is the Contractor's responsibility to locate all public and private utilities that may be impacted by the work.

3.2 FIELD VERIFICATION

A. Prior to ordering materials, verify the actual dimensions of existing conditions and assume responsibility for workable solutions for all new work. Verification that the new work and items are

workable for existing conditions while providing adequate clearances is the responsibility of the Contractor.

3.3 PROTECTION

A. Accomplish all work in accordance with the provision of Federal, State American Standard Safety Code for Building Construction and OHSA safety requirements.
   1. Implement and be responsible for protective railings and guards, tie-offs, fall protection, and other safety measures as required by OSHA, even if not specified.
   2. Fall protection is required.
   3. Architect / Owner is not a safety consultant and as such does not direct the means and methods of compliance with safety regulations.

B. Protect and maintain all building entrances, interior contents, building exterior and grounds.
   1. Return all surfaces to their original condition after all work is complete.

C. Replace/repair the damages caused by any type of improper protection [including interior or exterior equipment] at no expense to the Owner.

D. Comply with all regulations of the Local Fire Department and the Owner's requirement regarding storage and handling of flammable materials, etc. It is the responsibility of the Contractor performing any hot /torch work to comply with the safety provisions of the National Fire Codes pertaining to such work and the Contractor shall be responsible for all damage or fines resulting from failure to so comply.

3.4 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

3.5 JOB SUPERINTENDENT/EMPLOYEES

A. Each prime contractor shall have a qualified foreman on the project at all times when work is being accomplished.

B. Refrain from fraternization with building occupants other than specifically designated Owner's representatives.

C. Furnish the Owner with a list of personnel with phone numbers that will be working on the project and emergency contacts names and numbers that has the authority to handle emergencies on a 24 hour/seven days a week.

3.6 SAFETY PROGRAM

A. Develop, implement, and maintain a written safety program for all operations/ work performed on this project. Keep these documents at the job site and make available to the Architect / Owner upon request.

B. Assume all responsibility for project safety, ways, and means and methods of constructing the project. Engage safety consultant as may be necessary for the execution of the work.

C. In addition, the Owner may require special safety requirements to be performed by the Contractor, these requirements will be provided prior to commencement of work.

3.7 REMOVALS AND CLEANUP

A. Remove and demolish of items that are required for proper completion of the work as applicable in each section. All debris resulting from the work not designated for reuse becomes the property of the Contractor unless stated otherwise.

B. Keep all work areas and project sites neat and free of trash and clutter at all times.

C. Maintain the work areas, including all subcontractor's work, clean of all debris to the satisfaction of the Owner at the completion of each work day [daily cleanup].

D. Provide dumpsters or trash containers needed for the proper removal of project materials, trash, or debris related to the work.
   1. No Debris, materials, etc. may be left unprotected on the grounds.
   2. All exterior staging / dumpster areas must be fenced / protected.

3.8 SPECIAL PROCEDURES

A. Materials: As specified in product sections; match existing with new products for patching and extending work.

B. Employ skilled and experienced installer to perform alteration work.

C. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.

D. Remove unsuitable material not marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.

E. Remove debris and abandoned items from area and from concealed spaces.

F. Prepare surface and remove surface finishes to permit installation of new work and finishes.

G. Remove, cut, and patch Work in manner to minimize damage and to permit restoring products and finishes to original or specified condition.

H. Refinish existing visible surfaces to remain in renovated rooms and spaces, to renewed condition for each material, with neat transition to adjacent finishes.

I. Where new Work abuts or aligns with existing, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.

J. When finished surfaces are cut so that smooth transition with new Work is not possible, terminate existing surface along straight line at natural line of division and submit recommendation to Architect for review.

K. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.

L. Finish surfaces as specified in individual product sections.

3.9 GENERAL PROJECT REQUIREMENTS

A. Equipment delivery and equipment staging must be coordinated with Owner prior to start of project.

B. Safety is paramount and all personnel on site must wear appropriate personal protection equipment [PPE]. The Contractor is responsible for means and methods to ensure that proper PPE is provided. Failure to comply may result in dismissal from site.

C. Barricade work area with appropriate construction grade barriers to establish boundaries of work area and assure safety for all workers and general public. All work areas must be properly barricaded from the general public prior to starting any work.

D. Maintain job site in an orderly and neat fashion at all times.

E. Contractor will pre-determine work phases with Owner to minimize disruption of business operations.

F. IMPORTANT: Failure to show or mention petty details shall not be warranted for the omission of anything necessary for the proper completion of the work.

G. The plans and specifications are intended to depict the general scope, layout and quality of workmanship required. The documents are not an "instruction manual" to execute the work nor are they intended to show or describe in detail every item necessary for the proper installation of the work. The means and methods required to execute the work described is the sole responsibility of the Contractor. The Contractor shall include the ancillary work required, whether explicitly stated or not, for the proper completion of the work as intended. The Contractor is required to meet or exceed building code requirements, applicable industry standards, ASTM standards, and/or manufacturer installation requirements as they relate to the work.

H. The plans and specifications represent a single complete design package indicating the intended scope of the project in its entirety. As such, the project is structured to be awarded to a single Prime Contractor. The documents do not delineate bid packages or assign responsibilities to any subsequent subcontractors, dictate construction sequencing, nor provide coordination between any "trades". Such activities are the responsibility of the holder of the construction contract. In the event of a discrepancy within the drawings or between the drawings and the specifications, the more stringent requirement represented in the documents shall prevail.

I. Do not take advantage of any clerical errors, omissions, contradictions, or conflicts that may develop in plans, specifications, or details. Such errors, ambiguities and discrepancies shall be reported to the Architect immediately for clarification, revision, or correction prior to the submission of bids. If no notification is given, it shall be assumed that all specifications and conditions will be met.

END OF SECTION

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SECTION 01 25 00 – SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Section 00 23 13, Instructions to Bidders shall apply to this section.

1.2 WORK INCLUDES

A. Includes administration and procedural requirement for Substitutions.
   1. Substitutions' for Cause: Changes due to project conditions, such as unavailable of product.
   2. Substitutions' for Convenience: Changes that may offer advantages to the Owner.

1.3 PRODUCT OPTIONS

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

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions / Approved Equal: Submit request for substitution as outlined in this section for manufacturers not named.
   1. Architect / Owner is the decision maker if the proposed "approved equal" is in fact equal and approved. Any decision rendered is final.
   2. Any Contractor, Sub-contractor, or Supplier who makes their own judgement as to "approved equal" and includes within their bid without a formal approval is doing so at their own risk.

1.4 SUBSTITUTIONS PROCEDURES

A. Architect will consider requests for Substitutions by the Bidder only [not materials suppliers, etc].

B. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

C. A request constitutes a representation that the Bidder:
   1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
   2. Will provide same warranty for Substitution as for specified product.
   3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension which may subsequently become apparent.

D. Substitution Procedure
   1. **Submit copy of request for Substitution for consideration to Architect no later than [7] days before bid opening date**.
   2. Submit shop drawings, product data, and applicable certified test results attesting to proposed product equivalence. Burden on proof is on proposer.
   3. Architect will notify Bidder in writing of decision to accept or reject request within [5] days of receipt of request or request additional information or documentation for evaluation.

E. Substitutions will not be considered when they are indicated or implied on Submittals, without written request or when acceptance will require revision to the Contract Documents.

F. If the Substitution will require modifications to the Contract / Bidding Documents, the cost for updating the documents shall be paid by the Bidder / Contractor making the request.

G. Substitutions will not be considered after award of the project without justification.

H. Approved substitutions will be identified by Addenda.
   1. Bidders shall not rely upon approvals made in any other manner.

END OF SECTION

SECTION 01 29 00 – PAYMENT PROCEDURES

PART 1 GENERAL

1.1 WORK INCLUDES

A. Includes administration and procedural requirement for necessary to prepare and process Application for Payment.

1.2 SCHEDULE OF VALUES

A. Submit schedule on AIA Form G703.
   1. Provide line items for each applicable CSI division / defined work scope such that the Architect / Owner can review and determine/confirm progress.
   2. Include line items for each allowance, alternates [as applicable], and general conditions.

B. Submit Schedule of Values in duplicate within [7] days after date of Owner-Contractor Agreement.

1.3 APPLICATIONS FOR PAYMENT

A. Use AIA form G702 and G703 for Application for payment or a form the Owner has requested.

B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.

C. Complete every entry, notarize and execute by a person authorized to sign document on behalf of the Contractor. Include amounts for work completed following previous Application for Payment whether or not payment has been received, include amounts of Change Orders issued before last day of construction period covered by application.
   1. Stored materials included in application must have supporting documentation that verifies amount required, do not include overhead and profit on stored material.
   2. Submit to Architect for review and processing.
      a. E-mail submittal is acceptable unless otherwise directed by the Owner. Verify hard copies with Owner if required.

D. Each application for payment following the initial Application for Payments shall be consistent for payment with previous applications.

1.4 RETAINAGE

A. Refer to the Supplementary Conditions to the AIA-A104 Owner-Contractor Agreement.

1.5 PREVAILING WAGE / PAYROLL REPORTS

A. Submit certified payroll reports for each contractor [General Contractor and all Subcontractors] with each payment application. Payroll reports shall be set up on a weekly basis.

1.6 SUBMITTAL PROCEDURES

A. Submit [1] copy of each payment application on AIA Form G702 and G703, in PDF format
   1. Pencil copy to Architect for review/acceptance. Architect will review and provide any comments or questions.
   2. Submit final payment application in PDF format to Architect for processing.
   3. Architect will certify and process the payment application and will forward to Owner for payment.

B. Submit all required waivers of lien / partial release of lien [including vendors and subcontractors as requested by Owner], payroll reports, etc. as required by the Owner. Failure to submit required paperwork can delay processing of Application for Payment.

1.7 FINAL APPLICATION FOR PAYMENT

A. Refer to provisions in Section 01 77 00 for Application for Payment at Substantial Completion.

END OF SECTION

SECTION 01 33 00 – SUBMITTALS

PART 1 GENERAL

1.1 WORK INCLUDES

A. Review of shop drawings and product data by Architect / Owner.

1.2 SUBMITTAL PROCEDURES

A. Submit product data and shop drawings for all applicable components of the project. Refer to individual sections for additional requirements.
   1. Provide a submittal log at the beginning of the project for review by Architect / Owner. Submittal log shall identify proposed submittals by Specification Section. Group submittals within an individual specification section together whenever possible.
   2. Architect review of the submittals will be general in nature and does not relieve the Contractor in any way of the responsibility in compliance with the contract requirements, manufacturer requirements, and/or applicable codes.

B. Accomplish submittals in a digital [PDF] format.
   1. Any hard copies received will be scanned and returned electronically.
   2. Provide those submittals required to maintain orderly progress of the work and those required for early lead time for manufacturer fabrication.
   3. Mark each component to identify applicable products, models, options, and other data. Supplement manufacturer's standard data to provide information unique to this project. Non-identified submittals will be rejected.

C. Provide submittal form / cover sheet to identify Project, Contractor, subcontractor or supplier; and pertinent Contract Document references on each submittal.

D. Apply Contractor's stamp, signed or initialed, certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.

E. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of completed Work.

F. Revise and resubmit submittals as required; identify changes made since previous submittal.

G. Accomplish all submittals at the beginning of the project to allow the proper ordering of materials for the project.
   1. Failure by the Contractor to provide submittals in a timely fashion does not change the project start date nor contract period.

H. Any materials on the job site that have not been reviewed as part of the submittal process are subject to rejection / removal from the job-site. Any work undertaken without review of the submittal data is at the Contractor's risk and subject to rejection or replacement at no cost to the Owner if submittals are not in conformance with the project documents.

I. Allow [7] days for review of submittal items.

1.3 SUBMITTALS / PRODUCT DATA / SHOP DRAWINGS

A. Product Data/Shop Drawings:
   1. Submitted to Architect for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
   2. All shop drawings shall be to scale, submit drawings on sheets no larger than 24-inch x 36 inch, all other product data can be on 8 ½ X 11-inch sheets.

B. Samples for Review:
   1. Submitted to Architect for review and selection for aesthetic, color, or finish.

2. Submit physical samples of finishes from full range of manufacturer's standard colors, textures, and patterns for Owners selection.
3. Submit samples to illustrate functional and aesthetic characteristics of Product.

C. Personnel/Other Contractors
1. Submit a list of all subcontractors and on-site personnel with the list of lead contact and associated phone numbers.
2. Submit emergency contact sheet with contacts for an emergency – 24/7 call list.

D. Contract Items:
1. Submit Certificate of Insurance, Worker's Comp Certificates as required by Owner.
2. Submit bonds if applicable to the contract.
3. Submit a written Construction Schedule / Implementation and Sequencing Plan outlining starting points and length of time to complete work in each section.

E. Phasing Plan: Submit to Architect / Owner for review.

F. Safety Data Sheets: Submit Safety Data Sheets [SDS] on all products to the Owner.
1. Owner shall be responsible to provide to employees as applicable.
2. Architect does not review / approve any SDS sheets.

G. Site Specific Safety Plan
1. Provide to Owner for their Review.

H. Site Logistics Plan
1. Provide to Owner for their Review.

1.4 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit manufacturer printed instructions for delivery, storage, assembly, installation, [start-up,] adjusting, and finishing, in quantities specified for Product Data.

1.5 MANUFACTURER'S CERTIFICATES

A. When specified in individual specification sections, submit certifications by manufacturer to Owner, 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.

END OF SECTION

SECTION 01 77 00 - CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 WORK INCLUDES

A. Close-out of the actual work, including warranties, maintenance manuals and final cleaning. Close-out of all contract obligations.

1.2 CLOSE-OUT PROCEDURES

A. Notify Architect / Owner [7] days prior to the work being complete to establish the desired inspection date. Architect / Owner will either proceed with the inspection or notify Contractor of unfulfilled requirements.
   1. This project will likely require multiple phases / turn-over to the Owner. Anticipate phased turnover of the project in the bid amount.

B. Architect / Owner shall inspect the completed project and notify the Contractor of any deficiencies. Deficiencies will form 'punch list' for final acceptance.

1.3 PUNCHLIST REQUIREMENTS

A. Review and inspect all work prior to notifying the Architect / Owner for a Punchlist inspection of the work. Provide written documentation certifying review along with documentation of Contractor generated Punchlist.

B. If work is clearly not complete, the Punchlist will be suspended until such time that it is evident that the Contractor has completed and reviewed/inspected their own work.
   1. Architect anticipates [1] punchlist inspection and [1] back-punch / final inspection [for each of the phased turnover of the project] as part of our services to the Owner.
   2. Failures by the Contractor to complete the work, complete punchlists, etc. may result in a backcharge to the Contractor for the additional time to closeout the project.

C. Review and provide the noted repairs and corrective work necessary at each of the Punchlist inspections to allow project close out.
   1. Back-punch walk through may result in additional punchlist items which need to be addressed by the Contractor.

D. Provide adequate time in the construction schedule to accomplish punchout work within the overall contract period indicated within the bid documents.

E. The failure to identify any punchlist item during a walk through / inspection does not release the Contractor from contractual responsibility to address any item during the warranty period.

1.4 SUBSTANTIAL COMPLETION

A. A Certificate of Substantial Completion [AIA Form G704] will be issued upon completion of all the work. Certificate of Substantial Completion will set forth the date of warranty commencement, work yet to be completed, timeline for completion of that incomplete work, and value of that incomplete work.

1.5 CONTRACT COMPLETION

A. Overall Contract Completion is anticipated within 60 days after the date of Substantial Completion unless otherwise agreed to by the Owner. This includes completion of identified punchlist items, closeout documents, etc.

1.6 PREREQUISITIES TO FINAL ACCEPTANCE AND PAYMENT

A. Provide the following items to the Owner, prior to final project acceptance and final payment [contract completion]:
   1. Written / documented evidence of completing 'punch list' as applicable.

2. Final cleaning of all work areas.
3. Restoration of all work staging and lay-out areas to pre-construction conditions, including but not limited to, removal of debris, temporary facilities, grading and grass seeding, and cleaning or repair of impacted structures.
4. Final Inspection Approvals from authorities having jurisdiction over permitting. Both general building permits as well as applicable trade permits.
5. Any claims or disputes must be resolved.
6. Notarized affidavit of waiver of liens [Contractor of record], sub-contractors and material suppliers
7. Final Application for Payment, Refer to Section 01 29 00 for requirements.
8. Warranties: Contractor warranty for the project, manufacturer's original warranties, any maintenance agreements as applicable.
9. O+M Manuals
10. Manufacturer's maintenance and repair instructions.
11. As-Built / Record Drawings.

1.7 PHOTOGRAPHIC DOCUMENTATION

A. When requested by the Owner, submit photos of the completed punch list items along with any supporting documentation, in lieu of additional back punch walkthrough[s].

1.8 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of Contract Documents to be utilized for record documents.

B. Record actual revisions to the Work. Record information concurrent with construction progress.

C. Specifications: Legibly mark and record at each Product section description of actual Products installed.

D. Record Documents and Shop Drawings: Legibly mark each item to record actual construction.

E. Submit documents to Owner.

1.9 PROJECT WARRANTIES

A. All work undertaken as part of the project shall be warranted for a period of not less than [1] year. Individual sections / products may have specific additional warranty requirements.

B. Provide notarized copies of warranty documents to the Owner.
   1. Execute and assemble transferable warranty documents from subcontractors, suppliers, and manufacturers.

C. Original warranties are required to be provided to the Owner prior to final payment.

1.10 OPERATION AND MAINTENANCE DATA

A. Submit [1] hard copy and [1] digital copy of the Operation and Maintenance Manual prior to or at the final inspection. Hard copy to be bound in 3-ring binder[s] using 8-1/2 x 11-inch text pages.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS" and title of project.

C. Internally subdivide binder contents with permanent page dividers, logically organized, with tab titles legibly printed under reinforced laminated plastic tabs.

D. Contents:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, subcontractors, and major equipment suppliers.
   2. Part 2: Permit and Inspection information
   3. Part 3: Project submittals, organized by CSI division

a. Include applicable product warranties with individual sections / submittals
4. Part 4: Operation and maintenance instructions, arranged by system / CSI division.
5. Part 5: Project documents and certificates.
6. Part 6: Colors / finishes / samples

1.11 FINAL CLEANING AND SITE REPAIR

A. Final cleaning of all work areas:
1. Execute final cleaning prior to final inspection.
2. Clean interior and exterior surfaces exposed to view. Vacuum carpeted and soft surfaces.
3. Clean interiors of all cabinetry.
4. Clean all fixtures and finishes.
5. Replace filters of operating equipment.
6. Remove waste and surplus materials, rubbish, and construction facilities from site.

B. Restore all work staging and lay-out areas to pre-construction conditions, including but not limited to, removal of debris, temporary facilities, grading and grass seeding and cleaning or repair of impacted structures.

END OF SECTION

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SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Demolishing designated building equipment and fixtures.
   2. Demolishing designated construction.
   3. Cutting and alterations for completion of the Work.
   4. Removing designated items.
   5. Protecting items designated to remain.
   6. Removing demolished materials.

1.2 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of capped utilities, concealed utilities, subsurface obstructions, and any other documentation necessary for future reference.

1.3 QUALITY ASSURANCE

A. Conform to applicable code for demolition work, dust control, products requiring electrical disconnection and re-connection.

B. Conform to applicable code for procedures when hazardous or contaminated materials are discovered.

C. Obtain required permits from authorities having jurisdiction.

1.4 SCHEDULING

A. Schedule Work to coincide with proposed alterations and improvements.

B. Coordinate Work with Work by Others and Work by Owner as needed.

C. Coordinate utility and building service interruptions with Owner.
   1. Do not disable or disrupt fire alarm or life safety systems without approval from the Owner and Fire Department and/or Building Official. Coordinate requirements as needed.

1.5 PROJECT CONDITIONS

A. Cease operations immediately if structure appears to be in danger and notify Architect/Engineer. Do not resume operations until directed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

A. Notify affected utility companies before starting work and comply with their requirements.

B. Mark location and termination of utilities.

C. Erect, and maintain temporary barriers and security devices including warning signs and lights, and similar measures, for protection of the public, Owner, and existing improvements indicated to remain.

D. Erect and maintain weatherproof closures for exterior openings as applicable to work/scope.

E. Erect and maintain temporary partitions.

F. Prevent movement of structure; provide temporary bracing and shoring as required.

G. Provide appropriate temporary signage.

H. Do not close or obstruct building egress path.

I. Do not disable or disrupt building fire or life safety systems without **three** days prior written notice to Owner. Coordinate with Fire Department / Building Official.

3.2 SALVAGE REQUIREMENTS

A. Coordinate any applicable items to be salvaged with Owner.

B. Protect designated salvage items.

C. Package small and loose parts.

D. Deliver salvaged items to Owner.

3.3 DEMOLITION

A. Provide all selective demolition and removals necessary for the proposed alterations. Field coordinate all conditions with the design intent on the drawings.
   1. Drawings are diagrammatic and may not reflect the full extent of demolition / removals required to accomplish the proposed scope of work.
   2. Coordinate design intent and verify that all demolition work and restoration / repair work required is included in the scope of the project, regardless of specifically being noted on the drawings.

B. Minimize interference with adjacent and occupied building areas.

C. Maintain protected egress from and access to adjacent building areas.

D. Cease operations immediately when structure appears to be in danger and notify Architect.

E. Disconnect and remove utilities within demolition areas, refer to Drawings.

F. Cap and identify abandoned utilities at termination points when utility is not completely removed.

G. Protect existing improvements.

H. Carefully remove building components indicated to be Reused:

I. Remove demolished materials from Site except where noted otherwise. Do not burn or bury materials on Site. Provide the proper removal and/or all required dumpsters for the project.

J. Remove materials as Work progresses.

K. Upon completion of Work, leave areas in clean condition.

L. Remove temporary Work.

3.4 CLEAN UP

A. Remove demolished materials from site as work progresses.

B. Leave areas of work in clean condition.

END OF SECTION

SECTION 02 50 00 - HAZARDOUS MATERIALS REQUIREMENTS

PART 1 GENERAL

1.1 HAZARDOUS MATERIALS

A. There are known asbestos containing materials in the areas of work for this project. Refer to the Environmental Report prepared by mac paran Consulting for additional information and abatement requirements. All asbestos containing materials will be removed / abated as part of this project.

B. If during demolition, additional suspected asbestos containing materials are discovered, contact Architect / Owner for direction.

C. Coordinate all abatement efforts as required as they interface with the scheduled work.

1.2 SUMMARY

A. Contractors must comply with Occupational Safety and Health Administration regulation 29 CFR 1926.62 “Lead in Construction Standard” as well as the Environmental Protection Agency Lead, Renovation, Repair and Painting Rule.

B. Follow all applicable EPA rules and regulations when working with hazardous materials. Remain in compliance at all times during the project.

C. If any work person encounters any material which they suspect may be hazardous or toxic, they shall immediately advise the Owner. Take immediate and appropriate action to protect the building users and workers in accordance with federal, state, and local laws, codes and regulations. The Architect and architect's consultants shall have no responsibility for the discovery, presence, handling, removal or disposal of or exposure of persons to hazardous materials in any form at the project site, including but not limited to asbestos, asbestos products, polychlorinated biphenyl (pcb) or other toxic substances.

1. The contractor is hereby advised that RDA Group Architects, LLC is not a design professional in the determination of the presence of hazardous materials, nor is RDA a design professional involved in making recommendations regarding the testing, removal, encapsulation or other corrective measures pertaining to hazardous materials.
2. If the work which is to be performed under the contract interfaces in any way with the existing components which contain hazardous materials, it is the contractor’s responsibility to contact the environmental consultant regarding the proper means & methods to be utilized in dealing with hazardous materials.
3. By execution of the contract for construction, the contractor hereby agrees to bring no claim for negligence, breach of contract, indemnity or otherwise against the architect, his principals, employees, agents or consultants if such a claim in any way would involve the investigation of or remedial work related to hazardous materials in the project.
4. By execution of the contract for construction, the contractor further agrees to defend, indemnify and hold the architect, his principals, employees, agents or consultants harmless from any such asbestos or other hazardous materials related claims that may be brought by the contractor's subcontractors, suppliers or other third parties who may be acting under the direction of the contractor pursuant to this project.

END OF SECTION

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Cincinnati

3959 Fulton Grove Rd.
Cincinnati, Ohio 45245
(513) 752-9111
(513) 752-7973 (Fax)

Cleveland

3100 East 45th Street
Suite 446
Cleveland, Ohio 44127
(216) 916-7378

Florida

11982 Granite Woods Loop
Venice, Florida 34292
(513) 265-3299

Services

Phase I ESA's
Phase II Investigations
Asbestos
Lead-Based Paint
Industrial Hygiene
Indoor Air Quality/Mold
Radon
Safety
Training

Asbestos-Containing Materials Inspection Report

Moraine Municipal Building
4200 Dryden Road
Moraine, Ohio 45439

Prepared for:

Jennie Duke
Partner/Senior Project Architect, RA LEED AP
RDA Group Architects
7662 Paragon Road
Dayton, Ohio 45459
Phone: (937) 610-3340

Prepared by:

m.a.c. Paran Consulting Services, Inc.

George S. Beaudion
Certified Asbestos Hazard Evaluation Specialist #ES31662

Michelle Paraniuk, M.S., President

March 2024

Table of Contents

1.0 Executive Summary

1.1 Background

m.a.c. Paran Consulting Services, Inc. performed a limited pre-renovation asbestos inspection for RDA Group Architects. The structure inspected (Moraine Municipal Building) is located at 4200 Dryden Road, Moraine, Ohio. The objectives of the inspection were to (1) identify, by type and location, friable and non-friable asbestos-containing materials [ACM] in specified areas of the structure; (2) assess the current condition of the ACM identified; and (3) provide estimated quantities of ACM. The inspection was conducted by Mr. George S. Beaudion, certified Ohio Asbestos Hazard Evaluation Specialist (License #ES31662), on March 30-31, 2024.

1.2 Inspection Results

The following is a summary of the materials confirmed by the laboratory, or assumed through a previous inspection report, to contain >1% asbestos. Please note that the quantities provided in this summary are approximate amounts and should be verified by an abatement contractor prior to the onset of removal activities.

- **Pipe Fitting Insulation –** Approximately 242 asbestos-containing pipe fittings were identified throughout the structure. The material is in good condition. It should be noted that the material was previously sampled and identified as asbestos-containing.

- **Boiler Breeching –** Approximately 300 square feet of asbestos-containing boiler breeching was identified in the mechanical room. The material is in good condition. It should be noted that the material was previously sampled and identified as asbestos-containing.

- **12” Floor Tile/Black Mastic –** Approximately 521 square feet of asbestos-containing 12” floor tile/black mastic was identified throughout the structure. The material is in a non-friable condition.

- **Fiberboard Ceiling Material –** Approximately 551 square feet of asbestos-containing fiberboard ceiling material was identified in the lower level of the structure. The material is in good condition. It should be noted that the material was previously sampled and identified as asbestos-containing.

- **Drywall Ceilings –** Approximately 545 square feet of asbestos-containing drywall ceilings were identified in hallways on the ground floor level. The material is in good condition and is covered with 12” stapled-on ceiling tiles. It should be noted that the material was previously sampled and identified as asbestos-containing.

- **Fire Rated Doors –** Approximately 400 square feet of asbestos-containing fire rated doors were identified in the lower level of the structure. The material is in good condition. It should be noted that the material was previously sampled and identified as asbestos-containing.

- **Sink Undercoating –** Approximately 8 square feet of asbestos-containing sink undercoating was identified in the lower-level kitchen of the structure. The material is in good condition.

Note 1: While care was taken during the inspection to identify all asbestos-containing materials, additional materials may be located within non-accessible areas of the renovation area. If, through renovation or demolition these materials are discovered, they should be treated as asbestos-containing until further testing proves otherwise.

2.0 Inspection Procedures

2.1 General Asbestos Inspection and Sampling Procedures

The inspection was performed in accordance with the National Emission Standards for Hazardous Air Pollutants (NESHAPS, 40 CFR 61.145) and the Ohio Administrative Code (OAC, 3745-20) regulations governing asbestos emission and waste control from demolition/renovation activities. Bulk sampling of materials suspect to contain asbestos was conducted following Environmental Protection Agency (EPA) Asbestos Hazard Emergency Response Act (AHERA, 40 CFR 763.90), the accepted industry standard for conducting asbestos investigations in all types of buildings.

The vast majority of physically accessible spaces within the building were accessed and inspected for suspect asbestos-containing materials. The Inspector then grouped suspect materials into homogeneous areas for sampling. A homogeneous area consists of materials with like appearance, color, texture, and application date. A physical assessment (visual observation and touching the material) was also made of the current condition and degree of friability for each identified material (a material is considered friable if it can be crumbled using hand pressure). A list of homogeneous areas identified for this assessment is included on the Bulk Sample Summary Table.

The Inspector assessed all identified asbestos-containing materials. The inspection encompassed both friable and non-friable materials. The Inspector then assumed that the specific material remained homogeneous (based upon the material's appearance and application) throughout the building. In situations where materials appeared to alternate between asbestos containing and non-asbestos containing, the Inspector looked for visible differences between materials. If differences were not apparent, the Inspector made a professional decision to err on the side of conservatism and assumed that all materials were asbestos-containing.

The Inspector made every effort to locate all asbestos-containing materials identified during the inspection, however, should unidentified suspect asbestos-containing materials be discovered, please contact m.a.c. Paran Consulting Services, Inc. for assistance in material identification.

2.2 Method of Sampling and Analysis

2.2.1 Bulk Sample Collection Methods

To avoid disturbing suspected asbestos-containing materials more than necessary and minimize the potential release of asbestos fibers, the Inspector performed bulk sampling in accordance with the industry accepted procedures outlined in the current EPA Guidance Document and the AHERA sampling protocol. Each sample collected was pre-wetted and obtained using a clean coring tool, utility knife, or other appropriate tool. Each sample was then placed in a clean, sealable vial and labeled with a unique sample identification number. Care was taken to obtain a sample that was representative of all layers of a material. To avoid cross-contamination, the tools used for sample collection were thoroughly cleaned before collecting the next sample. If requested, the sample site was labeled with a pre-printed adhesive-backed sample identification tag bearing the corresponding sample identification number. Pertinent sample information was recorded on a standardized bulk sample log sheet including the date of inspection, name of the Inspector, a brief description and the location of the sample, and the type of material sampled (e.g., thermal systems insulation).

2.2.2 Analysis of Bulk Samples

Bulk samples were analyzed for asbestos content by Polarized-Light Microscopy (PLM) and dispersion staining (Method Reference: EPA/600/R-931/116). This analytical method, which EPA currently recommends, for the determination of asbestos in bulk samples, can be used for qualitative identification of six morphologically different types of asbestos fibers: chrysotile, amosite, crocidolite, anthophyllite, tremolite, and actinolite asbestos.

PLM analysis requires the microscopist to take a portion of the sample and treat it with an oil of a specific refractive index. This prepared slide is then subjected to a variety of tests while being viewed under varying polarizations of light. Each asbestos type displays unique characteristics when subjected to these tests. The percentages of the identified types of asbestos are determined by visual estimation.

For samples containing low concentrations of asbestos, the Inspector may choose to have the laboratory perform point count analysis. This additional step is employed to more accurately determine the percentage of asbestos that is in the material being sampled. Using the point counting procedure, eight mounts are made by dispersing eight sub-samples of the bulk sample into a suitable fluid. A reticule is placed on the eyepiece of the microscope that superimposes a grid of points over the field of view. Fifty non-empty points are examined for each mount, yielding 400 points, some of which may be identified as asbestos and the rest as non-asbestos material. A simple calculation gives the percentage asbestos; 4 points in 400 would be 1.0%.

2.2.3 Reporting of Analysis Results

The method specifies that the asbestos content in a bulk sample shall be estimated and reported as a finite percentage (rounded to the nearest percent) within the range of 0 to 100. Minute quantities of asbestos in bulk samples may be reported as “trace” (tr) or less than 1 percent. The composition of the bulk sample is reported in percentages of asbestos (i.e., chrysotile, amosite, crocidolite, or other) and non-asbestos (i.e., cellulose, fiberglass, mineral wool, synthetic, or other) components. The original laboratory reports are presented in Appendix A.

2.2.4 Laboratory

Analysis of all suspected asbestos-containing materials was performed by Eurofins CEI, Inc. using polarized light microscopy. Eurofins CEI, Inc. successfully participates in, and is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP), administered by the National Institute of Standards and Technology.

2.3 Physical and Hazard Assessment

2.3.1 Physical Assessment Factors

Per AHERA requirements, the Inspector performed a physical assessment of all friable asbestos-containing materials. This involved physically observing and documenting the current condition of each friable material, and assessing its potential for future disturbance (or fiber release potential).

The Inspector categorized the materials’ current condition as Good, Fair, or Poor. AHERA protocol is not specific as to how these categories are arrived at, but in general, the following guideline is used:

- Good – less than 10% area damage
- Fair – more than 10%, but less than 25% area damage
- Poor – more than 25% area damage

The Inspector then made an assessment of the materials' potential for future disturbance (or fiber release potential) using the general factors listed in Table 2-1 on the following page. The first three factors focus on the current condition of the asbestos-containing material. Evidence of deterioration, delamination, physical damage, or water damage indicates that fiber release has occurred, is occurring, or is likely to occur in the future. Such evidence is based on the appearance of the material and/or the presence of dislodged or crumbled material in the surrounding area. The first three factors focus on the potential for fiber release due to disturbance or erosion. Surface erosion is likely to occur when asbestos-containing materials are located in air plenums or near forced-air streams. Exposed and easily accessible materials in areas frequented by building occupants, or subject to mechanical vibrations are more vulnerable to disturbance or damage than materials in other locations.

Table 2-1: Factors for Assessing Potential Fiber Release
Current Condition of Asbestos-Containing Materials
• Evidence of deterioration or delamination from the underlying surface (substrate) • Evidence of physical damage (e.g., presence of debris) • Evidence of water damage
Potential for Future Disturbance, Damage, or Erosion of Asbestos-Containing Material
• Proximity to air plenum or direct airstream • Visibility, accessibility (to building occupants and maintenance personnel), and degree of activity (air movement, vibration, movement of building occupants) • Change in building use

2.3.2 Hazard Assessment Factors

Based upon the physical assessment, friable asbestos-containing materials are then given a hazard rank with corresponding response options to aid the building owner in prioritizing response actions (see Table 2-2). The hazard ranks range from 7 – most hazardous, to 1 – least hazardous as shown in Table 2-2 below. The highest rank is reserved for materials that are "significantly damaged" or material that is so extensively damaged that it requires immediate corrective action. Hazard ranks 4 – 6 reflect materials which are "damaged" with rank 6 indicating a high potential for further damage, and rank 5 indicating a moderate potential for damage. Hazard rank 4 denotes that a material has been damaged; however, the potential for any further damage is low. Hazard ranks 1 – 3 are reserved for materials currently in good condition with future disturbance potential being high, moderate, or low (3, 2, 1, respectively). Non-friable materials are categorized as non-friable.

Table 2-2: Classifications for Hazard Potential of Friable Asbestos-Containing Materials		
Hazard Rank	**Condition**	**Disturbance Potential**
7	Poor	Any
6	Fair	High
5	Fair	Moderate
4	Fair	Low
3	Good	High
2	Good	Moderate
1	Good	Low

2.3.3 Physical and Hazard Assessments of Materials Encountered

The physical and hazard assessments made for all asbestos-containing materials identified during this inspection can be found in Section 4.0 “Inventory of Asbestos-Containing Materials.”

3.0 Bulk Sample Data Summary

The following table presents the results of materials sampled.

Table 3-1: Bulk Sample Summary – Moraine Municipal Building

Room/Location	Material Description	Homogeneous Area (HA) Number	Sample Number	Laboratory Results
Lower-Level Hallway near Boiler Room	12” Floor Tile (grey, white)	8	MMB-1	3% Chrysotile
Lower-Level Hallway near Boiler Room	Black Mastic on HA #1	8A	MMB-1	5% Chrysotile
Lower-Level Hallway near Boiler Room	12” Floor Tile (grey, white)	8	MMB-2	Positive Stop Analysis
Lower-Level Hallway near Boiler Room	Black Mastic on HA #1	8A	MMB-2	Positive Stop Analysis
Lower-Level Storage Room near Elevator	12” Floor Tile (tan, brown)	9	MMB-3	None Detected
Lower-Level Storage Room near Elevator	Yellow Mastic on HA #2	9A	MMB-3	None Detected
Lower-Level Storage Room near Elevator	12” Floor Tile (tan, brown)	9	MMB-4	None Detected
Lower-Level Storage Room near Elevator	Yellow Mastic on HA #2	9A	MMB-4	None Detected
Lower-Level Storage Room near Elevator	Cove Base Adhesive (brown)	10	MMB-5	None Detected
Lower-Level Storage Room near Elevator	Cove Base Adhesive (brown)	10	MMB-6	None Detected
Lower Level Kitchen	Sink Undercoating (white)	11	MMB-7	4% Chrysotile
Lower Level Kitchen	Sink Undercoating (white)	11	MMB-8	Positive Stop Analysis
Finance Department File Room	12” Floor Tile (white, tan)	17	MMB-9	None Detected
Finance Department File Room	12” Floor Tile (white, tan)	17	MMB-10	None Detected
Police Area IT Room	12” Floor Tile (brown, tan)	18	MMB-11	None Detected
Police Area IT Room	Various Mastics on HA #18	18A	MMB-11	<1% Chrysotile
Police Area IT Room	12” Floor Tile (brown, tan)	18	MMB-12	None Detected

Table 3-1: Bulk Sample Summary – Moraine Municipal Building				
Room/Location	**Material Description**	**Homogeneous Area (HA) Number**	**Sample Number**	**Laboratory Results**
Police Area IT Room	Various Mastics on HA #18	18A	MMB-12	None Detected
Police Holding Area	12” Floor Tile (light blue)	19	MMB-13	None Detected
Police Holding Area	Yellow Mastic on HA #19	19A	MMB-13	None Detected
Police Holding Area	12” Floor Tile (light blue)	19	MMB-14	None Detected
Police Holding Area	Yellow Mastic on HA #19	19A	MMB-14	None Detected

4.0 Inventory of Asbestos-Containing Materials

The following table presents a list of asbestos-containing materials identified during the inspection.

Table 4-1: Asbestos-Containing Materials Inventory – Moraine Municipal Building

Room/Location	Material Type	Condition/ Hazard Rank	Estimated Quantity
Lower Level Mechanical Room	Pipe Fittings on Fiberglass Insulated Heating Lines	Good/3	86 fittings
Lower Level Mechanical Room	Pipe Fittings on Fiberglass Insulated Heating Lines	Good/3	40 fittings
Lower Level Mechanical Room	Pipe Fittings on Fiberglass Insulated Heating Lines	Good/3	30 fittings
Lower Level Mechanical Room	Pipe Fittings on Fiberglass Insulated Heating Lines	Good/3	30 fittings
Lower Level Mechanical Room	Boiler Breeching	Good/3	300 sf.
Lower-Level Hallway near Mechanical Room	12” Floor Tile/Black Mastic (grey, white)	Non-Friable	105 sf.
Lower-Level Hallway near Mechanical Room	Fiber Board Ceiling Material	Good/3	105 sf.
Lower-Level Storage Room near Women’s Restroom	Fiber Board Ceiling Material	Good/3	72 sf.
Lower-Level Elevator Area	Fiber Board Ceiling Material	Good/3	120 sf.
Lower-Level Kitchen	Fiber Board Ceiling Material	Good/3	224 sf.
Lower-Level Kitchen	Sink Undercoating (white)	Good/3	8 sf. (1 sink)
Lower-Level Women’s Restroom	Fiber Board Ceiling Material	Good/3	30 sf.
Lower-Level Women’s Restroom	Pipe Fitting Insulation	Unknown	8 fittings (assumed in wall)
Lower-Level Men’s Restroom	Pipe Fitting Insulation	Unknown	8 fittings (assumed in wall)
Lower-Level Police Area Women’s Locker Room	Pipe Fitting Insulation	Unknown	10 fittings (assumed in wall)
Lower-Level Police Area Men’s Locker Room	Pipe Fitting Insulation	Unknown	8 fittings (assumed in wall)
Lower-Level Police Area Locker Area near Mechanical Room	12” Floor Tile/Black Mastic (grey, white)	Non-Friable	198 sf.

Table 4-1: Asbestos-Containing Materials Inventory – Moraine Municipal Building			
Room/Location	**Material Type**	**Condition/ Hazard Rank**	**Estimated Quantity**
Lower-Level Police Area Women's Locker Room	Pipe Fitting Insulation	Unknown	10 fittings (assumed in wall)
Lower-Level Police Area Men's Locker Room	Pipe Fitting Insulation	Unknown	8 fittings (assumed in wall)
Lower-Level Police Area Locker Area near Mechanical Room	12" Floor Tile/Black Mastic (grey, white)	Non-Friable	198 sf.
Throughout Lower Level	Fire Rated Doors	Good/3	400 sf. (20 doors)
Ground Floor Clerk of Courts Hallway	Drywall Ceiling (covered with 12" ceiling tile)	Good/3	245 sf.
Ground Floor Custodial Closet near Men's Restroom	12" Floor Tile/Black Mastic (grey, white)	Non-Friable	12 sf.
Ground Floor Administration Area Hallway	Drywall Ceiling (covered with 12" ceiling tile)	Good/3	150 sf.
Ground Floor Police Area Garage	Pipe Fitting Insulation	Fair/4	8 fittings
Ground Floor Police Area Hallway	Drywall Ceiling (covered with 12" ceiling tile)	Good/3	150 sf.
Ground Floor Police Area Men's Restroom	Pipe Fitting Insulation	Unknown	8 fittings (assumed in wall)
Ground Floor Police Area Women's Restroom	Pipe Fitting Insulation	Unknown	6 fittings (assumed in wall)
Ground Floor Police Area Back Stairwell	12" Floor Tile/Black Mastic (grey, white)	Non-Friable	75 sf.
Ground Floor Police Area Kitchen Stairwell	12" Floor Tile/Black Mastic (grey, white)	Non-Friable	131 sf.

Attachment A

Laboratory Report

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report prepared for M.A.C Paran Consulting

Report Date: 3/15/2024

Project Name: Morraine Municipal Building

Project #: 24-6.2

SanAir ID#: 24015051

NVLAP TESTING

NVLAP LAB CODE 600227-0

11709 Chesterdale Road | Cincinnati, Ohio 45246
888.895.1177 | 513.438.6006 | IAQ@SanAir.com | SanAir.com

SanAir Technologies Laboratory

SanAir ID Number
24015051
FINAL REPORT
3/15/2024 1:13:04 PM

Name: M.A.C Paran Consulting
Address: 3959 Fulton Grove Rd.
Cincinnati, OH 45245
Phone: 513-752-9111

Project Number: 24-6.2
P.O. Number:
Project Name: Morraine Municipal Building
Collected Date: Not Provided on COC
Received Date: 3/14/2024 1:30:00 PM

Dear George Beaudion,

We at SanAir would like to thank you for the work you recently submitted. The 14 sample(s) were received on Thursday, March 14, 2024 via Drop Box. The final report(s) is enclosed for the following sample(s): MMB-1, MMB-2, MMB-3, MMB-4, MMB-5, MMB-6, MMB-7, MMB-8, MMB-9, MMB-10, MMB-11, MMB-12, MMB-13, MMB-14.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

Maureen Y. Haley
Asbestos Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:
- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:
- 14 samples in Good condition.

SanAir Technologies Laboratory

SanAir ID Number
24015051
FINAL REPORT
3/15/2024 1:13:04 PM

Name: M.A.C Paran Consulting
Address: 3959 Fulton Grove Rd.
Cincinnati, OH 45245
Phone: 513-752-9111

Project Number: 24-6.2
P.O. Number:
Project Name: Morraine Municipal Building
Collected Date: Not Provided on COC
Received Date: 3/14/2024 1:30:00 PM

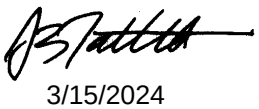
Analyst: Farnsworth-Pinkerton, Shoshauna

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
MMB-1 / 24015051-001 12" Floor Tile, Floor Tile	Grey Non-Fibrous Homogeneous		97% Other	3% Chrysotile
MMB-1 / 24015051-001 12" Floor Tile, Mastic	Black Non-Fibrous Homogeneous		95% Other	5% Chrysotile
MMB-2 / 24015051-002 12" Floor Tile, Floor Tile				Not Analyzed
MMB-2 / 24015051-002 12" Floor Tile, Mastic				Not Analyzed
MMB-3 / 24015051-003 12" Floor Tile, Floor Tile	Tan Non-Fibrous Homogeneous		100% Other	None Detected
MMB-3 / 24015051-003 12" Floor Tile, Mastic	Yellow Non-Fibrous Homogeneous		100% Other	None Detected
MMB-4 / 24015051-004 12" Floor Tile, Floor Tile	Tan Non-Fibrous Homogeneous		100% Other	None Detected
MMB-4 / 24015051-004 12" Floor Tile, Mastic	Yellow Non-Fibrous Homogeneous		100% Other	None Detected
MMB-5 / 24015051-005 Cove Base Adhesive, Cove Base	Black Non-Fibrous Homogeneous		100% Other	None Detected
MMB-5 / 24015051-005 Cove Base Adhesive, Adhesive	Brown Non-Fibrous Homogeneous	3% Wollastonite	97% Other	None Detected

Analyst: 

Analysis Date: 3/15/2024

Approved Signatory: 

Date: 3/15/2024

SanAir Technologies Laboratory

SanAir ID Number
24015051
FINAL REPORT
3/15/2024 1:13:04 PM

Name: M.A.C Paran Consulting
Address: 3959 Fulton Grove Rd.
Cincinnati, OH 45245
Phone: 513-752-9111

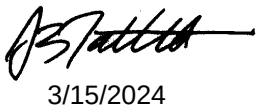
Project Number: 24-6.2
P.O. Number:
Project Name: Morraine Municipal Building
Collected Date: Not Provided on COC
Received Date: 3/14/2024 1:30:00 PM

Analyst: Farnsworth-Pinkerton, Shoshauna

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
MMB-6 / 24015051-006 Cove Base Adhesive, Cove Base	Black Non-Fibrous Homogeneous		100% Other	None Detected
MMB-6 / 24015051-006 Cove Base Adhesive, Adhesive	Brown Non-Fibrous Homogeneous	3% Wollastonite	97% Other	None Detected
MMB-7 / 24015051-007 Sink Undercoating	Grey Non-Fibrous Heterogeneous		96% Other	4% Chrysotile
MMB-8 / 24015051-008 Sink Undercoating				Not Analyzed
MMB-9 / 24015051-009 12" Floor Tile	Grey Non-Fibrous Homogeneous		100% Other	None Detected
MMB-10 / 24015051-010 12" Floor Tile	Grey Non-Fibrous Homogeneous		100% Other	None Detected
MMB-11 / 24015051-011 12" Floor Tile, Floor Tile	Tan Non-Fibrous Homogeneous		100% Other	None Detected
MMB-11 / 24015051-011 12" Floor Tile, Mastic	Various Non-Fibrous Heterogeneous	2% Cellulose	98% Other	< 1% Chrysotile
MMB-12 / 24015051-012 12" Floor Tile, Floor Tile	Tan Non-Fibrous Homogeneous		100% Other	None Detected
MMB-12 / 24015051-012 12" Floor Tile, Mastic	Various Non-Fibrous Heterogeneous	2% Cellulose	98% Other	None Detected

Analyst: 
Analysis Date: 3/15/2024

Approved Signatory: 
Date: 3/15/2024

SanAir Technologies Laboratory

SanAir ID Number
24015051
FINAL REPORT
3/15/2024 1:13:04 PM

Name: M.A.C Paran Consulting
Address: 3959 Fulton Grove Rd.
Cincinnati, OH 45245
Phone: 513-752-9111

Project Number: 24-6.2
P.O. Number:
Project Name: Morraine Municipal Building
Collected Date: Not Provided on COC
Received Date: 3/14/2024 1:30:00 PM

Analyst: Farnsworth-Pinkerton, Shoshauna

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
MMB-13 / 24015051-013 12" Floor Tile, Floor Tile	Grey Non-Fibrous Homogeneous		100% Other	None Detected
MMB-13 / 24015051-013 12" Floor Tile, Mastic	Yellow Non-Fibrous Homogeneous		100% Other	None Detected
MMB-14 / 24015051-014 12" Floor Tile, Floor Tile	Grey Non-Fibrous Homogeneous		100% Other	None Detected
MMB-14 / 24015051-014 12" Floor Tile, Mastic	Yellow Non-Fibrous Homogeneous		100% Other	None Detected

Analyst: Approved Signatory:

Analysis Date: 3/15/2024 Date: 3/15/2024

Disclaimer

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Polarized- light microscopy is not consistently reliable in detecting asbestos in floor covering and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.

Asbestos Accreditations, Licenses, or Certificates
NVLAP Lab Code 600227-0
State of Rhode Island Department of Health, Certification Number: PLM00144, TEM00144
State of West Virginia Bureau for Public Health, Analytical Laboratory Number: LT000637

SanAir Technologies Laboratory
11709 Chesterdale Road
Cincinnati, OH 45249
804.897.1177 / 513.438.6006
Fax 804.897.0070
sanair.com

Asbestos Chain of Custody

Form 140, Rev 3, 1/25/23

SanAir ID Number: 24015051

Company: MAC PARAN CONSULTING | Project #: 24-6.2 | Collect by: Geo. Beaudin

Address: 3959 Fulton Grove Rd | Project Name: MORAINE MUNICIPAL | Phone #: 513-383-6091

City, St., Zip: Cinti, Ohio 45245 | Date Collected: Building | Fax #:

State of Collection: Account#: | P.O. Number: | Email: gbeaudin@MACPARAN.com

Bulk

ABB	PLM EPA 600/R-93/116	☑
	Positive Stop ☑	
ABEPA	PLM EPA 400 Point Count	☐
ABB1K	PLM EPA 1000 Point Count	☐
ABBEN	PLM EPA NOB**	☐
ABBCH	TEM Chatfield**	☐
ABBTM	TEM EPA NOB**	☐
ABQ	PLM Qualitative	☐

** Available on 24-hr. to 5-day TAT

Air

ABA	PCM NIOSH 7400	☐
ABA-2	OSHA w/ TWA*	☐
ABTEM	TEM AHERA	☐
ABATN	TEM NIOSH 7402	☐
ABT2	TEM Level II	☐
Other:		☐

New York ELAP

ABEPA2	NY ELAP 198.1	☐
ABENY	NY ELAP 198.6 PLM NOB	☐
ABBNY	NY ELAP 198.4 TEM NOB	☐

Soil

ABSE	PLM EPA 600/R-93/116 (Qual.)	☐

Vermiculite & Soil

ABB	PLM EPA 600/R-93/116	☐
ABEPA3	PLM EPA 400 Point Count	☐
ABCM	Cincinnati Method	☐

Dust

ABWA	TEM Wipe ASTM D-6480	☐
ABDMV	TEM Microvac ASTM D-5755	☐

Water

ABHE	EPA 100.2	☐

Matrix	Other	
		☐

Turn Around Times				
	3 HR (4 HR TEM) ☐	6 HR (8HR TEM) ☐	12 HR ☐	1 Day ☐
	☐ 2 Days	☑ 3 Days	☐ 4 Days	☐ 5 Days

Special Instructions: Positive stop on 1→2, 3→4, 5→6, 7→8, 9→10, 11→12, 13→14

Sample #	Sample Identification/Location	Volume or Area	Sample Date	Flow Rate*	Start – Stop Time*	
MMB - 1	12" Floor Tile					
2	↓					
3						
4	↓					
5	Cove Base Adhesive					
6	↓					
7	Sink Undercoating					
8	↓					
9	12" Floor Tile					
10	↓					
11						
12	↓					

Relinquished by	Date	Time	Received by	Date	Time
GD	3/14/24		EMB	MAR 14 2024	1130pm

If no technician is provided, then the primary contact for your account will be selected. Unless scheduled, the turnaround time for all samples received after 3 pm EST will be logged in the next business day. Weekend or holiday work must be scheduled ahead of time and is charged at 150% of the 3hr TAT or a minimum charge of $150. A courier charge will be applied for same day and one-day turnaround times for offsite work. SanAir covers Standard Overnight FedEx shipping. Shipments billed to SanAir with a faster shipping rate will result in additional charges.

Page 1 of 2

24015051 Form 140, Revision 1, 12/14/20

Sample #	Sample Identification/Location	Volume or Area	Sample Date	Flow Rate*	Start – Stop Time*	
MMB-13	12" Floor Tile					
14	↓					

Special Instructions	

Relinquished by	Date	Time	Received by	Date	Time
[signature]	3/14/24		RMB	MAR 14 2024	1:30pm

If no technician is provided, then the primary contact for your account will be selected. Unless scheduled, the turnaround time for all samples received after 3 pm EST will be logged in the next business day. Weekend or holiday work must be scheduled ahead of time and is charged at 150% of the 3hr TAT or a minimum charge of $150. A courier charge will be applied for same day and one-day turnaround times for offsite work. SanAir covers Standard Overnight FedEx shipping. Shipments billed to SanAir with a faster shipping rate will result in additional charges.

Page 2 of 2

Attachment B

Asbestos Hazard Evaluation Specialist License

Ohio Environmental Protection Agency

Mike DeWine, Governor
Jon Husted, Lt. Governor
Anne M. Vogel, Director

8/10/2023

George Beaudion
M.A.C. Paran Consulting
3959 Fulton Grove Rd
Cincinnati, OH 45245

RE: Evaluation Specialist
Certification Number: ES31662
Expiration Date: 9/7/2024

Dear George Beaudion:

This letter and enclosed certification card approves your request to be certified as an asbestos Evaluation Specialist. You must present your card upon request at any project site while performing duties. Copies of cards are not acceptable as proof of certification.

This certification may be revoked by the Director of the Ohio Environmental Protection Agency (EPA) for violation of any of the requirements of 3745-22 or 3745-20 of the Ohio Administrative Code.

If you have any questions, please contact the Asbestos Program at 614-644-0226 or by email at asbestoslicensing@epa.ohio.gov.

Sincerely,

Brandon M. Schwendeman
Brandon Schwendeman
Manager, Business Operations Support Section
Ohio EPA - Division of Air Pollution Control

SECTION 03 01 00 - MAINTENANCE OF CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete surface repair.
   2. Concrete crack repair.
   3. Concrete sealer.

1.2 SUBMITTALS

A. Product Data: Submit product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.
   1. Concrete repair products.
   2. Concrete sealer.

B. Samples: Submit color samples for patches exposed to view in finished construction and required to match existing.

C. Manufacturer’s Instructions: Submit mixing instructions.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Concrete Sealer:
   1. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
   2. Store materials in a clean, dry area in accordance with manufacturer's instructions.
   3. Keep product from freezing.
   4. Avoid direct contact with this product as it may cause mild-to-moderate irritation of the eyes and/or skin.
   5. Protect materials during handling and application to prevent damage or contamination.
   6. Do not mix any compound containing solvent.
   7. Do not mix or agitate aggressively as foaming can occur.

1.4 MOCK-UP

A. Concrete Repair Products:
   1. Construct mockup panel illustrating patching method, color and texture of repair surface.
   2. Prepare one mockup of each type of patching/repair procedure.
   3. Locate where directed by Architect.
   4. Incorporate accepted mockup as part of Work.

B. Concrete Sealer:
   1. Construct mockup panel illustrating finished aesthetic and color.
   2. Prepare one mockup of each type of patching/repair procedure.
   3. Locate where directed by Architect.
   4. Incorporate accepted mockup as part of Work.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Follow manufacturer requirements for temperature and humidity prior to, during and after application.

PART 2 PRODUCTS

2.1 CONCRETE REPAIR PRODUCTS – BASIS OF DESIGN

2.2 BASIS OF DESIGN

A. General basis of design for all systems is SIKA, other manufacturers accepted provided bidder/contractor submission of complete technical data of proposed products/systems for review by Architect.

2.3 CONCRETE SELF-LEVELING UNDERLAYMENT MIX

A. Concrete Leveling Mix: one-component, fast drying, cementitious skim mortar ideal for repair or reprofiling of concrete slabs. Zero feather edge to ½" thickness application. Sika, Sika Level SkimCoat
   1. Flexural strength ASTM C-293: 1,300 psi at 28 days.
   2. Compressive strength ASTM C-109: 3,700 psi at 28 days

B. Concrete Leveling Mix: one-component, polymer modified, self-leveling underlayment ideal for repair or reprofiling of concrete slabs. Zero feather edge to ½" thickness application. Sika, Sika Level-125
   1. Flexural strength ASTM C-293: 1,150 psi at 28 days.
   2. Compressive strength ASTM C-109: 4,000 psi at 28 days

C. Concrete Leveling Mix: one-component, cementitious underlayment, self-leveling underlayment ideal for repair or reprofiling of concrete slabs. Zero feather edge to ½" thickness application. Sika, Sika Level-325
   1. Flexural strength ASTM C-293: 1,500 psi at 28 days.
   2. Compressive strength ASTM C-109: 5,300 psi at 28 days

2.4 CONCRETE REPAIR / CEMENTITIOUS MORTAR –PARTIAL DEPTH REPAIRS

A. Concrete Repair/Patch Cementitious Mortar: one-component, rapid hardening [ASTM C-928], early strength gaining, cementitious mix for repairs on horizontal surfaces.
   1. Flexural strength ASTM C-293: 1,000 psi at 28 days.
   2. Bond strength ASTM C-882: 2,500 psi at 28 days,
   3. Compressive strength ASTM C-109: 7,000 psi at 28 days

B. Sika, SikaQuick 1000 or Equal

2.5 CONCRETE SEALER

A. Concrete Sealer for new and existing concrete slabs on grade. Solvent based liquid membrane forming curing compound to seal surfaces with abrasion and stain resistant coating, non-yellowing resin. 100% acrylic polymer blend, fast drying solvent blend.
   1. SIKA Scofield Cureseal 100

2.6 CONCRETE SEALER FOR EXPOSED CONCRETE / AGGREGATE WALLS

A. Concrete Sealer for existing concrete walls:
   1. WR Meadows VOCOMP-25 or Equal: Exposed aggregate sealer, transparent, water based acrylic curing and sealing compound that improves resistance to staining and wear.

B. Performance Based Specification: Water-based acrylic curing and sealing compound shall be a non-yellowing, clear, acrylic curing and sealing compound meeting the following requirements:
   1. ASTM C 309, Type 1, Class B
   2. AASHTO M 148, Type 1, Class B
   3. ASTM C 1315, Class A, Section 6.4.1 – non-yellowing
   4. ASTM C 1315, Section 6.6 – exceed 50 MPa (70 psi) adhesion requirements.

PART 3 EXECUTION

3.1 REMOVALS

A. Remove all existing finish flooring – tile, VCT, epoxy paint, etc. from the existing concrete slabs. Remove/strip sealer from existing unfinished concrete slabs.

B. Prep existing concrete / substrate for new floor systems as specified.

3.2 EXAMINATION

A. Verify surfaces are ready to receive work.

B. Beginning of installation means acceptance of existing surfaces.

3.3 PREPARATION

A. Provide all temporary shoring and bracing as required for intended work.

B. Provide all required formwork, tools, and equipment as required for intended work.

C. Clean concrete surfaces of dirt, laitance, corrosion, or other contamination; wire brush using water; rinse surface and allow to dry.

D. Flush out cracks and voids with chemical solvent or water to remove laitance and dirt. Chemically neutralize by rinsing with water.

E. For areas patched with epoxy mortar, remove all broken and soft concrete. Remove corrosion from steel. Clean surfaces mechanically; wash with acid; rinse with water.

3.4 APPLICATION –CEMENTITIOUS MORTAR PARTIAL DEPTH REPAIR

A. Clean all surfaces of contaminants.
   1. Clean and prep all exposed reinforcing steel.
   2. Replace deteriorated reinforcing steel with new as indicated on the drawings.

B. Prime substrate in accordance with manufacturer requirements.

C. Mixing: mechanically mix per manufacturer requirements. Mix to a uniform consistency with a thorough mixing and proper proportioning of the two components.
   1. Add 3/8” course aggregate at desired quantity to uniform consistency as necessary.

D. Screed level.

E. Finish with float or light broom finish in accordance with approved mockup for desired finish texture.

F. Cure concrete per ACI recommendations using wet burlap, water mist,
   1. Do not use curing compounds for curing of concrete.

G. Avoid contact with aluminum materials to prevent adverse chemical reaction and possible failure of the repair. Insulate potential areas of contact by coating aluminum with epoxy.

3.5 APPLICATION – SELF-LEVELING MORTAR REPAIR

A. Prepare concrete by mechanical means, shot blast, sandblast, scarifying to achieve a matt, glaze free open textured surface.

B. Prime substrate in accordance with manufacturer requirements.

C. Mixing: mechanically mix per manufacturer requirements. Mix to a uniform consistency with a thorough mixing and proper proportioning of the two components.

D. Install in accordance with manufacturer requirements using a flat edge steel trowel.

E. Screed level.

3.6 APPLICATION – CONCRETE SEALER

A. Prep and clean surface per manufacturer requirements – clean from all prior sealers, curing compounds, oils, and foreign matters that may prevent penetration or adhesion. Meet Concrete Surface Profile of 1.

B. Distribute / Apply sealer per manufacturer requirements. Apply with garden sprayer and back roll with roller.

3.7 APPLICATION – CONCRETE SEALER FOR EXPOSED CONCRETE / AGGREGATE WALLS

A. Examine surfaces to receive curing and sealing compound. Notify architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

B. Surface Preparation: Prep and clean surface per manufacturer requirements – clean from all prior sealers, curing compounds, oils, and foreign matters that may prevent penetration or adhesion.
   1. Protect adjacent surfaces not designated to receive curing and sealing compound.
   2. Clean and prepare surfaces to receive curing and sealing compound in accordance with manufacturer's instructions.
   3. Ensure concrete surface is clean and dry, with all stains, oil, grease, dust, and dirt removed.
   4. Concrete surface water should be dissipated when used on new concrete.
   5. Concrete surfaces should not be marred by walking workers.

C. Application: Distribute / Apply sealer per manufacturer requirements using a sprayer or short-nap roller to apply uniform film.
   1. Apply curing and sealing compound in accordance with manufacturer's instructions.
   2. Ensure product is mixed for optimum performance. Avoid aggressive mixing as foaming may occur.
   3. Use an industrial sprayer with a 5916 tip that produces a flow rate of 1/10 of one gallon per minute.
   4. Alternatively apply using a lint-free roller or lamb’s wool roller.
   5. Avoid puddling or runs in low areas.

3.8 SCHEDULE / GENERAL REPAIR SCOPE

A. Clean / prep all existing concrete slabs after removal of existing floor finishes.

B. Remove all existing surface coatings, adhesives, mortar, etc. and patch repairs.

C. Remove all existing spalling and previous repair areas/patches.

D. Apply cementitious repairs to all areas of affected surfaces and to level various areas of the concrete slab between spaces within the building.
   1. Intent of repairs is to provide a smooth, uniform, floor slab free of voids, divots, and other irregularities in the finish, ready for a new finish floor system. Repairs shall be from edge to edge, across the entire floor system without exception.
   2. Floor repairs shall be accomplished to the satisfaction of the finish floor manufacturer / system as specified. Contractor to coordinate all requirements, and provide scope for the same.

E. Apply sealant [Sika, Sikaflex 1A or Equal] to joints and cracks.

F. Prepare for new finishes to concrete surfaces as indicated.

G. Apply sealer to new / existing concrete where noted and concrete is intended to be left exposed.

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Formwork.
   2. Reinforcement and Accessories.
   3. Cast-in place concrete.
   4. Finishing and curing.

1.2 SYSTEM DESCRIPTION

A. Design, engineer and construct formwork, shoring and bracing in accordance with ACI 301 to conform to design and applicable code requirements to achieve concrete shape, line and dimension as indicated on Drawings or required by proposed work.

B. Vapor Retarder Permeance: Maximum 1 perm when tested in accordance with ASTM E96/E96M, water method.

1.3 SUBMITTALS

A. Design Data: Submit mix designs, admixtures, reinforcement, and anchors.

1.4 QUALITY ASSURANCE

A. Construct and erect concrete formwork, reinforcing, and cast-in-place concrete in accordance with ACI 301.

PART 2 PRODUCTS

2.1 FORM MATERIALS AND ACCESSORIES

A. Form Materials: At discretion of Contractor.

B. Form Release Agent: Colorless mineral oil not capable of staining concrete or impairing natural bonding characteristics of coating intended for use on concrete.

C. Slab Edge Joint Filler: ASTM D1751, Premolded asphaltic board, 1/2 inch thick. As applicable to conditions.

D. Vapor Retarder: ASTM E1745 Class A; 10 mil thick clear polyethylene film; type recommended for below grade application. Furnish joint tape recommended by manufacturer.

2.2 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade, plain and/or deformed billet bars to suit condition and application, uncoated finish.

B. Welded Plain Wire Fabric: ASTM A185/A185M; in flat sheets; unfinished.

C. Fabricate concrete reinforcement in accordance with ACI 301.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C150, Normal-Type I Portland type.

B. Fine and Coarse Aggregates: ASTM C33.

C. Lightweight Concrete Aggregate: ASTM C330

D. Water: Clean and not detrimental to concrete.

E. Air Entrainment Admixture: ASTM C260.

F. Fiber Mesh Reinforcing: ASTM 1116-C.

G. Bonding Agent: Latex emulsion.

H. Non-shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.

2.4 COMPOUNDS, HARDENERS AND SEALERS

A. Membrane Curing Compound and Sealer: ASTM C1315 Type I, Class A. Dayton Superior or Equal
   1. Install only in areas not receiving finish flooring system.

2.5 CONCRETE MIX

A. Mix and deliver concrete in accordance with ASTM C94/C94M, Option A.

B. INTERIOR CONCRETE SLAB ON GRADE: Furnish concrete of the following strength:
   1. 150 PCF
   2. Compressive strength 3,000 psi (28 day).
   3. Slump limit of 4 inches at point of placement.
   4. Minimum Cement Content: 610 pounds/cu yd.
   5. Maximum water-cement ratio: 0.50
   6. Air Entrainment: Entrapped
   7. Transit Mixed.

2.6 GRANULAR BASE

A. Interior slabs:
   1. Install 4” pea gravel, clean and graded, washed river-run gravel, ASTM C33, Size #7.
   2. Match existing as applicable

PART 3 EXECUTION

3.1 FORMWORK ERECTION

A. Erect formwork, shoring and bracing to achieve design requirements.

B. Apply form release agent to formwork prior to placing form accessories and reinforcement.

C. Clean forms as erection proceeds, to remove foreign matter.

3.2 INSERTS, EMBEDDED COMPONENTS, AND OPENINGS

A. Provide formed openings where required for work to be embedded in and passing through concrete members.

B. Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

C. Install concrete accessories straight, level, and plumb.

D. Place joint filler at perimeter of floor slab, penetrations, and isolation joints.

3.3 REINFORCEMENT PLACEMENT

A. Place reinforcement, supported and secured against displacement.

B. Ensure reinforcing is clean, free of loose scale, dirt, or other foreign coatings.

C. Do not weld reinforcement bars for assembly.

D. Space reinforcement bars with a minimum clear space in accordance with ACI 301 of not less than 1 inch.

E. Maintain concrete cover around reinforcement in accordance with ACI 301 of not less than 1 1/2" inches for concealed work and 3 inches for concrete exposed to weather.

3.4 PLACING CONCRETE

A. Install 4 inch minimum thickness granular base over undisturbed soils and compact as applicable.

B. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.

C. Install vapor barrier under interior slabs on grade in accordance with ASTM E1643. **Lap joints minimum 6 inches and seal watertight using manufacturer supplied tape.**

D. Seal vapor barrier tight around all penetrations in accordance with manufacturer requirements.

E. Repair damaged vapor retarder with vapor retarder material, lap over damaged areas minimum 6 inches and seal watertight.

F. Place concrete continuously between predetermined expansion, control and construction joints. Do not break or interrupt successive pours creating cold joints.

G. Separate slabs-on-grade from vertical surfaces with 1/2 inch thick joint filler, extended from bottom of slab to within 1/4 inch of finished slab surface.

H. Where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack with non-shrink grout.

I. Screed slabs-on-grade level.

3.5 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Remove formwork progressively and in accordance with code requirements.

3.6 FLOOR FINISHING

A. Finish concrete floor surfaces in accordance with ACI 301.

B. Uniformly spread, screed, and float concrete.
   1. Smooth finish at interior slabs.
   2. Align flush with adjacent concrete finishes.

C. Maintain surface flatness, with maximum variation of 1/8 inch in 10 ft.

D. Control joints:
   1. Locate at maximum of 12’-0” o.c. each way.
   2. Sawcut joints permitted only at concealed concrete areas.
   3. Trowel and re-trace joints at all exposed concrete areas.

3.7 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
   1. Protect concrete footings from freezing for a minimum of 7 days.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete for not less than 7 days.

C. Apply sealer on floor surfaces not receiving finish floor system.

3.8 ERECTION TOLERANCES

A. Install reinforcement within tolerances required by ACI 301.

3.9 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with ACI 301 at the request of Architect.

B. Field Testing:
   1. Measure slump and temperature for each compressive strength concrete sample.
   2. Measure air content in air entrained concrete for each compressive strength concrete sample.

C. Cylinder Compressive Strength Testing:
   1. Test Method: ASTM C39.
   2. Test Acceptance: In accordance with ACI 301.
   3. Test two cylinders at 28 days.
   4. Dispose remaining cylinders when testing is not required.

3.10 DEFECTIVE CONCRETE

A. Modify or replace concrete not conforming to required lines, details and elevations, as directed by Architect.

END OF SECTION

SECTION 04 01 00 - MAINTENANCE OF MASONRY

PART 1 GENERAL

1.1 WORK INCLUDES BUT NOT LIMITED TO:

A. Removal and replacement of damaged concrete masonry units.
   1. Includes supplemental new masonry as required to replace damaged masonry from removals.

B. Re-pointing mortar joints including raking, pointing-up and tooling of mortar joints in masonry where impacted by work.

1.2 QUALITY ASSURANCE

A. Installer qualifications: 10 years-experience on similar projects. Work shall be performed by experienced and skilled mechanics.

B. Source limitations: obtain each type of material for masonry restoration [CMU, cement, sand, etc.] from one source with resources to provide materials of consistent quality in appearance and physical properties.

C. Perform Work in accordance with ACI 530 Building Code Requirements for Masonry Structures and ACI 530.1 Specification for Masonry Structures.

1.3 PRODUCT HANDLING

A. Deliver mortar materials to project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

D. Store lime putty covered with water in sealed containers.

E. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.4 ENVIRONMENTAL REQUIREMENTS / PROJECT CONDITIONS

A. Repoint mortar joints and repair masonry only when air temperature is between and 40°F and 90°F and is predicted to remain so for at least 7 days after completion of work.
   1. In accordance with ACI 530.1

B. Hot-weather requirements: protect masonry repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 90°F and above.
   1. In accordance with ACI 530.1

C. Patch masonry only when air and surface temperatures are between and 55°F and 100°F and are predicted to remain above 55°F for at least 7 days after completion of work. On days when air temperature is predicted to go above 90°F, schedule patching work to coincide with time that surface being patched will be in shade or during cooler morning hours.

D. Provide shoring, bracing, or support to prevent movement, settlement, or collapse of structure, work under demolition, or adjacent work to remain.

E. Prevent grout or mortar used in assembly and repair work from staining face of surrounding surfaces. Immediately remove grout and mortar in contact with exposed surfaces.

F. Protect sills, ledges, and projections from mortar droppings.

1.5 SEQUENCING AND SCHEDULING

A. Perform re-pointing after repair of existing masonry, including replacing existing masonry with new masonry materials and cleaning.

B. As scaffolding is removed, patch any anchor holes used to attach scaffolding. Patch holes in mortar joints in accordance with section covering re-pointing masonry.

1.6 MOCKUP

A. Construct a mockup of the masonry repairs for review by Architect, if warranted by conditions.

PART 2 - PRODUCTS

2.1 FACTORY-MIXED MORTAR

A. Match original mortar remnants on brick as determined from field sampling and laboratory analysis at the mortar manufacturers plant. Match for color, texture and compressive strength.

2.2 COMPONENTS

A. Portland Cement: ASTM C150, Type I, gray color.

B. Premix Mortar for below grade applications: ASTM C387/C387M, Type S using gray color cement.

C. Premix Mortar for above grade applications: ASTM C387/C387M, Type N using colored cement.

D. Mortar Aggregate: ASTM C144, standard masonry type.

E. Hydrated Lime: ASTM C206, Type N.

F. Mortar Color: color as selected by Architect from full range of available colors for above grade applications.

G. Grout Aggregate: ASTM C404, fine.

H. Water: Clean and potable.

I. Bonding Agent: Latex type.

J. Calcium chloride is not permitted.

2.3 MIXES

A. Mortar Mixes:
   1. Mortar for Structural Masonry: ASTM C270, Type N using Proportion specification.
   2. Mortar for Non-Structural Masonry: ASTM C270, Type N using Proportion specification.

B. Mortar Mixing:
   1. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.
   2. Add mortar color.

C. Grout Mixing:
   1. Mix grout in accordance with ASTM C94/C94M.
   2. Do not use anti-freeze compounds to lower freezing point of grout.

D. Mixing Procedures:

1. Measure materials by volume or equivalent weight. Do not measure by shovel; use known measure.
2. To hydrate mortar, thoroughly mix ingredients dry. Mix again, adding only enough water to produce a damp mix which will retain its form when pressed in a ball. After keeping mortar in this dampened condition for 1-2 hours, add sufficient water to form proper consistency.
3. Mix mortar using a clean mechanical batcher for 3-5 minutes or by hand until completely mixed.
4. Place mortar within two hours of final mixing.
5. Do not re-temper or use partially hardened materials

2.4 MASONRY

A. Provide masonry units with colors, surface texture, size, and shape to match existing masonry and with physical properties not less than those determined from pre-construction testing of selected existing units.

B. Concrete Masonry Units:
   1. Size and Shape: Nominal modular size of 4 x 8 x 16, 6 x 8 x 16, 8 x 8 x 16, or 12 x 8 x 16 inches as indicated on drawings. Furnish special units for 90 degree corners, bond beams, lintels, bullnosed corners.
      a. Hollow Load Bearing Concrete Masonry Units: ASTM C90; normal weight.
      b. Hollow Non-Load Bearing Concrete Masonry Units: ASTM C129; normal weight.

C. Provide specially molded shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

D. For existing masonry that exhibits a range of colors, provide brick that matches that range rather than brick that matches an individual color within that range. Provide a sample for architect's approval where possible remove from areas to be demolished and salvage for reuse.

2.5 ACCESSORIES

A. Single Wythe Joint Reinforcement: ASTM A951/A951M; truss or ladder type; steel; 0.148 inch diameter side rods with 0.148 inch diameter cross ties; hot dip galvanized.

B. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade, deformed billet bars, uncoated finish.

C. Preformed Control Joints: Neoprene material. Furnish with corner and tee accessories.

D. Precast Concrete Lintels: nominal 4”x8”, 6”x8”, or 8”x8” precast concrete lintels as required by conditions at new door openings. Refer to Drawings.

E. Steel Lintels: See Section 05 12 00 and Lintel Schedule on Drawings.

F. Adjustable Anchors / Wire Ties to Connect to Existing Structure: Anchors / Wire Ties that allow for vertical and / or horizontal adjustment but resist tension and compression forces on the wall.
   1. Adjustable ties with pintle and eye connections with an adjustment of +/- 1 inch.

G. Compressible Expansion Joint Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from closed cell neoprene or urethane. Sized as applicable to conditions.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.

B. Prevent mortar from staining face of surrounding masonry and other surfaces. Cover sills, ledges, and projections to protect from mortar droppings. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering. Immediately remove mortar in contact with exposed masonry and other surfaces. Clean mortar splatters from scaffolding at end of each day.

3.2 INSTALLATION

A. Install mortar in accordance with ACI 530.1 Specification for Masonry Structures.

3.3 FIELD QUALITY CONTROL

A. Testing of Mortar Mix: In accordance with ASTM C780.

B. Testing of Grout Mix: In accordance with ASTM C1019.

3.4 MASONRY REPLACEMENT

A. Remove and replace masonry where indicated on drawings and as required to facilitate work. Reuse/reinstall existing salvaged masonry and supplement with new masonry to match where required [match existing].

B. Remove in an undamaged condition as much masonry as possible. Remove mortar, loose particles, and soil from brick and stone by cleaning with hand chisels, brushes, and water.

C. The documents show the masonry to be removed at each area of repair. Depending on the Contractor's care, additional masonry may require replacement. The Contractor shall include in the base bid allowance for additional replacement masonry at the designated areas of removal. These masonry quantities are not to be considered under the stated bid allowance for additional replacement.

D. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

E. Install replacement masonry into bonding and coursing pattern of existing masonry. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

F. Lay replacement masonry with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption [suction] of more than 30 g/30 square inch per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid. Maintain joint width for replacement units to match existing joints.

G. Tool exposed mortar joints in repaired areas to match surrounding existing brickwork.

H. Pointing: during the tooling of joints, enlarge any voids or holes, except weep holes and completely fill with mortar. Point up all joints at corners, openings and adjacent work to provide a neat, uniform appearance, properly prepared for application of caulking of sealant compounds.

3.5 RE-POINT EXISTING MASONRY [AS IMPACTED BY MASONRY REMOVAL]

A. Joint raking: rake out all joints to be pointed by hand, using a mason's chisel that is not more than ¼ inch thick or by approved hand grinding methods. If grinding is used, wet methods are required to minimize dirt and dust. Rake or grind out mortar from joints to depths equal to 2-1/2 times their widths but not less than 1-inch nor less than required to expose sound, un-weathered mortar.
   1. Remove mortar to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum or flush joints to remove dirt and loose debris. No abrasive methods of cleaning shall be used.
   2. Do not spall edges of masonry units or widen joints. Replace masonry units which become damaged.

a. Do not use power-operated grinders without Architect's written approval based on submission by Contractor of a satisfactory quality-control program and demonstrated ability of operators to use tools without damaging masonry. Quality control program shall include provisions for supervising performance and preventing damage due to worker fatigue.

3. Replace any units which become damaged.
4. If the existing bricks have worn rounded edges, recess final mortar slightly from face to a point where joint face will not be wider than the original joint.

B. Joint Pointing:
1. Rinse masonry joint surfaces with water to remove any dust and mortar particles. Time application of rinsing so that, at time of pointing, excess water has evaporated or run off, and joint surfaces are damp but free of standing water.
2. Apply first layer of pointing mortar to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8-inch until uniform depth is formed. Compact each layer thoroughly and allow to become thumbprint-hard before applying next layer.
3. After joints are filled to uniform depth, place remaining pointing mortar in 3 layers with each of first and second layers filling approximately 2/5 of joint depth and third layer the remaining 1/5. Fully compact each layer and allow to become thumbprint-hard before applying next layer. Take care not to spread mortar over edges onto masonry surfaces, or to featheredge mortar.
4. When mortar is thumbprint-hard, tool joints to match original appearance of joints as determined by the architect. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in damp condition for not less than 72 hours.

3.6 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure. Do not use metal scrapers or brushes. Do not use acidic or alkaline cleaners.

B. Sweep and rake adjacent pavement and grounds to remove masonry debris. Where necessary, pressure wash surfaces to remove mortar, dust, dirt, and stains.

3.7 GENERAL CLEANING

A. As work proceeds and on completion, remove excess mortar, smears, droppings.

B. Clean dirt and light staining from all brick surfaces.

C. Perform cleaning working from top to bottom working in sections around the building at one elevation at a time.

D. Use spray equipment that provides controlled application at volume and pressure indicated. Adjust pressure and volume to ensure cleaning methods do not damage masonry.

END OF SECTION

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SECTION 04 20 00 - UNIT MASONRY

PART 1 GENERAL

1.1 SUMMARY

A. Section includes concrete masonry units, reinforcement, anchorage, and accessories.

1.2 PERFORMANCE REQUIREMENTS

A. Concrete Masonry Compressive Strength (f'm): 1,500 psi; determined by unit strength method.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 530 Building Code Requirements for Masonry Structures and ACI 530.1 Specification for Masonry Structures.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or temperature of masonry units is less than 40 degrees F.

B. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.

PART 2 PRODUCTS

2.1 COMPONENTS

A. Concrete Masonry Units:
   1. Size and Shape: Nominal modular size of 4 x 8 x 16, 6 x 8 x 16, 8 x 8 x 16, or 12 x 8 x 16 inches as indicated on drawings. Furnish special units for 90 degree corners, bond beams, lintels, bullnosed corners.
      a. Hollow Load Bearing Concrete Masonry Units: ASTM C90; normal weight.
      b. Hollow Non-Load Bearing Concrete Masonry Units: ASTM C129; normal weight.

2.2 ACCESSORIES

A. Single Wythe Joint Reinforcement: ASTM A951/A951M; truss or ladder type; steel; 0.148 inch diameter side rods with 0.148 inch diameter cross ties; hot dip galvanized.

B. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade, deformed billet bars, uncoated finish.

C. Mortar and Grout: As specified in Section 04 05 14.

D. Preformed Control Joints: Neoprene material. Furnish with corner and tee accessories.

E. Joint Filler: Closed cell **polyurethane**; oversized 50 percent to joint width; self expanding; 1/2 inch wide x by maximum lengths.

F. Precast Concrete Lintels: nominal 4”x8”, 6”x8”, or 8”x8” precast concrete lintels as required by conditions at new door openings. Refer to Drawings.

G. Steel Lintels: See Section 05 12 00 and Lintel Schedule on Drawings.

H. Anchor Rods: ASTM A307; Grade C; J-shaped or L-shaped complete with washers and heavy hex nuts; sized for 15-inch embedment; ASTM A153 hot dip galvanized finish.

I. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials; recommended by masonry unit manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify field conditions are acceptable and are ready to receive Work.

3.2 PREPARATION

A. Coordinate placement of anchors supplied by other sections.

3.3 INSTALLATION

A. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

B. Coursing of Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Concave.

C. Cut mortar joints flush where ceramic wall tile is scheduled, cement parging is required, resilient base is scheduled.

D. Joint Reinforcement And Anchorage - Single Wythe Masonry:
   1. Install horizontal joint reinforcement 16 inches oc. Place joint reinforcement continuous in first joint below top of walls.
   2. Place masonry joint reinforcement in first horizontal joint above and below openings. Extend minimum 16 inches each side of opening.
   3. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches oc.

E. Lintels:
   1. Install loose steel or precast concrete lintels over openings.
   2. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled or indicated.
   3. Maintain minimum 8 inch bearing on each side of opening.

F. Grouted Components:
   1. Reinforce bond beam and pilasters as detailed.
   2. Support and secure reinforcing bars from displacement.
   3. Place and consolidate grout fill without displacing reinforcing.
   4. At bearing locations, fill masonry cores with grout for minimum 12 inches both sides of opening.

G. Control Joints:
   1. Install control joints at the following maximum spacings, unless otherwise indicated on Drawings:
      a. Exterior Walls: 20 feet on center and within 24 inches on one side of each interior and exterior corner.
      b. Interior Walls: 30 feet on center.
      c. At changes in wall height.
   2. Do not continue horizontal joint reinforcement through control joints.
   3. Form control joint with sheet building paper bond breaker fitted to one side of hollow contour end of block unit. Fill resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.
   4. Install preformed control joint device in continuous lengths. Seal butt and corner joints.

H. Built-In Work:
   1. As work progresses, install built-in metal door frames, window frames, anchor bolts and plates and other items to be built in the work furnished by other sections.

2. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout or mortar. Fill adjacent masonry cores with grout minimum 12 inches from framed openings].

I. Cutting And Fitting:
   1. Cut and fit for chases, pipes, conduit, sleeves, grounds and other penetrations. Coordinate with other sections of work to provide correct size, shape, and location.

J. Cleaning:
   1. Remove excess mortar and mortar smears as work progresses.
   2. Clean soiled surfaces with cleaning solution.

K. Tolerances:
   1. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
   2. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

END OF SECTION

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SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Structural shapes; Channels and angles; plates; bolts, connectors, and anchors; Grout.

B. Coordinate all requirements with Structural Drawings.

1.2 SUBMITTALS

A. Shop Drawings: Indicate sizes, spacing, and locations of structural members, openings, connections, and welded connections.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with the following:
   1. Structural Steel: AISC 303.
   2. High Strength Bolted Connections: RCSC Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.

PART 2 PRODUCTS

2.1 STRUCTURAL STEEL

A. Structural W-shapes: ASTM A992/A992M; ASTM A572, Grade 60

B. Channels and Angles: ASTM A36/A36M; ASTM A572, Grade 60

C. Square and Rectangular Structural Sections: ASTM A500/A500M, Grade B

D. Structural Pipe: ASTM A53/A53M, Grade B.

E. Structural Plates and Bars: ASTM A36/A36M; ASTM A572, Grade 60

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. Bolts: Heavy hex, structural type.
   1. ASTM A325; Type 1, hot dipped galvanized, or Type 3, plain.

B. Nuts: ASTM A563 heavy hex type.
   1. Finish: Hot dipped galvanized.

C. Washers: ASTM F436; Type 1, circular. Furnish clipped washers where space limitations require.
   1. Finish: Hot dipped galvanized.

D. Tension Control Assemblies: ASTM F1872; Type 1, heavy hex head, twist off type, complete with washers and heavy hex nuts.
   1. Finish: Mechanically galvanized

E. Shear Connectors: ASTM A108; Grade 60, headed, unfinished and in accordance with AWS D1.1; Type B

F. Anchor Rods: ASTM F1554; Grade 55, weldable. Hooked shape.

G. Threaded Rods: ASTM A36/A36M.
   1. Finish: Hot dipped galvanized.

2.3 WELDING MATERIALS

A. Welding Materials: AWS D1.1; type required for materials being welded.

2.4 FABRICATION

A. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

B. Fabricate connections for bolt, nut, and washer connectors.

2.5 FINISHES

A. Prepare structural component surfaces in accordance with SSPC SP 3 or as required by conditions.

B. Shop prime structural steel members.

C. Galvanizing: ASTM A123/A123M; hot dip galvanize after fabrication.

D. Galvanizing for Bolts, Connectors, and Anchors:
   1. Hot-Dipped Galvanizing:
      a. Bolts, Nuts, and Washers: ASTM F2329.
      b. Connectors and Anchors: ASTM A153/A153M.
   2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

2.6 ACCESSORIES

A. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing minimum compressive strength of 7,000 psi at 28 days.

B. Shop Primer: SSPC Paint 15, Type 1, red oxide.

C. Touch-Up Primer: Match shop primer.

D. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify bearing surfaces are at correct elevation.

B. Verify anchors rods are set in correct locations and arrangements with correct exposure for steel attachment.

3.2 ERECTION

A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.

B. Field weld components indicated.

C. Do not field cut or alter structural members without approval of Architect/Engineer.

D. After erection, touch up welds and abrasions to match shop finishes.

3.3 GROUT INSTALLATION

A. Shim bearing plates and equipment supports to proper elevation, snug tighten anchor bolts.

B. Fill void under bearing surface with grout. Install and pack grout to remove air pockets.

C. Moist cure grout.

D. Remove forms after grout is set. Trim grout edges to from smooth surface, splayed 45 degrees.

E. Tighten anchor bolts after grout has cured for a minimum of 3 days.

3.4 FIELD QUALITY CONTROL

A. Bolted Connections: Inspect in accordance with AISC 303.
   1. Visually inspect all bolted connections.
   2. For Direct Tension Indicators, comply with requirements of ASTM F959. Verify that gaps are less than gaps specified in Table 2.

B. Welding:
   1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
   2. Visually inspect all welds.
   3. Ultrasonic Inspection: ASTM E164; perform on all full penetration welds.

C. Correct defective bolted connections and welds.

END OF SECTION

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SECTION 05 31 23 - STEEL ROOF DECKING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Steel roof deck and accessories.
   2. Bearing plates and angles.

1.2 PERFORMANCE REQUIREMENTS

A. Design metal deck in accordance with SDI 29 Design Manual and ASCE 3.

B. Calculate to structural limit stress design and maximum vertical deck deflection of 1/240.

1.3 REFERENCES

A. Reference standards of the following sources are applicable to products and procedures specified. Steel Deck Institute [SDI].

1.4 QUALITY ASSURANCE PROCEDURES

A. Applicator Qualifications: A qualified firm that is approved, authorized, or licensed to install the specified products and is eligible to receive a manufacturer's warranty. The firm shall have a minimum of 5 years documented experience performing work equal or similar to the specified work.

B. During work, if conditions are discovered which do not allow for continuation of the work per the technical specifications and drawings, notify RDA/Owner immediately for resolution.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original containers, dry, undamaged, with seals and labels intact.

B. Protect adjacent materials and surfaces against damage from roofing work. Do not store materials on previously completed roofing.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not perform steel deck repair/replacement work during inclement weather. Refer to product manufacturer for outdoor temperature requirements for installation of materials.

PART 2 PRODUCTS

2.1 STEEL DECK REPAIR/REPLACEMENT MATERIALS

A. For use at Steel Deck Brushing and Priming, as described in Paragraph 3.3.A:
   1. Rust-Oleum Industrial Enamel Quick Dry Primer.
   2. Carboline Carbocoat 150 Universal Primer.
   3. Or approved equal.

B. For use at Steel Deck Repair, as described in Paragraph 3.2:
   1. Steel plate: 16-gauge galvanized with pre-drilled holes for fasteners.
   2. For securing steel plate to steel deck: Teks 1 or No. 10 fluorocarbon-coated screws; length as necessary to penetrate minimum 1-inch depth through the deck.
   3. For securing steel plate to underlying structural steel [1/4-inch-thick max.]: 12-24 x 1-1/4-inch Hex Washer Head, Teks 5, or approved equal.

C. For use at Steel Deck Replacement, as described in Article 3.3:

1. Full sections to match existing in gauge, profile, and finish as necessary to comply with requirements of applicable insurance agencies and local codes.
2. Refer to Paragraph 2.1.B for fastener requirements.

2.2 MATERIALS

A. Sheet Steel: ASTM A653, Grade 33 Structural Quality; with G90 galvanized coating.

B. Bearing Angles: ASTM A36/A36M steel, unfinished, primed.

C. Shop Primer: SSPC Paint 15, Type 1, red oxide

D. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic.

2.3 FABRICATION

A. Metal Deck: Sheet steel, configured as follows:
   1. Span Design: single.
   2. Minimum Metal Thickness Excluding Finish: 20 gage.
   3. Nominal Height: 1-1/2 inch, fluted profile to match existing [Type B], field verify conditions.
   4. Side Joints: lapped.
   5. Flute Sides: plain vertical face.

B. Related Deck Accessories: Metal closure strips, cover plates, 20 gage thick galvanized sheet steel; of profile and size required for conditions.

C. Fasteners: Galvanized hardened steel, self tapping.

PART 3 EXECUTION

3.1 STEEL DECK INSPECTION

A. Inspect exposed steel decks for surface corrosion, severe corrosion, openings, and other defects.

3.2 STEEL DECK REPAIR

A. Steel Deck Brushing and Priming: For use at areas of light corrosion,
   1. Wire-brush or scrape the surface rust. Remove debris by power vacuum.
   2. Apply primer to the repair area; allow primer time to dry.

B. Steel Deck Repair: For use to repair at openings caused by obsolete roof penetration removal or other defects less than 12 inch by 12 inch in size.
   1. At locations encountered, cover the existing opening with 16-gauge steel plate stock. Lap the plate a minimum of 8-inches beyond the opening on all sides. Fasten the steel plate with specified fasteners and plates 6-inches on center. Secure the plate a minimum of 2-inches in from the outside edge of the repair plate.

3.3 STEEL DECK REPLACEMENT

A. Prior to the start of work, inspect the interior area below the area of damaged steel roof deck. Remove items from the replacement area that may be damaged during work activities. Provide adequate interior protection to protect interior surfaces and finishes from damage prior to the start of work. The Contractor shall provide an “Interior Protection Representative” during replacement work.

B. At deck replacement locations: Remove defective steel deck panels and install full decking sections to match existing. It is possible that in some areas a panel can be overlaid [retrofitted]. Install new decking in accordance with the requirements of the Steel Deck Institute, and applicable local codes. Decking tie-in shall be covered with a 16-gauge sheet metal strip fastened in place to the new and existing decking 12 inches on center on each side of the 8-inch-wide

strip. Overlaid decking must overlap good, secured panels 12 inches on center in all directions [end and side laps] and be fastened 6 inches on center.

C. Place deck panels on the supporting frame and adjust to final position with ends accurately aligned and bearing on the supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

D. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

E. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.

F. Provide additional reinforcement and closure pieces at the openings as required for strength, continuity of decking and support of other work.

3.4 INSTALLATION OF NEW STEEL DECK

A. Erect metal deck in accordance with SDI Manual.

B. Bear deck on adjacent steel deck or steel supports with 6 inch minimum bearing. Align and level.

C. Fasten deck to steel support members at ends and intermediate supports with mechanical fasteners or puddle welds at 12 inches oc maximum, parallel with deck flute and at every other transverse flute.

D. Mechanically **clinch** male/female side laps at 24 inches oc maximum.

E. Reinforce steel deck openings from 6 to 24 inches in size with 3 x 3 x 1/4 inch steel angles. Place framing angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and mechanically attach to deck at each flute.

F. Install 6 inch minimum wide sheet steel cover plates, of same thickness as deck, where deck changes direction. Mechanically attach at 12 inches oc maximum.

G. Install sheet steel closures and angle flashings to close openings between deck and walls, columns, and openings.

END OF SECTION

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SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes load bearing formed steel stud exterior wall and canopy framing and formed steel joists, framing and bridging.

1.2 SYSTEM DESCRIPTION

A. Size components to withstand design loads per structural drawings. **Design of cold-formed metal framing components is a delegated design by the Contractor.**

B. Maximum Allowable Deflection: 1: 360 of span.

C. Wall and Canopy System:
   1. Design to AISI NAS, AISC General, and AISC Header.
   2. Design to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.

D. Design system to accommodate:
   1. Construction tolerances, deflection of building structural members, and clearances of intended openings.
   2. Expansion and contraction of members and building movement without damage to connections or members.

E. Seismic Design: Design and detail elements and connections to resist seismic force in accordance with structural drawings.

1.3 SUBMITTALS

A. Shop Drawings:
   1. Indicate component details, framed openings, bearing, anchorage, loading, welds, type and location of fasteners, and accessories or items required of related work.
   2. Indicate stud, joist, purlin layout.
   3. Provide calculations for loadings and stresses of framing sealed by Professional Structural Engineer registered in State of Ohio. Delegated design submittal.

B. Product Data: Describe materials and finish, product criteria, limitations and other pertinent information related to products.

1.4 QUALITY ASSURANCE

A. Calculate structural properties of framing members in accordance with AISI NAS.

B. Furnish framing materials in accordance with SSMA - Product Technical Information.

C. Perform Work in accordance with the following:
   1. Framing: AISI General and AISI NAS.
   2. Headers: AISI Header.
   3. Trusses: AISI Truss.
   4. Wall Studs: AISI WSD.
   5. Lateral Design: AISI Lateral.

D. Design framing under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Ohio.

PART 2 PRODUCTS

2.1 FRAMING COMPONENTS

A. Steel Sheet: ASTM A1003/A1003M; Structural Grade, Type H, metallic coated:
   1. Grade: As required by performance requirements.
   2. Coating: G60.

B. Studs: Steel sheet, formed to channel shape, solid or punched web, size, gauge, and thickness as required by performance requirements

C. Joists, Purlins: Steel sheet, formed to channel, hat shape per drawings, solid or punched web; size, gauge, and thickness as required by performance requirements.

D. Track: Steel sheet, formed to channel shape; same width as studs, tight fit; gauge and thickness as required by performance requirements, solid web.

2.2 ACCESSORIES

A. Bracing, Furring, Bridging, Plates, Gussets, Clips: Formed sheet steel, thickness determined by performance requirements specified; same finish as framing members.

B. Screws: Hot dip galvanized, self drilling, self tapping.

C. Anchorage Devices: Power actuated.

D. Welding: In accordance with AWS D1.1 and AWS D1.3.

E. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic and compatible with coating on framing members.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 ERECTION OF STUDS

A. Align bottom and top tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches oc, but per the specifications of the performance requirements.

B. Place studs per design specifications. Connect studs to tracks using fasteners.

C. Erect load bearing studs one piece full length. Splicing of studs is not permitted.

D. Allow for deflection, directly below horizontal building framing for non-load bearing framing.

E. Attach bridging / furring channels to studs for attachment of fixtures anchored to walls and for attachment of mechanical and electrical items within walls.

F. Touch-up field welds and damaged metallic coatings surfaces with primer to match shop coating.

3.3 ERECTION OF JOISTS AND PURLINS

A. Make provisions for erection stresses. Provide temporary alignment and bracing.

B. Place joists and purlins per design specifications. Connect joists to supports using fasteners.

C. Set components parallel and level, with lateral bracing and bridging.

D. Locate component end bearing directly over load bearing studs or provide load distributing member to top of stud track.

E. Provide web stiffeners where required by design specifications.

F. Touch-up field welds and damaged metallic coatings surfaces with primer to match shop coating.

END OF SECTION

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SECTION 05 50 00 - METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Shop-fabricated metal items.
   2. Loose steel lintels.
   3. Ledge and shelf angles.
   4. Structural supports for miscellaneous attachments.

1.2 SUBMITTALS

A. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

B. Delegated Design Submittals: Submit signed and sealed Shop Drawings with design calculations and assumptions where applicable. Coordinate with structural drawings.

C. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.3 QUALITY ASSURANCE

A. Finish joints according to NOMMA Guideline 1.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept metal fabrications on-Site in labeled shipments. Inspect for damage.

B. Protect metal fabrications from damage by exposure to weather or by ground contact.

1.5 EXISTING CONDITIONS

A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

PART 2 PRODUCTS

2.1 LINTELS

A. Steel sections, size and configuration as indicated on Drawings, length to allow **8** in minimum bearing on both sides of opening.
   1. Exterior Locations: Galvanized.
   2. Interior Locations: Prime paint, one coat.

2.2 LEDGE AND SHELF ANGLES

A. Ledge and Shelf Angles, Channels and Plates Not Attached to Structural Framing: For support of metal decking, joists; prime paint, one coat.

2.3 MATERIALS

A. Steel:
   1. Structural W-Shapes: ASTM A992.
   2. Structural Shapes: ASTM A36.
   3. Channels and Angles: ASTM A36.
   4. Steel Plate: ASTM A36, ASTM A572; Grade 50.
   5. Hollow Structural Sections: ASTM A500, Grade B.
   6. Steel Pipe: ASTM A53, Grade B, Schedule 40 unless noted otherwise.

7. Sheet Steel: ASTM A653, Grade 33 Structural Quality.
8. Bolts: ASTM A307; Grade A or B, ASTM A325; Type 1].
9. Nuts: ASTM A563 heavy hex type.
10. Washers: ASTM F436; Type 1.
11. Welding Materials: AWS D1.1; type required for materials being welded.

2.4 FABRICATION

A. Fit and shop assemble items in largest practical sections for delivery to Site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by continuous welds.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small, uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.5 FINISHES

A. Steel:
1. Prepare surfaces to be primed according to SSPC SP 2.
2. Do not prime surfaces in direct contact with concrete or where field welding is required.
3. Prime paint items with one coat except where galvanizing is specified.
4. Galvanizing: ASTM A123; hot-dip galvanize after fabrication.
5. Galvanizing for Fasteners, Connectors, and Anchors:
    a. Hot-Dip Galvanizing: ASTM A153.
    b. Mechanical Galvanizing: ASTM B695; Class 50 minimum.
6. Bolts: Hot-dip galvanized.
7. Nuts: Hot-dip galvanized.
8. Washers: Hot-dip galvanized.
9. Shop Primer: SSPC Paint 15, Type 1, red oxide.
10. Touch-Up Primer: Match shop primer.

PART 3 EXECUTION

3.1 INSTALLATION

A. Field weld components indicated on **Drawings**].

B. Obtain approval of Architect/Engineer prior to Site cutting or making adjustments not scheduled.

3.2 FIELD QUALITY CONTROL

A. Inspect welds according to AWS D1.1.

END OF SECTION

SECTION 05 50 13 - METAL SERVICE PLATFORMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Steel service platforms and landings.
   2. Integral railing and handrailing.
   3. Vertical ladders.

1.2 SYSTEM DESCRIPTION

A. Design service platform assemblies and attachments to resist the following loads:
   1. Floor Live and dead loads with 1/180 of span maximum deflection.
      a. Live Loads: 60 psf uniform load [and concentrated load of 300 psf for new catwalk areas indicated on Drawings.
      b. Dead Loads: Actual weight of materials incorporated into Work.

B. Design handrail, guardrail, and attachments to resist loads required by Ohio Building code. Apply loads non-simultaneously to produce maximum stresses.
   1. Top Rail and Handrail Concentrated Load: 200 pounds applied at any point in any direction.
   2. Top Rail Uniform Load: 50 pounds per linear foot applied in any direction.
   3. Intermediate Rails, Panels, and Baluster Concentrated Load: 50 pounds applied to 1 sf area.

C. Design vertical ladders and attachments to resist two 250 pounds loads, located between two consecutive supports.
   1. Rung Load: 250 pounds applied at center of rung.

1.3 SUBMITTALS

A. Shop Drawings:
   1. Indicate platform, railing, and ladder layout, clearances, and fit to other construction.
   2. Identify removable components.
   3. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
   4. Show and identify field measurements.

1.4 QUALITY ASSURANCE

A. Fabricate platforms, handrails, railings, and ladders in accordance with the following:
   1. NAAMM AMP 510, Class Service.
   2. NAAMM AMP 521.
   3. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges.
   4. AISC 341 - Seismic Provisions for Structural Steel Buildings.
   5. RCSC Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts.

PART 2 PRODUCTS

2.1 STEEL MATERIALS

A. Structural W-Shapes: ASTM A992.

B. Structural T-Shapes: Cut from structural W-shapes.

C. Channels and Angles: ASTM A36.

D. Round Hollow Structural Sections: ASTM A500, Grade B.

E. Square and Rectangular Hollow Structural Sections: ASTM A500, Grade B.

F. Structural Pipe: ASTM A53, Grade B.

G. Tubing: ASTM A513, Type 5, minimum 50 ksi yield strength.

H. Structural Plates: ASTM A36.

I. Floor Plates: ASTM A786/A786M; 3/8 inch checker plate raised pattern.

2.2 FASTENERS, CONNECTORS, AND ANCHORS

A. Bolts: ASTM A307; Grade A.
   1. Finish: Unfinished.

B. High Strength Bolts:
   1. ASTM A325/A325M; Type 1.
      a. Finish: Unfinished.
   2. ASTM A490; Type 1, unfinished.

C. Nuts: ASTM A563 heavy hex type.
   1. Finish: Unfinished.

D. Washers: ASTM F436; Type 1, circular.
   1. For ASTM A307 Bolts: ASTM F844; Type 1, circular.
   2. For ASTM A325 Bolts: ASTM F436.
      a. Finish: Unfinished.
   3. For ASTM A490 Bolts: ASTM 436.
      a. Finish: Unfinished.

E. Threaded Rods: ASTM A36/A36M.
   1. Finish: Unfinished.

F. Stainless Steel Bolts, Nuts, and Washers: ASTM A354.

2.3 WELDING MATERIALS

A. Steel Welding Materials: AWS D1.1; type required for materials being welded.

B. Stainless Steel Welding Materials: AWS D1.6; type required for materials being welded.

2.4 ACCESSORIES

A. Shop Primer: SSPC Paint 15, Type 1, red oxide.

B. Touch-Up Primer: Match shop primer.

2.5 FABRICATION - GENERAL

A. Fit and shop assemble in largest practical sections, for delivery to site and field bolted assembly.

B. Fabricate components with joints tightly fitted and secured.

C. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

E. Accurately form components required for anchorage of platforms, landings, railings, handrails, and ladders to each other and to building structure.

F. Weld Finishing: NOMMA Guideline 1.
   1. Railings, Handrails, and Ladders: Joint Finish 3, partially dressed weld with spatter removed.
   2. Other Components: Joint Finish 4, good quality undressed weld with minimal spatter.

2.6 PLATFORM AND LANDING FABRICATION

A. Framing: Structural steel shapes **as indicated on Drawings**.

B. Traffic Surface: checker plate.

C. Openings: Cut opening for penetrations through grating, band exposed edges, and toe plates at opening perimeter.

2.7 RAILING AND HANDRAILS FABRICATION

A. Posts and Rails: 1-1/2 inch diameter pipe, welded joints.

B. Guard Top Rail: 42 inches above traffic surface to top of rail.

C. Intermediate Rails: Spaced for maximum 21 inch clear opening between rail and toe plate.

D. Ships Ladder Handrails: Mount 12 inches perpendicular distance from stringer, beginning 36 inches above finished floor.

E. Attachment: Bolted to stringers and platform perimeter framing.

2.8 VERTICAL LADDER FABRICATION

A. Side Rails: Steel sections, 3/8 x 2 inches spaced 24 inches apart, clear dimension.

B. Rungs: 1 inch diameter solid rod spaced 12 inches on center, with slip resistant finish.

C. Walk Through: Extend side rails minimum 42 inches above top level.

D. Joints: Welded.

E. Mounting: Steel mounting brackets for bolted attachment to platform framing and building structure with minimum 7 inch (175 mm) clearance from wall / obstructions.

2.9 SHOP FINISHING

A. Prepare steel component surfaces in accordance with SSPC SP 3.

B. Shop prime steel members. Do not prime surfaces that will be field welded, in contact with concrete, or high strength bolted.

C. Galvanizing: ASTM A123/A123M; hot dip galvanize after fabrication.

D. Galvanizing for Fasteners, Connectors, and Anchors:
   1. Hot-Dipped Galvanizing: ASTM A153/A153M.
   2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify bearing surfaces are at correct elevation.

B. Verify anchors rods are set in correct locations and arrangements with correct exposure for platform structure attachment.

C. Verify structural frame supporting platform is installed and braced for additional loads.

D. Verify equipment installation is sufficiently complete to permit installation of service platform without interfering with equipment installation.

3.2 PREPARATION

A. Furnish templates for installation of anchor rods embedded in concrete and masonry foundations.

3.3 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Allow for erection loads, and for sufficient temporary bracing to maintain platform safe, plumb, and in alignment until completion of erection and installation of permanent bracing.

C. Make field connections with threaded fasteners.

D. Do not field cut or alter structural members without approval of Architect/Engineer.

E. After erection, touch up abrasions to match shop finishes.

3.4 FIELD QUALITY CONTROL

A. Bolted Connections: Inspect in accordance with AISC 303.
   1. Visually inspect all bolted structural steel connections.

B. Correct defective bolted connections.

END OF SECTION

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Section includes exterior wall / canopy sheathing; gypsum wall sheathing; sill gaskets and flashings; preservative and fire retardant treatment; electrical panel backboards; blocking and related furring and framing materials.

1.2 REFERENCES

A. American National Standards Institute:
   1. ANSI A135.4 - Basic Hardboard.
   2. ANSI A208.1 - Mat-Formed Wood Particleboard.

B. American Wood-Preservers' Association:
   1. AWPA M4 - Standard for the Care of Preservative-Treated Wood Products.
   2. AWPA U1 - Use Category System: User Specification for Treated Wood.

C. ASTM International:
   1. ASTM C1396/C1396M - Standard Specification for Gypsum Board.
   2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   3. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
   4. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

D. Forest Stewardship Council:
   1. FSC Guidelines - Forest Stewardship Council Guidelines.

E. Green Seal:
   1. GS-36 - Aerosol Adhesives.

F. National Lumber Grades Authority:
   1. NLGA - Standard Grading Rules for Canadian Lumber.

G. Northeastern Lumber Manufacturers Association:
   1. NELMA - Standard Grading Rules for Northeastern Lumber.

H. South Coast Air Quality Management District:
   1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

I. Southern Pine Inspection Bureau:
   1. SPIB - Standard Grading Rules for Southern Pine Lumber.

J. U.S. Department of Commerce National Institute of Standards and Technology:
   1. DOC PS 1 - Construction and Industrial Plywood.
   2. DOC PS 2 - Performance Standard for Wood-Based Structural-Use Panels.
   3. DOC PS 20 - American Softwood Lumber Standard.

K. West Coast Lumber Inspection Bureau:
   1. WCLIB - Standard Grading Rules for West Coast Lumber.

L. Western Wood Products Association:
   1. WWPA G-5 - Western Lumber Grading Rules.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with the following agencies:
   1. Lumber Grading Agency: Certified by DOC PS 20.

2. Wood Structural Panel Grading Agency: Certified by EWA - The Engineered Wood Association.
3. Plywood Grading Agency: Certified by APA.
4. Lumber: DOC PS 20.
5. Wood Structural Panels: DOC PS 1 or DOC PS 2.

B. Perform Work in accordance with Ohio Building Code.

C. Apply label from agency approved by authority having jurisdiction to identify each preservative treated and fire retardant treated material.

PART 2 PRODUCTS

2.1 SHEATHING MATERIALS

A. Wall / Canopy Sheathing: APA/EWA, Structural I, Grade B-C; Exposure Durability 2; sanded, fire retardant treated plywood; 1/2 inch, 5/8 inch, and 3/4 inch thickness as noted on drawings; 48x96 inch sized sheets

B. Gypsum Board Sheathing: Fiberglass-Mat Faced Gypsum Sheathing, ASTM C1177, Type X
1. Thickness: 5/8 inch
2. Size: 48x96 inch sized sheets
3. Edges: square

C. Electrical / Data Backboard: APA, Structural I, Grade A-C, Exposure Durability 2, sanded, 3/4 inch thickness, 48x96 inch sized sheets

2.2 FIREBLOCKING AND FIRESTOPPING

A. Fireblocking: Solid lumber, structural wood panel, or particleboard.
1. Solid lumber nominal 2 inches thick.
2. Structural wood panel 23/32 inch thick with joints backed by structural wood panel.

2.3 ACCESSORIES

A. Fasteners and Anchors:
1. Fasteners: ASTM A153/A153M, hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
2. Nails and staples: ASTM F1667.

B. Die Stamped Connectors: galvanized steel, specific type/profile as applicable

C. Sill Gasket: Plate width, closed cell foam strip.

D. Sill Flashing: Polyethylene Sheet or Galvanized Steel.

2.4 FIRE-RETARDANT-TREATED MATERIALS (FRT)

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to

accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

PART 3 EXECUTION

3.1 SHEATHING

A. Install sheathing over framing members in full size sheets in accordance with APA Construction Guide [FRT plywood] and GA-253 / ASTM C1280 [gypsum sheathing].

B. Fasten sheathing in accordance with Ohio Building Code.

C. Secure wall / canopy sheathing with ends staggered, over firm bearing.

D. Coordinate installation of weather resistive barrier. Coordinate flashing installation to ensure continuous water resistant barrier.

E. Install electrical panel back board with plywood sheathing. Size back board by 12 inches beyond size of electrical panel.

3.2 FIREBLOCKING AND DRAFTSTOPPING

A. Install fireblocking to cut off concealed draft openings as required.
   1. Concealed Framed Wall and Furred Spaces: Install fireblocking vertically at floor and ceiling levels and horizontally.
   2. Connections Between Horizontal and Vertical Spaces: Install fireblocking between vertical walls and partitions and the following:
      a. Horizontal floor and roof framing.
      b. Soffits, dropped ceilings, cove ceilings and other horizontal concealed spaces.

3.3 SITE APPLIED WOOD TREATMENT

A. Treat site sawn cuts. Brush apply one coat of preservative treatment on untreated wood in contact with cementitious materials.

B. Allow preservative to cure prior to erecting members.

3.4 TOLERANCES

A. Framing members: ¼ inch from indicated position, maximum.

END OF SECTION

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SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: blocking in wall openings; concealed wood blocking; and preservative treatment of wood.

1.2 QUALITY ASSURANCE

A. Perform Work according to following:
   1. Lumber Grading Agency: Certified by DOC PS 20.
   2. Lumber: DOC PS 20.
   3. Wood Structural Panels: DOC PS 1 or DOC PS 2.

B. Surface Burning Characteristics:
   1. Fire Retardant Treated Materials: Maximum 25/450 flame spread/smoke developed index when tested according to ASTM E84.

PART 2 PRODUCTS

2.1 MATERIALS

A. Lumber Grading Rules: SPIB; ASLS

B. Miscellaneous Framing: Stress Group D SPF or SYP species, #2 grade, 19 percent maximum moisture content, fire retardant treated. 1x and 2x as noted on drawings.

C. Plywood: APA/EWA, Structural I, Grade B-C; Exposure Durability 2; sanded, fire retardant treated.

2.2 FIRE-RETARDANT-TREATED MATERIALS (FRT)

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
   1. Use treatment that does not promote corrosion of metal fasteners.
   2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

2.3 ACCESSORIES

A. Fasteners and Anchors:
   1. Fasteners: ASTM A153/A153M, hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.

2. Nails and Staples: ASTM F1667.
3. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel. All anchors sized to suit application and loads.

2.4 FIREBLOCKING AND FIRESTOPPING

A. Fireblocking: Solid lumber, structural wood panel, or particleboard, fire retardant treated.
   1. Solid lumber nominal 2 inches thick.
   2. Structural wood panel 23/32 inch thick with joints backed by structural wood panel.

2.5 FACTORY WOOD TREATMENT

A. Wood Preservative (Pressure Treatment): AWPA U1, Commodity Specification A-Sawn Products or F-Wood Composites using water-borne ACQ preservative.

B. Fire Retardant Treatment: Chemically treated and pressure impregnated, having flame spread of 25 or less when tested according to ASTM E84 and showing no evidence of significant progressive combustion when test is continued for an additional 20 minute period, Interior Type.

C. Moisture Content after Treatment: Kiln dried (KDAT).
   1. Lumber: Maximum 19 percent.
   2. Structural Panels: Maximum 15 percent.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate conditions are ready to receive blocking and framing.

3.2 PREPARATION

A. Coordinate placement of blocking and framing items.

3.3 FRAMING

A. Erect wood framing/blocking in accordance with Ohio Building Code. Place members level and plumb. Place horizontal members crown side up.

B. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.

C. All exterior blocking intended to be left exposed to weather shall be pressure treated and anchored with galvanized fasteners and appropriate connectors.

D. All blocking and framing shall be fire retardant treated.

E. Fasten blocking per conditions and in accordance with Ohio Building Code.

3.4 FIREBLOCKING AND DRAFTSTOPPING

A. Install fireblocking to cut off concealed draft openings as required.
   1. Concealed Framed Wall and Furred Spaces: Install fireblocking vertically at floor and ceiling levels and horizontally.
   2. Connections Between Horizontal and Vertical Spaces: Install fireblocking between vertical walls and partitions and the following:
      a. Horizontal floor and roof framing.
      b. Soffits, dropped ceilings, cove ceilings and other horizontal concealed spaces.

3.5 SITE APPLIED WOOD TREATMENT

A. Treat site sawn cuts. Brush apply one coat of preservative treatment on untreated wood in contact with cementitious materials.

B. Allow preservative to cure prior to erecting members.

3.6 TOLERANCES

A. Framing members: ¼ inch from indicated position, maximum.

END OF SECTION

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SECTION 06 41 00 - ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Custom plastic-laminate-finished casework.
   2. Custom plastic-laminate-finished counter tops.
   3. Cabinet hardware.

1.2 SUBMITTALS

A. Product Data:
   1. High-pressure decorative laminates.
   2. Hardware accessories.

B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location, schedule of finishes.

C. Samples: Plastic laminate, trim profiles as applicable.

1.3 QUALITY ASSURANCE

A. Perform Work according to AWS, Section 6, Section 10, and Section 11; custom grade.

B. Surface Burning Characteristics: Maximum 25/450 flame-spread/smoke-developed index when tested according to ASTM E84.

C. Fabricator: Company specializing in fabricating products specified in this Section with minimum five years' experience similar to this Project.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.5 AMBIENT CONDITIONS

A. Maintain storage space relative humidity within ranges indicated in AWS Section 2.

B. Subsequent Conditions: Maintain same temperature and humidity conditions in building spaces as will occur after occupancy during and after installation of Work of this Section.

1.6 EXISTING CONDITIONS

A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

PART 2 PRODUCTS

2.1 PLASTIC LAMINATE

A. Manufacturer:
   1. Wilsonart [basis of design]
   2. Formica
   3. Arborite

2.2 CUSTOM CASEWORK

A. Plastic-Laminate-Finished Custom Casework:
   1. Frameless construction.
   2. Style: Flush overlay.
   3. AWS Section 10.

4. Custom grade.
5. Exterior and Interior Exposed Surfaces: High-pressure decorative laminate over medium density fiberboard [MDF].
6. Semi-Exposed Surfaces: Thermally Fused Melamine over particleboard.
7. Interior Surfaces, Interior Cabinet Shelves, Drawers: Thermally Fused Melamine over particleboard.

B. Casework Construction Details:
1. Drawer Side Joinery: dovetailed or lock jointed.
2. Drawer and Door Edge Profile: Square with thin, applied band.
3. Toe Base Finish: Rubber Base as specified in Section 09 65 00.
4. Grain Direction: field verify with Architect as applicable.

C. Plastic-Laminate-Finished Counter Tops: AWS Section 11; custom grade.
1. Core: Medium density fiberboard or Particleboard.
2. Splash Top Profile: Square with scribe.
3. Deck at Splash Joint Type: Horizontal Butt
4. Front Edge: Square edge, plastic laminate, 1 1/2 face dimension.
5. Splash Assembly: Field assembled.

D. Solid Surface Counter Tops: Refer to Section 06 61 16.

2.3 CASEWORK MATERIALS

A. Softwood Lumber: DOC PS 20.

B. Particleboard: ANSI A208.1 Grade M2 or better; composed of wood chips or sawdust, medium density.
1. Fire-Retardant Particleboard: ASTM E84; 25 maximum flame-spread index and 450 maximum smoke-developed index.

C. Medium-Density Fiberboard: ANSI A208.2, composed of wood fibers, medium density.
1. Fire-Retardant Fiberboard: ASTM E84; 25 maximum flame-spread index and 450 maximum smoke-developed index.

D. High-Pressure Decorative Laminate (HPDL): NEMA LD 3; through color, style/pattern as selected, and surface texture as selected.
1. Horizontal Surfaces: HGS; 0.048 in thick.
2. Vertical Surfaces: VGS; 0.028 in thick.
3. Cabinet Liner: CLS; 0.020 in thick.
4. Backing Sheet: BKL; 0.020 in thick.

E. Adjustable shelf standards: Heavy Duty type, Knape & Vogt 83 / 183 Series
1. BMHA Grade 2 Compliant
2. Material: 16 gauge steel construction
3. Finish: Corrosion resistant Anochrome
4. Size: per drawings.
5. Standards: maximum spacing at 24 inches on center.

F. Decorative Countertop Supports: Knape and Vogt, RP-201RC-8BK or Equal

G. Countertop Supports: Universal Heavy Duty Commercial Countertop Support Bracket, Size as required for countertop.

2.4 FABRICATION

A. Fabricate interior finish carpentry to AWS Section 6 custom grade.

B. Fabricate casework to AWS Section 10 custom grade.

C. Fabricate counter tops to AWS Section 11 custom grade.

D. Shop-assemble casework for delivery to Site in units easily handled and to permit passage through building openings.

E. Fit exposed plywood edges with matching veneer edging. Use one piece for full length only.

F. Cap exposed high-pressure decorative laminate finish edges with material of same finish and pattern.

G. Door and Drawer Fronts: 3/4 inch thick.

H. When necessary to cut and fit on-Site, fabricate materials with ample allowance for cutting. Furnish trim for scribing and Site cutting.

I. Apply high-pressure decorative laminate finish in full, uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.

J. Apply laminate backing sheet to reverse side of plastic-laminate-finished surfaces where required by AWS for specified grade.

K. Fabricate cabinets and counter tops with cutouts for applicable fixtures and fittings and cutouts. Verify locations of cutouts from on-Site dimensions. Seal cut edges.

2.5 ACCESSORIES

A. Adhesive for High-Pressure Decorative Laminates: Type recommended by laminate manufacturer to suit application.

B. Fasteners and Anchors:
   1. Fasteners: ASTM A153, hot-dip galvanized steel for high-humidity and treated wood locations, unfinished steel elsewhere.
   2. Nails and Staples: ASTM F1667.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application.

D. Shelf Standards and Rests: In-line bored holes 1-3/8 in o.c., to within 6 in of top and bottom of opening with four support pins for each shelf.

E. Hardware: BMHA A156.9

F. Drawer and Door Pulls:
   1. U-shaped pull, stainless steel with satin finish.
   2. Size and Spacing: 4 in centers.

G. Drawer Slides: Self-closing, galvanized steel construction, ball bearings separating tracks, rail mounted full extension type.

H. Hinges: Fully Concealed hinge Grade 2 European Style, adjustable type, self closing, steel with satin finish.

I. Grommets: Plastic, sized for conditions.
   1. Grommets to be field verified by Contractor and Architect.

J. Contact Adhesives: Water Base type.

K. Wall Adhesive: Cartridge type, compatible with wall substrate, capable of achieving durable bond.

2.6 SHOP FINISHING – INTERIOR FINISH CARPENTRY

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler matching surrounding surfaces and of types recommended for applied finishes.

D. Stain, seal, and varnish exposed to view surfaces, refer to Section 09 90 00.

E. Seal internal surfaces and semi-concealed surfaces.

F. Seal surfaces in contact with cementitious materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with Work of this Section.

3.2 PREPARATION

A. Prime paint surfaces of woodwork items and assemblies to be in contact with cementitious materials.

3.3 INSTALLATION – PLASTIC LAMINATE CASEWORK

A. Install casework according to AWS Section 10 custom grade.

B. Install counter tops according to AWS Section 11 custom grade.

C. Set and secure casework, interior finish carpentry, and counter tops in place; rigid, plumb, and level.

D. Use fixture attachments in concealed locations for wall-mounted components.

E. Use concealed joint fasteners to align and secure adjoining cabinets and counter tops.

F. Carefully scribe casework abutting other components, with maximum gaps of 1/32 in. Do not use additional overlay trim for this purpose.

3.4 INSTALLATION – INTERIOR FINISH CARPENTRY

A. Install interior finish carpentry according to AWS Section 6 custom grade.

B. Carefully scribe finish carpentry abutting other components with maximum caps of 1/32 inch.

C. Countersink anchorage devices at exposed locations. Conceal with putty or wood plug as appropriate.

3.5 TOLERANCES

A. Conform to AWS Sections 6 and 10 requirements for following:
   1. Smoothness.
   2. Gaps.
   3. Flushness.
   4. Flatness.
   5. Alignment

3.6 ADJUSTING

A. Adjust moving or operating parts to function smoothly and correctly.

3.7 CLEANING

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

3.8 SCHEDULE

A. Refer to Drawings.

END OF SECTION

SECTION 06 61 16 - SOLID SURFACING FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes cast plastic / solid surface fabrications as scheduled.

1.2 REFERENCES

A. ASTM International:
   1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. South Coast Air Quality Management District:
   1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

C. Underwriters Laboratories Inc.:
   1. UL - Fire Resistance Directory.

1.3 DESIGN REQUIREMENTS

A. Design Load: Limit deflection to 1/360.
   1. Design items with sufficient strength for handling stresses.

1.4 SUBMITTALS

A. Shop Drawings: Indicate dimensions, thicknesses, required clearances, tolerances, materials, colors, finishes, fabrication details, field jointing, adjacent construction, methods of support, integration of electrical components, and anchorages.

B. Product Data: Submit data on specified component products, electrical characteristics and connection requirements.

C. Samples: Submit two samples representative of countertop illustrating color, texture, and finish.

D. Manufacturer's Installation Instructions: Submit preparation of opening required, rough-in sizes; tolerances for item placement, temporary bracing of components.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit list of approved cleaning materials and procedures required; list of substances harmful to component materials, Include instructions for stain removal, surface and gloss restoration, and general repairs.

1.6 QUALITY ASSURANCE

A. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

B. Obtain materials from one source from a single manufacturer unless specifically noted otherwise on drawings.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.9 WARRANTY

A. Manufacturer Warranty: Provide 10 year material warranty against defects and/or deficiencies in the solid surface materials unless a non-covered condition.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer List:
   1. Formica Everform Solid Surface [Basis of Design – see schedule of finishes on drawings]
   2. Corian, Dupont
   3. Wilsonart Contract
   4. Samsung Chemical

2.2 MATERIALS

A. Solid Surface Materials: Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment; not coated, laminated or of composite construction; meeting following criteria:
   1. Comply with ISSFA-2.

B. Adhesives: for seams and drop edges: Manufacturer seaming cartridge kit, single component. Color to blend with sheet color.

C. Sealant: A standard mildew-resistant, FDA/UL and NSF/ANSI 51 compliant in Food Zone area, recognized silicone color matched sealant or clear silicone sealants.

2.3 COMPONENTS

A. Counter Perimeter Frame: 3/4" thick, moisture resistant cores for counter tops in wet areas having sinks or lavatories are 3/4" thick exterior grade plywood with waterproof adhesive, Fir or Poplar plywood, veneer core only. MDF core conforming to ANSI/NPA A208.2 balanced design, of minimum density of 48 lb/cu ft and surface character to match sample approved by Architect. Ensure fire retardant Product contains fire-retardant chemicals injected with raw materials during manufacturing and achieves a maximum flame-spread rating of 25 with a maximum smoke development of 200 when tested to ASTM E84.

B. Countertops: 1/2” [12 mm] thick countertop of solid polymer solid surfacing material, cast to desired profiles and sizes having edge details as indicated on Drawings conforming to CSA B45.5/IAPMO Z124. Provide countertops complete with backsplashes of size shown on Drawings. Attach to mounting hardware / brackets according to manufacturer's instructions.

C. Polishing Cream: Compatible polishing cream to achieve specified sheen to gel coat.

D. Adhesive: as recommended by Manufacturer.

2.4 FABRICATION

A. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved Shop Drawings and solid polymer manufacturer requirements. Form joints between components using manufacturer’s standard joint adhesive without conspicuous joints. Provide factory cutouts for plumbing fittings and accessories as indicated on Drawings.
   1. AWI Grade: Custom.

B. Where indicated, thermoform corners and edges or other objects to shapes and sizes indicated on Drawings, prior to seaming and joining. Cut components larger than finished dimensions and sand edges to remove nicks and scratches. Heat entire component uniformly prior to forming.

C. Provide cut-outs for plumbing fixtures, trim, accessories, and related items. Confirm exact locations and rough in conditions prior to beginning work.

D. Ensure no blistering, whitening and cracking of components during forming.

E. Fabricate backsplashes from solid surfacing material with radius cove where counter and backsplashes meet as indicated on Drawings.

F. Fabricate joints between components using manufacturer's standard joint adhesive. Ensure joints are inconspicuous in appearance and without voids. Attach 50 mm (2") wide reinforcing strip of solid polymer material under each joint.

G. Provide holes and cutouts for plumbing and bath accessories as indicated on Drawings.

H. Rout and finish component edges to a smooth, uniform finish. Rout cutouts, then sand edges smooth. Repair or reject defective or inaccurate work.

I. Finish: Ensure surfaces have uniform finish. Matte finishes unless noted otherwise.

J. Radius corners and edges.

2.5 SHOP FINISHING

A. Color: as selected from full range of Manufacturer colors and patterns

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify joint preparation and affected dimensions are acceptable.

3.2 PREPARATION

A. Provide anchoring devices for installation and embedding.

B. Provide templates and rough-in measurements.

3.3 INSTALLATION

A. Install components plumb, level, rigid, scribed to adjacent finishes in accordance with reviewed Shop Drawings and Product installation details.

B. Fabricate field joints using manufacturer's recommended adhesive, with joints being inconspicuous in finished work. Exposed joints/seams are not permitted. Keep components and hands clean when making joints. Reinforce field joints as specified herein. Cut and finish component edges with clean, sharp returns.

C. Route radii and contours to template. Anchor securely to base component or other supports. Align adjacent components and form seams to comply with manufacturer’s written recommendations using adhesive in color to match work. Carefully dress joints smooth, remove surface scratches and clean entire surface.

D. Install countertops with no more than 1/8" sag, bow or other variation from a straight line.

E. Seal between wall and components with joint sealant as specified.

F. Provide backsplashes and endsplashes as indicated on Drawings. Adhere to countertops using a standard color-coordinated silicone sealant. Adhere applied sidesplashes to countertops using a standard color-matched silicone sealant. Provide coved backsplashes and sidesplashes at walls and adjacent millwork. Fabricate radius cove at intersection of counters with backsplashes to dimensions shown on reviewed Shop Drawings. Adhere to countertops using manufacturer’s standard color-coordinated joint adhesive.

G. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Ensure components are clean on date of Substantial Completion of the Work.

3.4 ERECTION TOLERANCES

A. Maximum Variation From Indicated Dimension: 1/8 inch.

B. Maximum Offset From Indicated Position: 1/8 inch.

3.5 CLEANING

A. Clean and polish fabrication surfaces.

3.6 SCHEDULE

A. Refer to Drawings

END OF SECTION

SECTION 07 01 50 – PREPARATION FOR ROOFING

PART 1 GENERAL

1.1 WORK INCLUDES, BUT IS NOT LIMITED TO:

A. Remove existing roof system as required for proposed work / new penetrations, etc.

B. Clean roof / deck surface of all debris detrimental to installation of new roof system, including cleaning of metal deck flutes, etc.

C. Removal of existing perimeter base flashing material [metal, BUR, composite and single ply as applicable] and from associated equipment supports and related items.
   1. Locations where wall flashing heights are below the manufacturers requirements shall be raised or use liquid flashing system if approved by the manufacturer.

D. Removal of wood nailers and blocking. Wood members that are securely bolted or adequately fastened or can be adequately fastened to the structure per specs and are in a dry good condition can remain in place. Remove deteriorated and damaged wood members. [See section 06 10 53 for anchoring requirements].

E. Removal and reinstall existing electrical conduits, cable lines and associated wall attachments.

F. Removal of sheet metal items such as edges, bib flashings, gutters/downspouts and counter-flashings as noted.

G. Removal of existing unused curbs, abandon equipment as noted on the drawings, cover opening as shown.

H. Remove and reinstall existing RTU's from associated curbs as required to install new flashings as noted on the drawings.

I. Other removals necessary to accomplish the new work.

1.2 QUALITY ASSURANCE

A. Work shall be performed in strict accordance with the terms and conditions of all municipal and state regulation and local codes.

B. Demolition shall comply with the requirements of ANSI - American National Standard Safety Requirements for Demolition.

C. Conduct demolition work in a manner that will minimize disruption of owner's normal operations. Coordinate work activities daily with Owner.

D. Properly protect all facility surfaces and associated landscaping from damages due to normal demolition operation. Return all areas to their original condition at no charge to the Owner.

E. Drainage Testing: The Contractor shall test each roof drain and/or downspouts/scuppers for proper water flow and notify the Owner of any clogged drainage and drains that cannot have the roof membrane secured with the existing clamping ring [broken, bolts, etc] before commencement of work. Commencement of work shall constitute acceptance of drainage device and any costs to unclog or repair these items shall be borne by the Contractor.

F. Do not remove existing roofing membrane or components when weather conditions threaten integrity of building contents.

1.3 COORDINATION

A. All utilities and mechanical rooftop equipment will remain active during normal work hours, unless approved otherwise by the Owner.

B. All removals shall be legally disposed, except those indicated to be reinstalled, salvaged or to remain Owner's property. Comply with hauling and disposal regulations of authorities having jurisdiction and EPA notification regulations.

1.4 FIELD CONDITIONS

A. Do not overload structure with storage of materials, verify roof deck weight capacity and location of structural supports, only items needed that day shall be stored on the roof. Limit loads on roof to 25 pounds per square foot for uniformly distributed loads for metal/gypsum decks, 75 pounds per square for concrete decks. **Provide temporary securement of existing membrane to prevent membrane blow off while installing new roof system, if applicable.**

B. Do not apply roofing system during inclement weather or when the chance is 40% or greater, percentage as listed on www.weather.com for the local area, percentage as listed when read at time of commencement. Proceed with roofing and associated work when weather conditions will permit unrestricted use of materials and quality control of the work being installed.

C. Building space underneath roof work is utilized by on-going operations. Coordinate all work with owner including, material storage and contractor parking. Owner's approval required before proceeding with the work. **Contractor must provide overhead protection for Owner's workers, public, visitors, etc from falling materials/debris at building entry points.**

PART 2 PRODUCTS

2.1 EXISTING ROOF CONDITIONS

A. Deck Conditions
   1. Check deck for damage as work progresses. Workers may have inadvertently damaged the deck using axes or power cutting tools during roof removal or repair.
   2. When roofing is removed, loosely attached decking may be observed. All loose decking must be properly attached using techniques appropriate to construction.
   3. The installation of roof mounted equipment or items that project through the roof often requires cutting the deck. These areas, and any area in which the deck has been cut, should be thoroughly examined and properly reinforced as is necessary.
   4. Areas of damaged deck should be properly repaired. Deteriorated deck should be removed, as necessary to eliminate the spread of deterioration. Appropriate treatments such as corrosion inhibitors should be applied.
   5. All deck replacement should be compatible with the original construction and should include an area sufficient to assure the structural integrity of the deck. The deck replacement should be fastened using techniques appropriate to the construction.

B. Drainage: All roofs should provide positive drainage.
   1. Verify heights of existing drains and how drains interface with new roof insulation, drain sumps, and overall structural slopes to ensure positive drainage to the roof drains.
   2. Ensure drains are properly attached or anchored to the deck.
   3. Ensure that the drain components are not broken and are properly installed and tightened.

C. Flashings: Ensure that a minimum of 8 inches in flashing height is provided above the finish roof membrane; otherwise obtain acceptance from the roof membrane manufacturer for a low flashing detail which is approved and included in the warranty.
   1. Where required or indicated on Drawings. Existing curbs, utility lines, and through-wall flashings need to be raised.
   2. Do not extend roof flashing above through-wall counterflashing.
   3. Do not block weep holes in walls.

2.2 TEMPORARY PROTECTION MATERIALS

A. Air Filters: Filter medium with activated charcoal or comparable to mitigate fumes or odors from entering the building through air intakes, etc.

PART 3 EXECUTION

3.1 ROOF REPLACEMENT PREPARATION

A. Removal of all moisture, and other materials from existing roofing that inhibit new roofing materials from conforming to substrate, including power blowing of deck surfaces.

B. Verify that surfaces and site conditions are ready to receive work. Verify that deck is clean and smooth, free of depressions, irregularities, or projections and properly leveled, start of work constitutes acceptance of conditions.

C. Verify that all wood blocking, nailers, decking are securely anchored in place.

3.2 DECK PREPARATION/OTHER REPAIRS

General: Depressed areas shall be made level prior to insulation of roofing or insulation in accordance with manufacturer's recommendation or as outlined herein.

A. Surface Rusted Metal Deck: Remove rust and coat rusted deck sections with a water-based rust inhibiting coating where panels have over 35% of the surface area rusted, prior to installation of roof system.

3.3 DUST / FUME CONTROL

A. Take measures to avoid dust, dirt and debris from entering the building.

B. Throwing material off the roof is prohibited; provide an enclosed chute, crane or raised dump truck to remove roofing materials. Provide a tarp or other protection of walls where material is being removed.

C. Take special precautions around deck penetrations, including but not limited to installation and removal of reinforced visqueen below the roof deck to protect property below.
   1. Interior protection shall be accomplished by the Contractor during removal of any roofing system or their components where open areas occur exposing office, rooms or interior elements and removal of items that produce large penetrations. This protection must prevent dust, dirt moisture and fasteners from entering the above-mentioned areas. Contractor to coordinate as required to accomplish this work.

D. Take special precautions to avoid fumes from entering the facilities through air intakes. Provide charcoal filters or other filtration media as necessary to cover intakes, coordinate with owner.

3.4 TRAFFIC

A. Conduct demolition operations and the removals of debris to ensure minimum interference with streets, walks and other adjacent facilities. Do not close or obstruct streets or walks, without permission from Owner and authorities having jurisdiction.

3.5 DISPOSAL OF MATERIALS

A. Remove all debris, rubbish and other materials resulting from the demolition operations from the site which are not being reused as soon as possible. The landfill used for disposal shall be approved for type of materials being disposed. Comply with local laws, EPA regulations when transporting materials from the site.

B. All materials that are to be reused in the new work shall be removed, cleaned and stored in a safe place until reinstallation, as applicable.

3.6 ASBESTOS REMOVAL / NOTIFICATION

A. If asbestos is found during course of work, all removals shall be in accordance with written guidelines provided by OSHA Asbestos Construction Standard [29 CFR 1926.1101], and State, County and EPA guidelines as applicable. Contractor must be OSHA trained meeting the requirements of 29 CFR 1926.1101 for the removal, handling and monitoring of removed material.

B. Indicate receipt and acceptance of hazardous wastes, such as asbestos containing materials, by a landfill licensed to accept such materials. Notify and provide all documentation to the Owner for disposal of asbestos. All costs for asbestos removal, permitting and handling will be included in the bid if noted herein. No suspect ASBESTOS containing materials have been found.

C. All asbestos removals shall be in a manner not to cause the roofing fibers to become crumbed, pulverized or airborne, these materials shall be handled as Category I and II non-friable asbestos. Should asbestos be encountered noted or not, that has become friable due to the actions of the Contractor or the condition of the material, the Contractor shall secure the services of an abatement contractor to remove the material and an independent firm to monitor removal activities and procedures [removal plan required]. Contractor shall pay for this abatement contractor if asbestos became friable due to their removal procedures. Notify Architect if asbestos has been encountered that was not noted, prior to removal.

3.7 UTILITIES / EQUIPMENT

A. Where electrical lines, refrigerant line sets, equipment, controls, etc. interface with the performance of the work, they shall be temporality removed, replaced and made fully operational as soon as possible, a 48-hour notice and approval from Owner is required before any removals can take place. The Contractor has the responsibly to verify the operational status of all equipment before removals take place.

B. The Contractor must notify the Owner of any non-operational items prior to removal, commencement of work constitutes acceptance of equipment and any costs to make operational shall be borne by the Contractor.

END OF SECTION

SECTION 07 21 13 - BOARD INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Rigid board insulation at exterior wall behind metal panel wall finish.

1.2 SYSTEM DESCRIPTION

A. Materials of This Section: Provide continuity of thermal barrier at building enclosure elements.

B. Materials of This Section: Provide thermal protection to air seal materials at building enclosure elements in conjunction with air barrier materials in Section 07 27 00.

1.3 SUBMITTALS

A. Product Data: Product characteristics, performance criteria, limitations, adhesives.

B. Manufacturer's Installation Instructions: Submit special environmental conditions required for installation, installation techniques.

1.4 QUALITY ASSURANCE

A. Insulation Installed in Concealed Locations Surface Burning Characteristics:
   1. Foam Plastic Insulation: Maximum 75/450 flame spread/smoke developed index when tested according to ASTM E84.
   2. Other Insulation: Maximum 25/450 flame spread/smoke developed index when tested according to ASTM E84.

B. Insulation Installed in Exposed Locations Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested according to ASTM E84.
   1. Attic Floor Insulation: Minimum 0.12 watt per sq cm critical radiant flux when tested according to ASTM E970.

C. Apply label from agency approved by authority having jurisdiction to identify each foam plastic insulation board.

1.5 ENVIRONMENTAL REQUIREMENTS

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

1.6 SEQUENCING

A. Sequence Work to ensure **vapor retarder and air barrier** materials are in place before beginning Work of this Section where appropriate.

PART 2 PRODUCTS

2.1 COMPONENTS

A. Polyisocyanurate Insulation: ASTM C1289, Type I, Class 1 & 2, rigid board, type, conforming to following:
   1. Board Size: 48 x 96 inch.
   2. Board Thickness: 2 inches.
   3. Facing: Factory applied skin of aluminum foil on both faces.
   4. Compressive Strength: Minimum 16 psi.
   5. Thermal Resistance: Aged R of 12.
   6. Board Edges: square.
   7. Water Absorption: According to ASTM D2842; less than 1.5 percent by volume maximum.

2.2 ACCESSORIES

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

B. Tape: Bright aluminum, type as recommended by insulation manufacturer, self-adhering type, 2 inch wide.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate surface is flat, free of honeycomb, fins, or irregularities which would impact installation.

3.2 INSTALLATION - EXTERIOR WALLS

A. Install boards on wall surface, horizontally. Place surface of insulation against adhesive.

B. Place boards in method to maximize contact bedding. Stagger end joints. Butt edges and ends tight to adjacent board and to protrusions.

C. Cut and fit insulation tight to protrusions or interruptions to insulation plane.

D. Place polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to curtainwall / window frame. Tape seal in place to ensure continuity of vapor retarder and air seal.

E. Tape insulation board joints.

END OF SECTION

SECTION 07 21 16 - BLANKET INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Batt insulation and vapor retarder in exterior wall and ceiling / roof construction; and batt insulation for filling perimeter window and door shim spaces, crevices in exterior wall and roof, sound batt insulation in interior partitions.

1.2 SYSTEM DESCRIPTION

A. Materials of This Section: Provide continuity of thermal barrier at building enclosure elements [in conjunction with thermal insulating materials in other sections.

B. Materials of This Section: Provide thermal protection to vapor retarder in conjunction with vapor retarder materials.

C. Materials of This Section: Provide thermal protection to air seal materials at building enclosure elements in conjunction with air barrier materials.

1.3 PERFORMANCE REQUIREMENTS

A. Vapor Retarder Permeance: Maximum 1 perm when tested according to ASTM E96.

1.4 SYSTEM DESCRIPTION

A. Design Requirements: Provide [Products/systems] that have been manufactured, fabricated and installed to the following criteria:
   1. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test methods indicated below or other testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
   2. Surface Burning Characteristics (ASTM E84): flame spread rating < 25 and smoke developed index rating < 450.

1.5 SUBMITTALS

A. Product Data: Product characteristics, performance criteria, limitations.

1.6 QUALITY ASSURANCE

A. Insulation Installed in Concealed Locations Surface Burning Characteristics:
   1. Batt Insulation: Maximum 25/450 flame spread/smoke developed index when tested according to ASTM E84.

B. Insulation Installed in Exposed Locations Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested according to ASTM E84.
   1. Attic Floor Insulation: Minimum 0.12 watt per sq cm critical radiant flux when tested according to ASTM E970.

PART 2 PRODUCTS

2.1 BATT INSULATION COMPONENTS

A. Batt Insulation: ASTM C665; preformed fiberglass batt and blanket; friction fit to framing as applicable, conforming to following:
   1. Thermal Resistance:
      a. R of 13 [3 5/8 inch walls].
      b. R of 19 [6 inch walls

c. R of 30 [ceilings]
2. Batt Size: nominal 16 or 24 wide to match framing conditions.
3. Facing: Faced on one side with asphalt treated mesh reinforced kraft paper [exterior walls only – unfaced at ceilings.

B. Sound Attenuation Batt Insulation for Interior Walls: ASTM C665, Type I, preformed glass fiber batt, friction fit:
1. Thickness: 3 inch and 6 inch to match wall thickness.
2. Facing: Unfaced.

C. Fire Resistance Rated Batt Insulation: ASTM C665, preformed mineral wool insulation, friction fit
1. Size / thickness as required for fire resistance rated assemblies.
2. Facing: Unfaced.

D. Sheet Vapor Retarder: polyethylene film for above grade application, 6 mil thick. [only where required by field conditions without air barrier and / or kraft faced insulation.

E. Fasteners: type and size to suit application.

F. Tape: self-adhering type as recommended by insulation manufacturer, 2 inch wide.

G. Insulation Fasteners: Steel impale spindle and clip on flat metal base, self adhering backing, length to suit insulation thickness, capable of securely and rigidly fastening insulation in place.

H. Wire Mesh: Galvanized steel, hexagonal wire mesh.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate, adjacent materials, and insulation boards are dry and ready to receive insulation.

3.2 INSTALLATION

A. Install in exterior walls and roof / ceiling spaces without gaps or voids. Do not compress insulation.

B. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

C. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within plane of insulation.

D. Install with factory-applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane **over** framing members.

E. Retain insulation in place as applicable to the conditions.

F. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

G. Metal Framing: Place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over member face.

H. Tape seal tears or cuts in vapor retarder.

I. Extend vapor retarder tight to full perimeter of adjacent window and door frames and other items interrupting plane of membrane. Tape seal in place.

3.3 SCHEDULES

A. Exterior walls: R-19 kraft faced insulation

B. Ceilings: R-30 unfaced insulation

C. Fire rated assemblies / fire blocking: Mineral wool per site conditions

D. Interior Partitions: 3 inch and / or 6 inch sound batt insulation.

END OF SECTION

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SECTION 07 21 19 - FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Closed-Cell, Foamed-in-place insulation at the underside of roof decking, at exterior wall crevices requiring thermal seal; and foamed-in-place insulation at junctions of dissimilar wall and roof materials to achieve thermal and air seal, with protective overcoat cover [as required to achieve flame spread / smoke developed index requirements].

1.2 REFERENCE STANDARDS

A. ASTM International:
   1. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
   2. ASTM C1029 Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation.
   3. ASTM C1338 Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
   4. ASTM D1621 Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
   5. ASTM D1622 Standard Test Method for Apparent Density of Rigid Cellular Plastics.
   6. ASTM D1940 Method of Test for Porosity of Rigid Cellular Plastics.
   7. ASTM D2842 Standard Test Method for Water Absorption of Rigid Cellular Plastics.
   8. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
   9. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
   10. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
   11. ASTM E283 Standard Test Method for Determining Rate of Air Leakage.
   12. ASTM E413 Classification for Rating Sound Insulation.
   13. ASTM E2178 Standard Test Method for Air Permeance of Building Materials.
   14. ASTM E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

1.3 PERFORMANCE REQUIREMENTS

A. Conform to Ohio Building Code for flame and smoke, concealment, and overcoat requirements.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test methods indicated below or other testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
   1. Surface Burning Characteristics (ASTM E84): 25 / 450.
   2. Assembly Fire Resistance Rating (NFPA 285): Passes NFPA 285 as part of an approved assembly.
   3. Combustion Characteristics (NFPA 286): Pass

C. Material Performance: Provide materials which have an air permeance not to exceed 0.004 cubic feet per minute per square foot under a pressure differential of 0.3 in. water (1.57 pounds per square foot) when tested in accordance with ASTM E 2178. The water vapor permeance shall be determined in accordance with ASTM E 96 and shall be declared by the manufacturer.

D. Assembly Performance: Provide a continuous air barrier in the form of an assembly that has an air leakage not to exceed 0.040 cubic feet per square foot per minute under a pressure differential of 0.3 in. water (1.57 pounds per square foot) when tested in accordance with ASTM E 2357. Assembly shall accommodate movements of building materials by providing expansion and

control joints as required. Expansion / control joints, changes in substrate and perimeter conditions shall have appropriate accessory materials at such locations.

1. Assembly shall be capable of withstanding combined design wind, fan and stack pressures, both positive and negative on the envelope without damage or displacement, and shall transfer the load to the structure.
2. Assembly air barrier material shall not displace adjacent materials in the assembly under full load.
3. Assembly shall be joined in an airtight and flexible manner to the air barrier material of adjacent assemblies, allowing for the relative movement of assemblies due to thermal and moisture variations, creep, and anticipated seismic movement.

E. Adjacent Materials: Install closed-cell spray polyurethane foam to prevent air leakage at the following locations [where indicated and where impacted by proposed work]:

1. Foundation and walls, including penetrations, ties and anchors.
2. Walls, windows, curtain walls, storefronts, louvers and doors.
3. Different assemblies and fixed openings within those assemblies.
4. Wall and roof/ceiling connections.
5. Walls, floor and roof across construction, control and expansion joints.
6. Walls, floors and roof to utility, pipe and duct penetrations.
7. All other potential air leakage pathways in the building envelope.

1.4 SUBMITTALS

A. Product Data: Product description, insulation properties, preparation requirements, and overcoat properties.

B. Manufacturer's Installation Instructions: Special procedures, perimeter conditions requiring special attention.

C. Manufacturer's Certificate: Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Insulation Installed in Concealed Locations Surface Burning Characteristics:

1. Foam Plastic Insulation: Maximum 75/450 flame spread/smoke developed index when tested according to ASTM E84.
2. Overcoat: Maximum 25/450 flame spread/smoke developed index when tested according to ASTM E84.

B. Apply label from agency approved by authority having jurisdiction to identify each foam plastic component.

C. Manufacturer: Company specializing in manufacturing products specified in this Section with ten years' documented experience.

D. Installer: Company specializing in performing Work of this Section with five years' experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.

B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier spray foam manufacturer. Protect stored materials from direct sunlight.

C. Handle materials in accordance with manufacturer’s recommendations.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Temperature: Install closed-cell, medium density spray polyurethane foam air barrier within range of ambient and substrate temperatures recommended by air barrier manufacturer. Do not apply air barrier to a damp or wet substrate.

B. Field Conditions: Do not install air barrier in snow, rain, fog, or mist. Do not install air barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.

C. Sequencing. Do not install air barrier material before the roof assembly has been sufficiently installed to prevent a buildup of water in the interior of the building.

D. Compatibility. Do not allow closed-cell, medium density spray polyurethane foam to come in contact with chemically incompatible materials.

E. Ultra-violet exposure. Do not expose the air barrier material to sunlight longer than as recommended by the manufacturer (if applicable).

1.8 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's limited product warranty, for 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 FOAMED-IN-PLACE INSULATION COMPONENTS

A. Medium Density Closed Cell Spray Polyurethane Foam Air Barrier: ASTM C1029, Type II polyurethane. JM Corbond III by Johns Manville or Equal
   1. Class A per ASTM E84, Flame Spread Index < 25; Smoke Developed Index < 450.
   2. Compressive Strength: ASTM D1621; minimum of 25 psi.
   3. Density: ASTM D1622; 2.0 lb/cu ft.
   4. Closed-Cell Content (ASTM D1940): Greater than 90 percent.
   5. K-Factor (ASTM C518 initial): 0.15.
   6. K-Factor (ASTM C1029 180-day aged): 0.16.
   7. R-Value (ASTM C518 initial): 7.0.
   8. R-Value (ASTM C1029 180-day aged): 7.0.
   9. Water Absorption (ASTM D2842): 0.020 (gm/cc).
   10. Water Vapor Transmission (ASTM E96): 0.61 perms at 1.5 inches.

2.2 ACCESSORIES

A. Primer: As required by insulation manufacturer.

B. Thermal Barrier: Spray applied foam insulation must be separated from the interior of the building by an approved thermal barrier, such as 1/2-inch (min) gypsum wallboard, or an equivalent 15-minute thermal barrier complying with the applicable code. The alternative thermal barrier coating system shall be applied to the closed cell polyurethane foam insulation and tested to the criteria of NFPA 286, UL 1715 for duration of 15 minutes by an accredited fire testing facility and satisfies the International Building Code (IBC) requirements.
   1. Alternative thermal barrier coating - Intumescent Coating: Subject to compliance with requirements of Contract Documents, products which may be incorporated into the Work include, but are not limited to, the following. Use only intumescent coatings approved by the respective polyurethane insulation manufacturer.
      a. JM No-Burn Plus ThB intumescent coating; manufactured by NO-BURN, Inc.
      b. Fireshell TC intumescent coating; manufactured by TPR2
      c. DC315; manufactured by National Fireproof, Inc.

2. Ignition Barrier: When the insulation is installed within an attic space where entry is made only for service of utilities, an ignition barrier must be installed in accordance with IBC. The ignition barrier must be consistent with the requirements for the type of construction required by the applicable code. The ignition barrier may be an intumescent coating identified above. Products which may be incorporated into the Work include, but are not limited to, the following:
   a. JM No-Burn Plus ThB intumescent coating; manufactured by NO-BURN, Inc.
3. JM Corbond III meets NFPA 286 criteria for various conditions and may be installed without a prescriptive ignition barrier in accordance with Sections 3.4.3.1, 3.4.3.2, 3.4.3.3 of IAPMO Evaluation Report 146.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which the air barrier assembly will be installed, with Installer present, for compliance with requirements.
   1. Verify that surfaces and conditions are suitable prior to commencing work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.
   2. Ensure that the following conditions are met:
      a. Surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants
      b. Concrete surfaces are cured and dry, smooth without large voids or sharp protrusions.
      c. Masonry joints are reasonably flush, and all excess mortar sitting on masonry ties has been removed.
   3. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263 and take suitable measures until substrate passes moisture test.
   4. Verify sealants are compatible with membrane proposed for use. Perform field peel-adhesion test on materials to which sealants are adhered.
   5. Notify Architect in writing of anticipated problems using closed-cell, medium density spray polyurethane foam over substrate prior to proceeding.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.
   1. Ensure that penetrating work by other trades is in place and complete.
   2. Prepare surfaces by brushing, scrubbing, scraping, grinding or compressed air to remove loose mortar, dust, oil, grease, oxidation, mill scale and other contaminants which will affect adhesion of the closed-cell, medium density spray polyurethane foam.
   3. Where there are release agents or other non-compatible coatings, wipe down metal surfaces to remove these release agents or other non-compatible coatings, using clean sponges or rags soaked in a solvent compatible with the spray polyurethane foam.
   4. Ensure veneer anchors are in place.

B. Protection from Spray Applied Materials:
   1. Mask and cover adjacent areas to protect from overspray.
   2. Ensure any required foam stop or back up material are in place to prevent over spray and achieve complete seal.
   3. Seal off existing ventilation equipment. Install temporary ducting and fans to ensure exhaust fumes. Provide for make-up air.
   4. Erect barriers, isolate area and post warning signs to advise non-protected personnel to avoid the spray area.

3.3 INSTALLATION

A. Spray Polyurethane Foam Installation: Install materials in accordance with manufacturer's recommendations, ULC S 705.2 and the following:
   1. Apply only after transition strip at foundation and wall intersection has been installed.
   2. Installer shall use proper personal protective equipment (PPE) during the installation of material in accordance with US Government regulation 29 CFR 1910.134.
   3. Warning signs shall be displayed and non-protected personnel shall be kept from the spray area in accordance with ULC S705.2.
   4. Equipment used to spray polyurethane foam shall comply with ULC S 705.2 and the manufacturer’s recommendations for the specific type of application. Record equipment settings on the Daily Work Record as required by the ULC S 705.2 installation standard. Each proportioner unit shall supply only one spray gun.
   5. Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer or the ULC S 705.2 Installation standard.
   6. Apply in consecutive passes as recommended by manufacturer to thickness as indicated on drawings. Passes shall be not less than 1/2 inch and not greater than 3.5 inches. An additional pass shall only be done after the first pass has had time to cool down.
   7. Install within manufacturer’s tolerances, but not more than minus 1/4 inch.
   8. Do not install spray polyurethane foam within 3 inches of heat emitting devices such as light fixtures and chimneys.
   9. Finished surface of foam insulation to be free of voids and embedded foreign objects.
   10. Remove masking materials and over spray from adjacent areas immediately after foam surface has hardened. Ensure cleaning methods do not damage work performed by other sections.
   11. Trim, as required, any excess thickness that would interfere with the application of cladding/covering system by other trades.
   12. Clean and restore surfaces soiled or damaged by work of the section. Consult with section of work soiled before cleaning to ensure methods used will not damage the work.
   13. Complete connections to other components and repair any gaps, holes or other damage using material which conforms to ULC S 710.1 (single component) or ULC S 711.1 (two components) and installed in accordance with ULC S 710.2 or ULC S 711.2 as applicable.

3.4 PROTECTING AND CLEANING

A. Protec material from damage during installation and the remainder of the construction period, according to manufacturer's written instructions.
   1. Coordinate with installation of materials which cover the air barrier assemblies, to ensure exposure period does not exceed that recommended by the manufacturer.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and acceptable to the primary material manufacturer.

END OF SECTION

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SECTION 07 27 00 - AIR BARRIERS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes air leakage criteria for primary air seal building enclosure materials and assemblies; materials and installation methods supplementing other air seal materials and assemblies; and air seal materials to connect and seal openings, joints, and junctions between other air seal materials and assemblies.

1.2 SYSTEM DESCRIPTION

A. Provide continuity of air seal materials and assemblies in conjunction with materials described in other sections.

1.3 SUBMITTALS

A. Product Data: Submit product information.

PART 2 PRODUCTS

2.1 AIR BARRIERS

A. Provide any manufacturer listed and approved by Air Barrier Association of America [ABAA] for use as part of the air barriers in the affected portions of the building.

2.2 PERFORMANCE REQUIREMENTS

A. Material Performance: Provide materials which have an air permeance not to exceed 0.004 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (0.004 cfm/ft2 @ 1.57 psf), when tested in accordance with ASTM E 2178 (unmodified).

B. The water vapor permeance Desiccant method, (Procedure A) and Water method (Procedure B) shall be determined in accordance with ASTM E96 and shall be declared by the material manufacturer.

C. Assembly Performance: Provide a continuous air barrier in form of an assembly that has an air leakage not to exceed 0.04 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (0.04 cfm/ft2 @ 1.57 psf) when tested in accordance with ASTM E 2357. Assembly shall accommodate movements of building materials by providing expansion and control joints as required. Expansion / control joints, changes in substrate and perimeter conditions shall have appropriate accessory materials at such locations.
   1. Assembly shall be capable of withstanding combined design wind, fan and stack pressures, both positive and negative, on envelope without damage or displacement and shall transfer load to structure.
   2. Assembly air barrier material shall not displace adjacent materials in assembly under full load.
   3. Assembly shall be joined in an airtight and flexible manner to air barrier material of adjacent assemblies, allowing for relative movement of assemblies due to thermal and moisture variations, creep and anticipated seismic movement.

D. Connections to Adjacent Materials: Provide connections to prevent air leakage at following locations:
   1. Foundation and walls, including penetrations, ties and anchors.
   2. Walls, windows, curtain walls, storefronts, louvers and doors.
   3. Different assemblies and fixed openings within those assemblies.
   4. Wall and roof connections.

5. Floors over unconditioned space.
6. Walls, floor and roof across construction, control and expansion joints.
7. Walls, floors and roof to utility, pipe and duct penetrations.
8. Expansion joints.
9. All other potential air leakage pathways in building envelope.

E. Water Penetration: When tested in accordance with ASTM E331, no uncontrolled water penetration shall occur at a minimum differential pressure of 6.24 psf for minimum test duration of 2 hours.

F. Mold Resistance: Thermal wall and air barrier system components shall provide non-food source for fungal growth (no organic materials).

PART 3 EXECUTION

3.1 PREPARATION

A. Examine substrates, areas, and conditions under which air barrier assembly will be installed, with manufacturer's representative, for compliance with requirements.
   1. At end of each working day, provide weather protection at top of parapet walls and non-finished roofs to prevent moisture migration into walls and damage to installed air barrier systems.
   2. Verify that surfaces and conditions are suitable prior to commencing work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.
   3. Ensure that following conditions are met:
      a. Surfaces are sound, dry, even, and free of excess mortar or other contaminants
      b. Inspect concrete surfaces to be smooth without large voids or sharp protrusions. Inform Contractor if substrates are not acceptable to be repaired.
      c. Inspect masonry joints to be reasonably flush and completely filled, and ensure all excess mortar sitting on masonry ties has been removed. Inform Contractor if masonry joints are not acceptable to be repaired by mason sub-trade.

3.2 INSTALLATION

A. Provide continuity with air barrier systems by sealing following areas with construction and construction assemblies. These areas are typical in nature and do not limit application of these products to those noted areas, but any and all details within construction that present similar air leakage characteristics should receive similar applications. Note following:
   1. Window head, jamb, and sill areas.
   2. Junction of roof air/vapor barrier and wall air/vapor barrier.
   3. Floor-to-floor construction.
   4. Glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings.

B. Inspect roof perimeter for air leakage paths such as fluted deck itself, truss and structural beam penetrations above and below top of wall. Use smoke tester kits to identify and locate leakage.
   1. Use both one-component and two-component foam sealants in combination to create a continuous foamed-in-place seal between wall and roof air/vapor barrier.
   2. Where deck flutes run perpendicular to wall, foam open flutes completely out to fascia.
   3. Where closed flutes occur, punch flutes and inject foam through holes. Locate holes as close to wall as possible so that plane of injected and cured foam within closed flute is level with plane of exposed foam in open flutes.
   4. Where steel deck is parallel to wall, fill void with either one-component and two component material, depending on gap size.

C. Flashing and Sealant
   1. Apply material within application limits of product manufacturer.

2. Do not apply product on surfaces with standing water or frost.
3. Avoid installing on days with a high probability of significant rainfall.
4. Seal gaps greater than 1/4 inch in width with penetration filler prior to applying flashing.
    a. If facer on board insulation is damaged, make note of affected area and apply additional spray over damaged area.
    b. Replace damaged insulation, or repair facer flows with appropriate flashing as recommended by insulation manufacturer.
5. Apply flashing and sealant to board joints, penetrations and other fenestration openings as required at material required application thickness.
    a. Apply flashing 3 inches, plus or minus 1 inch wide over board insulation joints, with at least 1 inch of spray covers each side of joint.
    b. Apply flashing and fasteners and washers along board insulation joints.
    c. Install façade attachment system after flashing has been applied.
6. Rough Openings: Apply flashing and sealant at least 3 inches onto face of insulation panel sheathing, and completely cover edge of insulation board; also spray at least 3 inch back onto rough opening substrate.
    a. It is recommended to cover back into rough opening at least 1 inch past the interior weatherseal.
7. Board Insulation or Substrate Penetrations: Apply flashing and sealant at least 2 inches onto face of insulation sheathing and at least 2 inches onto penetration or primary flashing substrate.
8. Use wet mil thickness gauge to ensure proper installation thickness.
    a. Where consistently below minimum thickness, apply another layer to achieve proper thickness requirements.
9. Visually inspect for any areas missed and trowel on sealant as necessary.

END OF SECTION

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SECTION 07 42 43 - COMPOSITE WALL PANELS

PART 1 GENERAL

1.1 WORK INCLUDES, BUT NOT LIMITED TO:

A. Wall panel assembly consisting of Metal Composite Panels with mounting system, Installation, and Accessories. Panel mounting system includes anchorage, shims, furring, gaskets and sealants, related flashing adapters, and masking as required for a complete installation.

1.2 DEFINITIONS

A. MCM: Metal Composite Material is two sheets of smooth aluminum continuously thermo-bonded to a solid Fire Retardant (FR) core under precise temperature, pressure, and tension.

B. DBVR: Drained and back-ventilated rainscreen system is designed to drain and dry cavity entering water through drainage channels, weeps, and air ventilation.

1.3 SYSTEM DESCRIPTION

A. Panel Performance:
   1. Design wall system to withstand a positive and negative wind load pressure acting inward and outward normal to the plane of the wall to meet the requirements of the latest adopted Local Building Code.
   2. Make adequate provisions in the wall system for thermal expansion and contraction of the component parts and fastening of the system to prevent harmful damage caused by buckling, opening of joints, contraction and expansion due to accumulation of dead loads and variations of live loads.
   3. Panel's exposed finishes shall perform according to AAMA 2603-98, AAMA 2605-98 as applicable.
   4. Exposed anodized aluminum according to AAMA 611-98.

1.4 SUBMITTALS

A. Product Data:
   1. Submit manufacturer's data and installation guidelines for each type of panel system.
      a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
   2. Submit manufacturer’s warranty meeting the requirements of this section.
   3. Product Test Reports: For each product, tests performed by a qualified testing agency.
      a. MCM Manufacturer's Material Test Reports: Certified test reports showing compliance with specific performance or third-party listing documenting compliance to comparable code sections IBC 1407.14 and IBC 1703.5.
      b. MCM System Fabricator's Certified System Tests Reports: Certified system test reports showing system compliance with specific performance or third-party listing documenting compliance code section. Base performance requirements on MCM system type provided.
         1) Wet Seal System: Tested to AAMA 501.
         2) DBVR System: Tested to AAMA 509.
         3) NFPA 285.

B. Shop Drawings:
   1. Submit shop drawings indicating project layout and elevations, fastening and anchoring methods, dimensions of individual components and profiles, detail and location of joints, sealants and gaskets, flashing and accessories and any other special details.
   2. Shop drawings shall show the preferred joint details providing a structurally sound wall panel system that allows no uncontrolled water penetration on the inside face of the panel system as determined by ASTM E 331.

C. Samples:

1. Submit two [2] samples of each product / finish specified.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Manufacturer shall have a minimum of ten [10] years experience in the manufacture of composite metal panels / systems.
   2. Composite Panel Manufacturer shall be solely responsible for the panel manufacture and application of the finish.
   3. Installer: Installer with a minimum of five [5] years experience in performing work of this section and in work of similar scope required by this project. Installer shall be acceptable to the composite panel manufacturer.
   4. Panel Installer shall assume undivided responsibility for all components of the exterior panel system including, but not limited to attachment to sub-construction, panel to panel joinery, panel to dissimilar material joinery, and joint seal associated with the panel system.

B. Pre-Installation Meeting: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockup of typical wall panel, as shown on Drawings; one bay wide by full thickness, including supports, attachments, and accessories.
   2. Water-Spray Test: If applicable, Conduct water-spray test of mockup of MCM panel assembly, testing for water penetration in accordance with AAMA 501.2.
   3. Approved mockups may become part of completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal-faced composite wall panels, and other manufactured items so as not to be damaged or deformed. Package metal-faced composite wall panels for protection during transportation and handling.

B. Unload, store, and erect metal-faced composite wall panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Store metal-faced composite wall panels vertically, covered with suitable weathertight and ventilated covering. Store metal-faced composite wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal-faced composite wall panels in contact with other materials that might cause staining, denting, or other surface damage. Do not allow storage space to exceed 120 deg F.

D. Retain strippable protective covering on metal-faced composite wall panel for period of panel installation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify location and dimension of all elements related to the installation of the wall panel assembly. Indicate those measurements on the shop drawings.

B. Limitations: Proceed with installation of the wall panel assembly only when existing site conditions and weather forecast comply with manufacturer's recommendations.

1.8 PREINSTALLATION MEETING

A. Conduct meeting with Owner, Architect, MCM panel Fabricator and Installer, MCM sheet manufacturer's representative, structural-support / framing Installer, and installers whose work interfaces with or affects MCM panels, including installers of doors, windows.

B. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.

C. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect MCM panels.

D. Review temporary protection requirements for MCM panel assembly during and after installation.

E. Review procedures for repair of panels damaged after installation.

1.9 WARRANTY

A. Metal Composite Material (MCM):
   1. Panel: The integrity of the panel bond will remain intact for a minimum of ten [10] years from the Date of Substantial Completion.
   2. Workmanship Warranty: two [2] years from the date of Substantial Completion.
   3. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal-faced composite wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
      a. Exposed Panel Finish: Deterioration includes, but is not limited to, following:
         1) Color fading more than 5 Hunter units when tested according to ASTM D 2244.
         2) Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
         3) Cracking, checking, peeling, or failure of paint to adhere to bare metal.
      b. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Composite Material (MCM): Two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials. The core material shall be free of voids and/or air spaces and not contain foamed insulation material. Products laminated sheet by sheet in a batch process using glues or adhesives between materials shall not be acceptable.

B. Acceptable Manufacturer:
   1. 3A Composites USA, Alucobond [Basis of Design]
      a. Alucobond Plus [wet seal system]
      b. Alucobond EasyFix System [using Alucobond Plus Panels]
   2. Citadel Architectural Products
   3. Arconic Architectural Products.
   4. Mitsubishi Chemical Composites.
   5. Approved Equal

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide MCM panel systems capable of withstanding the effects of the following loads, based on testing in accordance with ASTM E330:
   1. Wind Loads: As indicated on Drawings.
   2. Panel Deflection Limit: For wind loads, no greater than 1/60. of the span.
   3. Framing Member Deflection Limits: For wind loads, no greater than 1/175 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. of wall area when tested in accordance with ASTM E283 at a test-pressure difference of 6.24 lbf/sq. ft.

C. Water Penetration under Static Pressure: No water penetration to room side of assembly when tested for 15 minutes in accordance with ASTM E331 a test-pressure difference of 6.24 lbf/sq. ft.

D. Thermal Movements: Locate expansion and contraction points to allow for free and noiseless thermal movements from surface temperature changes at a range of 20 deg F to 180 deg F, material surfaces.

E. Fire Propagation Characteristics: MCM wall assembly passes NFPA 285 testing.

F. Rainscreen Cladding Performance:
   1. AAMA 509: Dynamic water penetration classification no greater than W2 or 1.0oz/ft² and air flow ventilation classification no less than V1 or 6.0 cfm/ft².

2.3 MCM WALL PANELS

A. MCM Wall Panel Systems: Provide shop formed and assembled, MCM panels formed into profiles for the installation method indicated on the construction drawings. Include attachment assembly components**,** panel stiffeners, and accessories required.

B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch-thick aluminum sheet facings.
   1. Panel Thickness: 4mm (0.157”)
   2. Core: Fire retardant.
   3. Exterior Finish: Acceptable coating resins are polyvinylidene difluoride (PVDF), The number of coats and film thicknesses shall comply with the specified warranty period and specified basis-of-design finishes:
      a. Basis-of-design finishes: Refer to Finish Schedule on Drawings.
   4. Peel Strength: 22.5 in-lb/in. when tested for bond integrity in accordance with ASTM D1781.
   5. Fire Performance: Flame spread less than 25 and smoke developed less than 450, in accordance with ASTM E84.

C. Attachment Assembly Components [Alucobond Plus, Wet-Seal System]: Formed from extruded aluminum or other compatible material per the construction drawings and in compliance with all required performance testing.

D. Attachment Assembly Components [Alucobond Eazy-Fix System]: formed from extruded aluminum or other compatible material per the construction drawings and in compliance with all required performance testing..
   1. Basis-of-design Product:
      a. ALUCOBOND® EasyFix™ 90º/135º Joint Profile
         1) Finish: AAMA 611 Black Anodized Class 1
         2) Clip Length: 3”
         3) Rail Length: 12’
      b. ALUCOBOND® EasyFix™ 90º End Joint Profile
         1) Aluminum 6063-T6
         2) Finish: AAMA 611 Black Anodized Class 1
         3) Clip Length: 3”
         4) Rail Length: 12’
      c. Rail Length: 12’ ALUCOBOND® EasyFix™ 90º End Joint Profile
         1) Aluminum 6063-T6
         2) Finish: AAMA 611 Black Anodized Class 1
         3) Clip Length: 3”
         4) Rail Length: 12’

E. Finishes
   1. Coil coated KYNAR 500 based Polyvinylidene Fluoride [PVDF] resin in conformance with the requirements of AAMA 2605.
      a. Color: Standard color [White to match panels being removed]
      b. Coating Thickness: Painted Panels: 1.0 mil
      c. Hardness: ASTM D 3363; HB minimum using Eagle Turquoise Pencil.

d. Impact: Test method: ASTM D 2794; Gardner Variable Impact Tester with 5/8" mandrel. Coating shall withstand reverse impact of 1.5 in·lb per mil substrate thickness. Coating shall adhere tightly to metal when subjected to #600 Scotch Tape pick-off test. Slight minute cracking permissible. No removal of film to substrate.
e. Adhesion: Test Method: ASTM D 3359. Coating shall not pick off when subjected to a grid of 11 cuts x 11 cuts, 1/16" apart, and taped with #600 Scotch Tape.
f. Humidity Resistance: Test Method: ASTM D 2247. No formation of blisters when subjected to condensing water fog at 100% relative humidity and 100°F for 4000 hours.
g. Weather Exposure
   1) Outdoor: Ten-year exposure at 45° angle facing south Florida exposure. Maximum color change of 5 Delta E units as calculated in accordance with ASTM D 2244. Maximum chalk rating of 8 in accordance with ASTM D 4214. No checking, crazing, adhesion loss.
h. Chemical Resistance: ASTM D 1308 utilizing 10% Muriatic Acid for an exposure time of 15 minutes. No loss of film adhesion or visual change when viewed by the unaided eye. ASTM D 1308 utilizing 20% Sulfuric Acid for an exposure time of 18 hours. No loss of film adhesion or visual change when viewed by the unaided eye. AAMA 2605 utilizing 70% reagent grade Nitric Acid vapor for an exposure time of 30 minutes. Maximum color change of 5 Delta E units as calculated in accordance with ASTM D 2244.

F. Installation System: Wet Seal System: Alucobond Rout and Return Wet:
1. System must provide a wet seal [caulked] reveal joint as detailed on drawings. The sealant type shall be as specified in Section 07900 and with foamed type backer rod as indicated on architectural drawings.

G. System Characteristics
1. Plans, elevations, details, characteristics, and other requirements indicated are based upon standards by one manufacturer. It is intended that other manufacturers, receiving prior approval, may be acceptable, provided their details and characteristics comply with size and profile requirements, and material/performance standards.
2. System must not generally have any visible fasteners, telegraphing or fastening on the panel faces or any other compromise of a neat and flat appearance.
3. System shall comply with the applicable provisions of the "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual" by AAMA and ANSI/AAMA 302.9 requirements for aluminum windows.
4. Fabricate panel system to dimension, size, and profile indicated on the drawings based on a design temperature of 70°F.
5. Fabricate panel system so that no restraints can be placed on the panel, which might result in compressive skin stresses. The installation detailing shall be such that the panels remain flat regardless of temperature change and at all times remain air and water tight.
6. The finish side of the panel shall have a removable plastic masking applied prior to fabrication, which shall remain on the panel during fabrication, shipping, and erection to protect the surface from damage.

H. Accessories:
1. Wall Panel Accessories: Provide components required for a complete metal-faced composite wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal-faced composite wall panels unless otherwise indicated.
2. Panel stiffeners, if required, shall be structurally fastened or restrained at the ends and shall be secured to the rear face of the composite panel with silicone of sufficient size

and strength to maintain panel flatness. Stiffener material and/or finish shall be compatible with the silicone.

3. Flashing and Trim: Formed from same material as metal composite materials panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal-faced composite wall panels.
   a. Shall be installed in such a manner to maintain the integrity of the wall system against moisture intrusion.
4. Extrusions:
   a. Shall conform with ASTM B211 and the manufacturer's recommendations.
   b. Shall be applied in accordance with the panel manufacturer's installation guidelines.
5. Panel Sealants: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal composite material panels and remain watertight; and as recommended in writing by metal composite material panel manufacturer. Refer to Section 07 90 00.
6. Fasteners/Attachment System Components: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.
   a. Attachment System Components: Formed from extruded aluminum to meet specified design loads and system test performance according to each MCM System Fabricator’s design. Galvanized cold formed steel clips or staggered aluminum angles are not acceptable for panel to panel attachment.
   b. Shall be applied using the recommended fastener schedule in accordance with panel manufacturer's installation guidelines.
   c. Shall be coated to prevent corrosion and/or reaction with other materials.
   d. Shall be concealed except where unavoidable. Exposed fasteners shall be finished to match adjoining metal. Provide EPDM, PVC, or neoprene sealing washers.

2.4 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Sub-framing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet ASTM A653/A653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide Fabricator's standard sections as required for support and alignment of MCM panel system.

B. Panel Accessories: Provide components required for a rainscreen panel system including trim and flashing components as indicated on the construction drawings. Match material and finish of MCM panels unless otherwise indicated.

C. Flashing and Trim: Provide flashing and trim formed from same material as MCM panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, end walls, framed openings, rakes, fasciae, and parapet caps.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ALUCOBOND® AXCENT™ manufactured by 3A Composites USA Inc.:
   2. Aluminum Trim: Formed with minimum 0.040-inch thick, coil-coated aluminum sheet Unless otherwise indicated on the construction drawings.
   3. Basis-of-design Finish: To match MCM wall panel system unless otherwise indicated in the construction drawings.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of MCM panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Joint Sealants: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in MCM panels and remain weathertight; and as recommended in writing by MCM panel manufacturer.

F. Panel Sealants: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in MCM panels and remain weathertight; and as recommended in writing by MCM panel manufacturer.

2.5 FABRICATION – WET SEAL SYSTEM

A. General: Fabricate and finish MCM panels and accessories to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and dimensions on the construction drawings.

B. Fabricate MCM panel joints fully sealed with exposed, continuous caulk that provide a weathertight seal to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and dimensions on the construction drawings.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations or recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
   1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
   2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
   3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
   4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
   5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
   6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
      a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.6 FABRICATION – EASY FIX SYSTEM

A. General: Fabricate and finish MCM panels and accessories to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and dimensions as indicated on the drawings.

B. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations or recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
   1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
   2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
   3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
   4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.

5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of range of approved Samples. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

D. Aluminum Panels and Accessories:
    1. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

E. Allowable finishes for Aluminum Panels and Accessories: See basis-of-design finish selection and warranty requirements. Prepare, pretreat, and apply coatings to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate to receive the work of this section to verify that the conditions are acceptable for installation.
    1. Substrate to receive panels shall be even, smooth, sound, clean, dry, and free from defects detrimental to work. Notify contractor in writing of conditions detrimental to proper and timely completion of the work.
    2. Substrate to receive panels shall be in vertical and horizontal alignment with no more deviation than 1/4" in 20'.

B. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by MCM wall panel manufacturer.

C. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by MCM wall panel manufacturer.
    1. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

D. Proceed with installation only after all unsatisfactory conditions have been corrected in a manner acceptable to installer. Starting work within a particular area will be construed as installer's acceptance of surface conditions.

3.2 PREPARATION

A. Verify dimensions as required.

B. Protect adjacent work areas and finished surfaces to prevent damage that otherwise might occur during the work of this section.

C. Miscellaneous Supports: Install sub framing, furring, and other miscellaneous panel support members and anchorages in accordance with ASTM C754 and MCM panel manufacturer's written recommendations.

3.3 INSTALLATION

A. General: Install metal-faced composite wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts unless otherwise indicated. Anchor panels and other components of Work securely in place, with provisions for thermal and structural movement.
   1. Shim or otherwise plumb substrates receiving metal-faced composite wall panels.
   2. Flash and seal metal-faced composite wall panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by panels are installed.
   3. Install screw fasteners in predrilled holes.
   4. Locate and space fastenings in uniform vertical and horizontal alignment.
   5. Install flashing and trim as metal-faced composite wall panel work proceeds.
   6. Locate panel splices over, but not attached to, structural support. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
   7. Align bottoms of metal composite material panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
   8. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
   9. Provide weathertight escutcheons for pipe, scuppers, and conduit penetrating exterior walls.
   10. Wall panel assembly shall be installed in accordance with the manufacturer's written installation guidelines and the approved set of shop drawings.
   11. Maximum deviation from vertical and horizontal alignment of erected wall panel assembly shall be no more than 1/4" in 20'-0".
   12. Maximum deviation in panel flatness shall be 0.6% of the assembled units.
   13. Seal all joints as required using methods and materials as recommended by the panel manufacturer.

B. Fasteners:
   1. Aluminum Wall Panels: Use aluminum or stainless-steel fasteners.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal-faced composite wall panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal-faced composite wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by panel manufacturer.

E. Attachment System Installation, General: Install attachment system required to support metal faced composite wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.
   1. Include attachment to supports, panel-to-panel joinery, and panel-to-dissimilar-material joinery, and panel-system joint seals.
   2. Do not begin installation until weather barrier and flashings that will be concealed by composite panels are installed.

F. Clip Installation: Attach panel clips to supports at each metal-faced composite wall panel joint at locations, spacings, and with fasteners recommended by manufacturer. Attach routed-and returned flanges of wall panels to panel clips with manufacturer's standard fasteners.
   1. Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Section 07 90 00.

G. Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
   1. Install components required for a complete metal-faced composite wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

H. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
   1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
   2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with mastic sealant (concealed within joints).

3.4 TOLERANCES

A. Maximum deviation from vertical and horizontal alignment of erected panels: 1/8 inch in 10 feet, non-accumulative.

3.5 FIELD QUALITY CONTROL

A. Water-Spray Test: After installation, test area of assembly for water penetration in accordance with AAMA 501.2.

B. Fabricator's Field Service: Engage a factory-authorized service representative to test and inspect completed MCM wall panel installation, including accessories.

C. MCM wall panels will be considered defective if they do not pass test and inspections.

D. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

E. Prepare test and inspection reports.

3.6 CLEANING

A. Remove panel masking immediately after installation. Delay will result in difficulty with removal and possibly residue on the panel surface.

B. Remove temporary coverings and protection to adjacent work areas.

C. Verify weep holes and drainage channels are unobstructed and free of dirt and sealants as applicable.

D. Remove and legally dispose of construction debris from project site.

END OF SECTION

SECTION 07 46 16 – METAL CLADDING

PART 1 GENERAL

1.1 WORK INCLUDES, BUT NOT LIMITED TO:

A. Wall panel assembly consisting of Metal Cladding with mounting system, Installation, and Accessories. Panel mounting system includes anchorage, shims, furring, gaskets and sealants, related flashing adapters, and masking as required for a complete installation.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
   2. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C
   3. ASTM E283-04 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
   4. ASTM E331-00 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
   5. ASTM E2768-11 – Standard Test Method for Extended Duration Surface Burning Characteristics for Building Materials (30 min Tunnel Test). Results: Zero Flame Spread, Smoke Developed Index of 5. Meets criteria for Class A fire rating

B. American Architectural Manufacturers Association (AAMA)
   1. AAMA 2605 - Voluntary Specification, Performance requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels
   2. AAMA 2604 - Voluntary Specification, Performance requirements and Test Procedures for High Performing Organic Coatings on Aluminum Extrusions and Panels
   3. AAMA 509 - Voluntary Test and Classification Method for Drained and Back Ventilated Rainscreen Wall Cladding Systems
   4. AAMA 501.1-17 - Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure

1.3 SYSTEM DESCRIPTION

A. Panel Performance:
   1. Design wall system to withstand a positive and negative wind load pressure acting inward and outward normal to the plane of the wall to meet the requirements of the latest adopted Local Building Code.
   2. Make adequate provisions in the wall system for thermal expansion and contraction of the component parts and fastening of the system to prevent harmful damage caused by buckling, opening of joints, contraction and expansion due to accumulation of dead loads and variations of live loads.
   3. AAMA 509 Rainscreen: W1, W2
   4. Impact Testing: TAS 201
   5. ASTM E84: Class A Fire Rating, Non-Combustible

1.4 SUBMITTALS

A. Product Data:
   1. Submit manufacturer's data and installation guidelines for each type of panel system.
      a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
   2. Submit manufacturer’s warranty meeting the requirements of this section.
   3. Product Test Reports: For each product, tests performed by a qualified testing agency.

B. Shop Drawings:
   1. Submit shop drawings indicating project layout and elevations, fastening and anchoring methods, dimensions of individual components and profiles, detail and location of joints, sealants and gaskets, flashing and accessories and any other special details.

C. Samples:
   1. Submit two [2] samples of each product / finish specified.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Manufacturer shall have a minimum of ten [10] years experience in the manufacture of metal siding / cladding systems.
   2. Manufacturer shall be solely responsible for the panel manufacture and application of the finish.
   3. Installer: Installer with a minimum of five [5] years experience in performing work of this section and in work of similar scope required by this project. Installer shall be acceptable to the composite panel manufacturer.
   4. Installer shall assume undivided responsibility for all components of the exterior panel system including, but not limited to attachment to sub-construction, panel to panel joinery, panel to dissimilar material joinery, and joint seal associated with the panel system.

B. Pre-Installation Meeting: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockup of typical wall panel, as shown on Drawings; one bay wide by full thickness, including supports, attachments, and accessories.
   2. Water-Spray Test: If applicable, Conduct water-spray test of mockup of panel assembly, testing for water penetration in accordance with AAMA 501.2.
   3. Approved mockups may become part of completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, siding panels, and other manufactured items so as not to be damaged or deformed. Package metal-faced composite wall panels for protection during transportation and handling.

B. Unload, store, and erect metal-faced composite wall panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Store siding panels, covered with suitable weathertight and ventilated covering. Store siding panels to ensure dryness, with positive slope for drainage of water. Do not store siding panels in contact with other materials that might cause staining, denting, or other surface damage. Do not allow storage space to exceed 120 deg F.

D. Retain strippable protective covering on siding panels for period of panel installation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify location and dimension of all elements related to the installation of the wall panel assembly. Indicate those measurements on the shop drawings.

B. Limitations: Proceed with installation of the wall panel assembly only when existing site conditions and weather forecast comply with manufacturer's recommendations.

1.8 PREINSTALLATION MEETING

A. Conduct meeting with Owner, Architect, panel Fabricator and Installer, sheet manufacturer's representative, structural-support / framing Installer, and installers whose work interfaces with or affects panels, including installers of doors, windows.

B. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.

C. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect panels.

D. Review temporary protection requirements for panel assembly during and after installation.

E. Review procedures for repair of panels damaged after installation.

1.9 WARRANTY

A. Siding Panel Warranty: The manufacturer shall provide a warranty for a minimum of fifteen [15] years from the Date of Substantial Completion.

B. Workmanship Warranty: two [2] years from the date of Substantial Completion.

C. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal-faced composite wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:
   1. Longboard Architectural Products [Basis of Design]
      a. Rainscreen Tongue and Groove Planks, 6 inch V-Groove Planks
   2. Approved Equal

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide panel systems capable of withstanding the effects of the following loads, based on testing in accordance with ASTM E330:
   1. Wind Loads: As indicated on Drawings.
   2. Panel Deflection Limit: For wind loads, no greater than 1/60. of the span.
   3. Framing Member Deflection Limits: For wind loads, no greater than 1/175 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. of wall area when tested in accordance with ASTM E283 at a test-pressure difference of 6.24 lbf/sq. ft.

C. Water Penetration under Static Pressure: No water penetration to room side of assembly when tested for 15 minutes in accordance with ASTM E331 a test-pressure difference of 6.24 lbf/sq. ft.

D. Thermal Movements: Locate expansion and contraction points to allow for free and noiseless thermal movements from surface temperature changes at a range of 20 deg F to 180 deg F, material surfaces.

E. Rainscreen Cladding Performance:
   1. AAMA 509: Dynamic water penetration classification no greater than W2 or 1.0oz/ft² and air flow ventilation classification no less than V1 or 6.0 cfm/ft².

2.3 ALUMINUM CLADDING – PLANKS

A. V-Groove Planks, extruded Aluminum 6063 T5, 6 inch dimension.
   1. Finish coating: powder coated finish

2. Color: color selected by Architect, Refer to Drawings.
3. Gloss: 30 ± 5.
4. Thickness: 1/16 inch (1.57mm) base metal thickness.
5. Profile: 6-inch (152mm) V-Groove X 24 ft (7315.2mm) plank

2.4 ACCESSORIES

A. Wall Panel Accessories: Provide components required for a complete wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of wall panels unless otherwise indicated.

B. Flashing and Trim: Formed from same material as wall panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal-faced composite wall panels.
   1. Shall be installed in such a manner to maintain the integrity of the wall system against moisture intrusion.

C. Fasteners/Attachment System Components: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.
   1. Shall be applied using the recommended fastener schedule in accordance with panel manufacturer's installation guidelines.
   2. Shall be coated to prevent corrosion and/or reaction with other materials.
   3. Shall be concealed except where unavoidable. Exposed fasteners shall be finished to match adjoining metal. Provide EPDM, PVC, or neoprene sealing washers.

D. 3" STARTER STRIP, 5/8" STARTER J-TRACK, 5/8" J-TRACK, 5/8" TWO PIECE J-TRACK, 1-3/8" TWO PIECE J-TRACK, 3/4" INSIDE CORNER, 1" OUTSIDE CORNER, 2" CORNER SET, 3/16" OUTSIDE CORNER, 5/8" TERMINATION SET, 1-3/8" TERMINATION SET, 1-3/8" COMPRESSION JOINT, 1/2" FLAT REVEAL, 3/4" U-REVEAL SET, 1-1/2" U-REVEAL SET, 1-1/2" FLAT REVEAL SET, 3/4" T&G U-REVEAL, 1-1/2" T&G U-REVEAL, 1/2" T&G FLAT REVEAL, 2” OFFSET FLAT REVEAL, in same material and finishes as cladding.

E. Plank Clips: 316 Stainless steel Quick-Screen Clips that are shipped loose for field installation.

F. System Characteristics
   1. Plans, elevations, details, characteristics, and other requirements indicated are based upon standards by one manufacturer. It is intended that other manufacturers, receiving prior approval, may be acceptable, provided their details and characteristics comply with size and profile requirements, and material/performance standards.
   2. System must not generally have any visible fasteners, telegraphing or fastening on the panel faces or any other compromise of a neat and flat appearance.

2.5 MISCELLANEOUS MATERIALS

A. Panel Accessories: Provide components required for a rainscreen panel system including trim and flashing components as indicated on the construction drawings. Match material and finish of MCM panels unless otherwise indicated.

B. Flashing and Trim: Provide flashing and trim formed from same material as panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, end walls, framed openings, rakes, fasciae, and parapet caps.

2.6 FABRICATION

A. General: Fabricate and finish wall panels and accessories to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and dimensions as indicated on the drawings.

B. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations or recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
   1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
   2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
   3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
   4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
   5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
   6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by wall panel manufacturer.
      a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of range of approved Samples. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

D. Aluminum Panels and Accessories:
   1. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

E. Allowable finishes for Aluminum Panels and Accessories: See basis-of-design finish selection and warranty requirements. Prepare, pretreat, and apply coatings to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate to receive the work of this section to verify that the conditions are acceptable for installation.

1. Substrate to receive panels shall be even, smooth, sound, clean, dry, and free from defects detrimental to work. Notify contractor in writing of conditions detrimental to proper and timely completion of the work.
2. Substrate to receive panels shall be in vertical and horizontal alignment with no more deviation than 1/4" in 20'.

B. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by panel manufacturer.

C. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by panel manufacturer.
   1. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

D. Proceed with installation only after all unsatisfactory conditions have been corrected in a manner acceptable to installer. Starting work within a particular area will be construed as installer's acceptance of surface conditions.

3.2 PREPARATION

A. Verify dimensions as required.

B. Protect adjacent work areas and finished surfaces to prevent damage that otherwise might occur during the work of this section.

C. Miscellaneous Supports: Install sub framing, furring, and other miscellaneous panel support members and anchorages in accordance with ASTM C754 and panel manufacturer's written recommendations.

3.3 INSTALLATION

A. Install cladding and components in accordance with manufacturer's written instructions and shop drawings, including product technical bulletins, datasheets and install videos

B. Install all cladding planks using Quick-Screen Clips in accordance with the manufacturer's written instructions, technical bulletins, datasheets and install videos to not restrict thermal movement at specified o.c. spacings. Install screws in pre-punched holes. Install one (1) hard-fastened screw per plank, directly through the plank flange to prevent plank migration. All fasteners should penetrate into solid, secure framing or blocking

C. Install components in accordance with the manufacturer's written instructions and shop drawings, including technical bulletins, datasheets and install videos with positive anchorage to building and provide for thermal movement

D. Install screw fasteners using power tools having controlled torque adjusted to compress Quick-Screen Clips tight without damage or deformation of the Quick-Screen Clips, screw heads, screw threads or cladding

E. Hard-fasten any and all butt-joints into solid secure framing or blocking, to maintain tight fitting hairline joints. Never exceed one (1) hard-fastener per plank, all other attachment points to use Quick-Screen Clips to not restrict thermal movement

F. Do not install damaged panels; repair or replace as required

G. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal-faced composite wall panel manufacturer.

H. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by panel manufacturer.

I. Clip Installation: Attach panel clips to supports at each wall panel joint at locations, spacings, and with fasteners recommended by manufacturer.

J. Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
   1. Install components required for a complete wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

K. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
   1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
   2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with mastic sealant (concealed within joints).

3.4 TOLERANCES

A. Maximum deviation from vertical and horizontal alignment of erected panels: 1/8 inch in 10 feet, non-accumulative.

3.5 FIELD QUALITY CONTROL

A. Water-Spray Test: After installation, test area of assembly for water penetration in accordance with AAMA 501.2.

3.6 CLEANING

A. Remove panel masking immediately after installation. Delay will result in difficulty with removal and possibly residue on the panel surface.

B. Remove temporary coverings and protection to adjacent work areas.

C. Verify weep holes and drainage channels are unobstructed and free of dirt and sealants as applicable.

D. Remove and legally dispose of construction debris from project site.

END OF SECTION

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SECTION 07 53 00 - EPDM ROOF SYSTEM AND ROOF SPECIALTIES

PART 1 GENERAL

1.1 WORK INCLUDES BUT NOT LIMITED TO

A. It is generally anticipated that any impact to the existing roof systems will be minimal and directly related to any modifications to / removal of existing curbs, installation of new rail curbs and rooftop unit curbs as well as related flashing components. Provide modifications and repairs to existing EPDM roof system as required for removed, altered, and new roof penetrations.
   1. Contractor to coordinate with Mechanical Contractor for requirements.

B. Existing roof system is approximately 6 years old and is under warranty with Carlisle. The installing Contractor was Cotterman & Company. Accomplish all roof repairs in accordance with Carlisle requirements, by an approved Contractor to maintain the existing roof warranty intact.
   1. Contractor, as a requirement of this project, shall install plywood protection over the existing roof system[s] to provide temporary protection of the roof system. The plywood protection shall be installed at all perimeter / sides of each rooftop unit curb and any / all areas traversed from the roof access ladder to the work areas.

C. Coordination with mechanical contractor working in the building below to coordinate removals and any new penetrations required in the roof system.

D. Installation of a new EPDM roof system / flashing, etc. at the areas impacted by the proposed work.

E. Installation of a new EPDM roof system / flashing, etc. at the gutter trough at the front of the building.

F. Installation of new sheet metal items, bib flashing, vent flashings, equipment supports, termination bars, expansion joint and counter- flashings as is applicable to the work.

G. Installation of new flat stock and tapered insulation, cover board, tapered insulation saddles [see roof schedule] to match existing / adjacent roof system.

H. Installation of new roof accessories/specialties as outlined.

1.2 QUALITY ASSURANCE

A. Manufacturer inspection of the roof is required upon completion to ensure and document the roof system remains under warranty.

B. Applicator: Company specializing in applying single ply roofing with minimum 5 years documented experience, never been terminated by a manufacturer for workmanship problems, be approved for minimum 2 years by the manufacturer for use of their materials and be capable of providing the warranties as specified.

C. Contractor shall have a large waterproof tarp on site for sudden inclement weather.

1.3 REGULATORY PERFORMANCE REQUIREMENTS

A. Fire Hazard Classification: Underwriters Laboratories [UL], Use only Class A fire-rated materials as tested in accordance with ASTM E 108 or UL 790 for exterior fire.

B. American Society of Civil Engineers [ASCE], Factory Mutual Global Corporation [FMG]/Roof Material Manufacturer/NRCA: Roof materials supplied must be FMG approved meeting FM 4470 test standards meeting the intent of the test criteria set forth in FMG/ANSI standard 4474 to resistance the uplift design pressure as noted on the drawings and for **FMG** windstorm resistance classifications, to support internal/external fire , exposure **Class 1A** [metal deck] to support corrosion resistant fasteners/anchors and impact resistance for **severe hail [SH]**

rating. The roof membrane manufacturer in compliance with the building code must provide the roof assembly securement requirements to resist the wind pressures as noted along with meeting the roof warranty wind requirements and other requirements as shown and outlined in the specifications. The manufacturer's roof assembly securement must **not** be less stringent then the ASCE 7-10 calculations and must be successfully tested to resist wind uplift pressure according with FMG procedures. A field pull [ANSI/SPRI FX-1] or adhesion test [ANSI/SPRI 1A-1] will be necessary prior to commencing work when conditions are different then manufacture's assembly test criteria for their approval to meet the design pressures or required by the state building codes or RDA. If a test has been accomplished the results will be provided herein.

1.4 WEATHER CONDITIONS

A. Do not apply roofing system during inclement weather or when the chance is 40% or greater, percentage as listed on www.weather.com for the local area, percentage as listed when read at 7 AM local time or time of work commencement. Proceed with roofing and associated work when weather conditions will permit unrestricted use of materials and quality control of the work being installed.

B. Do not apply roofing system to damp or frozen deck surface.

C. Adverse weather conditions e.g. extreme temperature, high winds, high humidity and moisture could have a detrimental effect on adhesives, contact manufacturer for acceptable tolerances. See additional restrictions specified herein.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not overload structure with storage of materials, verify roof deck weight capacity and location of structural supports, only items needed that day shall be stored on the roof. Limit loads on roof to 25 pounds per square foot for uniformly distributed loads for metal/ gypsum decks, 75 pounds per square foot for uniformly distributed loads for concrete decks. Provide temporary securement of existing membrane as applicable, to prevent membrane blow off while installing new roof system.

B. Store and protect products in accordance with manufacturer's instructions.

C. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact. All materials must be UL or FM labeled.

D. Store products in weather-protected environment [manufacturer's plastic wrap is accepted for proper protection, unless wrap is broken, torn, partly removed or if noted otherwise by the manufacturer packing label], clear of ground 4 inches minimum and away from moisture. Protect foam insulation from direct sunlight exposure. Water damaged materials will be marked 'rejected' by the contractor/owner or RDA and removed from the site.

E. Storage of flammable liquids in buildings is prohibited. All combustible debris shall be removed from the site daily.

F. Storage shall be in areas designated by Owner.

1.6 SEQUENCING AND SCHEDULING

A. Coordinate the work of installing all associated items in such sequence that will not necessitate movement of workers and equipment over completed roof areas.

B. Sequence daily work of new roofing to be limited only that can be covered and made 100% watertight at the end of each day, including full adhesion of the membrane, flashings and night seals. No temporary roofing shall be allowed unless approved by RDA.

1.7 MANUFACTURER WARRANTIES

A. Maintain existing manufacturer warranty in place. Accomplish all work / repairs / modifications such that existing warranties remain in place.

1. Existing warranty is 20 year, no dollar limit with 72 MPH wind rider.

B. Roof membrane manufacturer [Carlisle] to provide an inspection of the existing roof systems upon completion of the alterations to the roof systems. Carlisle to provide an inspection report to the Contractor indicating that work is accomplished in accordance with their requirements and the current warranty is maintained in place.
   1. Contractor to include all required costs for this inspection in the bid amount.

1.8 PORTABLE FIRE EXTINGUISHER

A. Two standard listed multipurpose dry chemical fire extinguisher, NFPA 10, with 10-pound capacity, 4A-60B:C UL rating shall be provided and located near the work area. Additional fire extinguishers shall be provided for different roof levels/work sites.
   1. Contractor to ensure all personnel are trained to use fire extinguishers.

PART 2 PRODUCTS

2.1 ROOFING SYSTEM DESCRIPTION

A. Roof System, Elastomeric, EPDM, Ethylene Propylene Diene Monomer: Single ply, non-reinforced, fully adhered membrane system, Color Black.

B. Elastomeric Manufacture and Membrane Designation: [Single Ply]: Ethylene Propylene Diene Monomer]EPDM], .060 inches thick. Carlisle EPDM, 'Design A, Sure Seal FR' [See roofing system schedules].
   1. Insulation, Polyisocyanurate Manufacturers: Carlisle Insulbase.
   2. Base Flashing Designations, Single ply: Carlisle EPDM.
   3. Use manufacturer approved product for irregular flashing conditions, including molded EPDM manufacturer furnished items.
   4. Other Flashing Designation: Manufacturers approved details for 20-year warranty.

C. Manufacturers and Membrane Products and Membrane Designation: [Single Ply]: Ethylene Diene Monomer [EPDM] .060 inches thick, non-reinforced, self-adhered, color black.
   1. Carlisle SynTec., Sure-Seal FR EPDM SAT.

ROOFING SYSTEM SCHEDULES

EXISTING ROOF SYSTEM (EPDM Roof System)

Deck, Prep:	Metal deck.
Vapor Barrier	6 mil polyethylene
Insulation:	+/- 3 1/2 inch thick polyiso insulation, mopped in place
Original Roof:	Coal tar pitch built up roof system with gravel
Lightweight:	Lightweight Insulating Concrete [sloped]
Cover Board:	1/2 inch high density polyiso cover board, adhered in place
Membrane:	60 mil reinforced black EPDM, fully adhered in place

NOTE: At area of infill: match existing / adjacent roof thickness with new polyiso roof insulation, install new high density cover board, mechanically fasten or adhere all layers in place, install new 60 mil EPDM roof membrane, flashed and sealed to adjacent roof membrane.

GUTTER TROUGH ROOF SYSTEM (EPDM Roof System)

Deck, Prep:	Metal deck / pan. Remove existing EPDM lining complete.
Cover Board:	1/2 inch high density polyiso cover board, adhered in place [where required by conditions]
Membrane:	60 mil self-adhered black EPDM, adhered in place

2.2 SHEET MATERIALS [ELASTOMERIC]

A. Elastomeric Sheet: ASTM D4637, type I, class A material, cured, Black, synthetic, polyester reinforced, single ply membrane composed of Ethylene Propylene Diene Monomer [EPDM], .060 inches thick.

B. Elastomeric Sheet: ASTM D4637, type I, class A material, cured, synthetic, non-polyester reinforced, self-adhered, single ply membrane composed of Ethylene Propylene Diene Monomer [EPDM], .060 inches thick.

C. Membrane Flashing: ASTM D4811, Type I I, .055 -.060 inches thick, black, non-reinforced, semi-cured, synthetic, single ply EPDM.

D. Self-Adhesive Flashing: un-cured .045 inches thick, EPDM membrane laminated to 35 mil EPDM tape adhesive.

E. Lap Splice Tape: .035 inches thick, EPDM-based, formulated for compatibility w/EPDM membrane, self adhering, cured, width as required.

F. Adhesive Primer: Solvent based synthetic rubber based formulated for compatibility w/EPDM membrane.

G. Splice Adhesive: Synthetic polymer-based.

H. Bonding Adhesive: Solvent-Free, No odor, polymer based, designed for bonding EPDM.

I. Water Block Seal: Butyl rubber sealant.

J. Splice Cleaner: Organic solvent mixture.

2.3 INSULATION ADHESIVE

A. Insulation Adhesive: Two part, moisture cured, polyurethane based, low odor, as approved by the membrane manufacturer.

2.4 INSULATION AND COVER BOARD

A. General: All flat stock insulation or cover board from the same manufacturer. Board configuration: 48 inches x 96 inches [mechanically fastened] or 48 inches x 48 inches for adhered applied. Mixing of insulation panels from different manufacturers is not acceptable. Insulation shall meet FMG 4450.

B. Flat/Tapered Board Stock [includes infill, replacement, tapered saddles and leveling]: ASTM C1289, closed cell polyiso, rigid board; type II, class 1, grade 2, non-asphaltic, glass fiber reinforced organic facers on both sides, square edges; minimum 20 psi compressive strength, size as approved for application and as supplied by the roof membrane manufacturer. Thickness/slope as indicated in roofing schedule and roof matrix.
   1. Saddles: Each side of the saddle width shall be minimum 1/4 [25%] of the drain to drain length as applicable for conditions. Saddle insulation shall be sloped at ½ inch per foot.
   2. Drains: Tapered min. 1/4 inch per foot slope drain sumps are required at all drains.

C. Cover Board, Flat Stock: ASTM C 1289,Type II, class 4, grade 2, Carlisle 'SecurShield', 1/2 inch thick, square edges, coated inorganic bonded glass facer with a high density closed cell core.

2.5 CANTS / EDGE

A. Cant and Tapered Edge Strips: Perlite, fire resistant, performed to 45 degree angle and 18” long tapered edge strip, tapered front to back as required by the manufacturer.

2.6 ACCESSORIES / ROOF SPECIALTIES

A. General: Fasteners/Anchors: strength, type and configuration must meet the required pull test resistance for each attachment application. Fasteners rate and pattern must be FMG or local code approved to meet the intent of the wind uplift rating specified. The Contractor shall determine fastener lengths, minimum embedment: steel 3/4-inch, concrete/concrete block-1 ¼ inch, and wood-1 1/4 inch. Fastener manufacturers listed are ITW Buildex, IWT Red Head and TruFast or equal. All fasteners shall be corrosion resistant steel in accordance with meeting or ASTM F1667 [2015] or type 304 -316 stainless. Some items below may not be required for this project.

1. Roofing and Other Nails: square or round head, ring shanked galvanized or non-ferrous type, length and diameter as required to suit application.
2. Metal Counterflashing and other LG metal sheets to Wood, ITW Buildlex, 'Scots Teks' [AB point] stainless steel-hex head, ¼ inch, corrosion resistance steel shank with EPDM washer.
3. New -Existing Wood Members or New-Existing Nailers to Steel, ITW Buildex, # 14 or ¼ inch tek/ 3, 4.5 or 5, hex washer head, corrosion resistant self-drilling steel fastener [pre-drill holes and countersink head- max. wood thickness 7 inches].
4. New -Existing Wood Members or New-Existing Nailers to Metal Decking, TruFast , #14 HD, phillips head, corrosion resistant self drilling steel roof fastener .
5. Metal Counterflashing and Other LG Sheet Metal [exposed] to Masonry, ITW Red Head, ¼ inch,'Scots Tapcon', stainless steel-hex head, HL treads, corrosion resistant steel shank, with EPDM washer.
6. Termination Bars [exposed] to Masonry, ITW Red Head, ¼ inch, 'Scots Tapcon', stainless steel-hex head, HL treads, corrosion resistant steel shank, with EPDM washer.
7. Metal Sheets or Metal Decking to Metal Decking, #10, ITW Buildex,' tek/ 1', hex washer head, ABOT self-tapping with corrosion resistant steel shank.
8. Metal Decking to Metal Joists, #14 or 1/4 inch, ITW Buildex, ' tek/ 4 or 4.5 hex washer head, self tapping with corrosion resistant steel shank.
9. Wood Members/Nailers to Masonry: ITW Red Head, ¼ inch 'tapcon' steel anchor, corrosion resistant, pre-drilled and countersink head - max wood thickness 5 inches required. Or use TruFast, #14, HD phillips head, corrosion resistance steel roof fastener.
10. General Purpose Stainless Steel: Series 304 fasteners, with or w/out EPDM washers.

B. Penetration Pockets: Pre-finished 24 gauge stainless steel, soldered together with 4 inch roof flange and 4 inch height or size required for condition, only use if liquid flashing system not applicable.

C. Continuous Cleats: Galvanized steel, 22 gauge.

D. Counter-flashing and Flange/Sleeve: 24-gauge stainless steel [flange/sleeve], with 4 inch roof flange, length/style as shown. CF corners shall be mitered and sealed with sealant

E. Pipe Supports/Hangers: Manufactured by Portable Pipe Hangers, Adjustable, stainless metal components, polypropylene base, 'type SS8 – C or R [up to 2 ½ inch pipes] or PP10' [up to 3 ½ inch pipes] or Manufactured by OMG, Pipe-Guard, non-adjustable, PGM-BK, PGS-BK, PGTS-BK pipes up to 2 inches, as required for conditions.

F. Termination Bars: Aluminum 1.3-inch-wide, 10 feet long, 1.08 inch [min.] thick bars with flat or with [integral caulk edge], if applicable per manufacturer.

G. Skirt / Bib Metal: 24-gauge pre-finished steel or .032 alumimum, minimum 4 inch wide.

H. Pourable Sealer: Polyurethane, manufacturer's standard.

I. Rail Curbs: Manufactured by Pate, type es-1, es-2 or es-5, as required for condition, size as required by unit base size.

J. Equipment Enclosure: 24-gauge galvanized steel or .040 aluminum, shop or pre-manufactured with top fabricated [angled] to allow no moisture from entering the pipe areas.

Install mortar in the bottom of base with polyurethane pourable sealer poured around pipes [2-inch depth minimum]. Seal pipes that exit enclosure with sealant/foam.

K. Light Weight Fill Patch/Replacement Material: ASTM C 317, United States Gypsum [USG], Securock, non-combustible, Concrete Patch, 500 psi compressive strength.

L. Walk Pads: manufacturer's standard, adhered EPDM type, 30 inch square with textured surface.

2.7 SHEET METAL

General: Roof membrane manufacturer supplied and approved components must be used, these sheet metal components must be tested and approved in accordance with ANSI/SPRI/FM 4435 ES-1 test methods and must be included into the roof warranty. All other metal shall be shop fabricated in accordance with SMACNA 6th Edition or other details or pre-manufactured as shown. All pre-finished metal [steel] shall be fabricated using galvalume, unless not available or wind resisting testing was used with galvanized steel.

A. Pre-Finished Sheet Steel [Galvalume]: ASTM A792, grade 40, class A250, 24 or 22 gauge [as noted], primed and repainted by coil coating, finished exposed to view side with a fluoropolymer Kynar 500 [PVDF] thermally cured coating and a wash coat .5 mil thick applied to the reverse side; 20-year warranty covering fade, chalking and film integrity. Colors as selected by Architect.

B. Pre-Finished Sheet Steel [Galvanized]: ASTM A755/A653, G90, 24 or 22 gauge [as noted], primed and repainted by coil coating, finished exposed to view side with a fluoropolymer Kynar 500 [PVDF] coating and a wash coat .5 mil thick applied to the reverse side; 20-year warranty covering fade, chalking and film integrity. Colors as selected by Architect.

C. Pre-Finished Aluminum: ASTM B209, 3105 H15 alloy, thickness .032, .040 inches [as noted], primed and repainted by the coil coating, finished exposed to view side with a fluoropolymer kynar 500 [PVDF] thermally cured coating and a wash coat 0.5 mil thick applied to the reverse side; 20-year warranty covering fade, chalking and film integrity. Colors as selected by the Architect.

D. Stainless Steel: ASTM A 240/A 240M, dead soft fully annealed, smooth 24-gauge, type/grade 304 and 316 [exposed to view].

E. Galvanized Steel: ASTM A 653, hot dipped, zinc-coated, G90, gauges as shown.

2.8 SEALANT

A. General Use: ASTM C 920, Tremco's 'Dymonic FC' polyurethane, non- staining, non-shrinking, non-sagging and ultra-violet resistant, clear or to match surrounding existing color.

PART 3 EXECUTION

3.1 EXAMINATION / SURFACE CONDITIONS

A. Verify that surfaces and site conditions are ready to receive work. Verify that deck [total removed sections] is clean, dry and smooth, free of depressions, irregularities, or projections, **properly leveled**, start of work constitutes acceptance of conditions.

B. Areas of substrate where ponding water will occur [1 inch deep or greater one hour after rainfall] shall be built-up in accordance with the leveling fill manufacturer's recommendations prior to the installation of the final ply sheet, string leveling deck/insulation prior to final ply recommended. Water test may be required upon request of RDA. Failure to perform this action could result in total roof removal at Contractor expense.

3.2 PROTECTION

A. Protect building surfaces/interior spaces against damage from roofing work. It is the Contractor's responsibility to take any necessary actions to prevent construction-related leaks, to include but not limited to repairing watertight existing surrounding roofing scheduled to be replaced or overlaid. Surround roofing areas include roof top material storage areas, workers roof top access to from roofing work site areas and any drainage system [roof drain-scuppers] leak issues located in work area

B. Provide, erect barricades, guardrails as required by applicable regulatory advisory to protect occupants of building and workers.

C. Cover all drains and other openings intended for drainage during construction to prevent clogging of system, remove at the end of each day to allow for drainage.

D. Special precautions shall be taken to avoid fumes from entering the facilities through air intakes, coordinate with owner to deal with active A/C units intake location and required preparation [fibers etc] prior to starting work.

3.3 DECK PREPARATION

A. General: Depressed areas shall be made level prior to installing roofing or insulation in accordance with manufacturer's recommendation or as outlined herein.

B. Concrete [LWC] Decks: Clean and prime surfaces [if required] as recommended by the membrane manufacturer. Remove all asphalt roof membrane, residue to remain. Repair or replace all wet/deteriorated LWC.

C. Metal Deck [perimeters/corners where deck is exposed]: Fasten any loose or non- welded sections at exposed deck sections. Replace or retro-fit [overlay] all rusted metal decking with new panels, overlay structural supports min. 4 inches, match existing deck profiles and gauge, fasten in place 12 inches on center in all directions [end laps/side laps]. Holes or weak areas, less than 1 square foot or 12 inches in dia. and deck tie-ins shall be covered with 18 gauge steel sheets fastened in place in all /edges overlapping good decking 4 inches [min. 4 fasteners or 18 inches on center fastening].

3.4 INSULATION / COVER BOARD

A. Secure insulation/cover board to roof deck to the requirements of FMG loss Prevention Data Sheet 1-28 and 1-29 to include additional securement at the corners and perimeters.

B. Metal Deck: Overlay new insulation and cover board on the metal deck. Mechanically fasten the insulation in accordance with the Manufacturer's / Contractors / RDA approved layout, Secure the cover board to the insulation in low rise adhesive. Adhered insulation or cover boards shall be walked-in before skin coat develops and boards shall have continuous pressure until the adhesive sets [4 to 8 minutes, less time if adhesive is the quick setting type] to ensure not less than 85% of any board be in contact with the substrate. Install the insulation board perpendicular to roof slope with joints staggered [as applicable] no less than 24 inches in all directions Stagger joints of top layers/cover boards from bottom layers/saddles as applicable, in accordance with windstorm resistance classification securement pattern as specified and/or insulation manufacturer's securement pattern. Two opposite edges on any panel shall be supported on the flutes minimum 1 1/2 inch where total removal has taken place. Any portion of an insulation board that falls within the calculated perimeter or corner area has the increased securement applied over the entire board.

C. Apply no more insulation than can be sealed watertight with roofing membrane in the same day. Cut insulation to fit neatly to perimeter blocking and around penetrations through the roof, maximum joint width 3/8 inch.

D. All ventilators, A/C unit curbs, supports etc. [square or rectangle] will have a tapered edge strip [formed as a saddle] placed around the high side of unit to slope water from unit.

Ventilators, A/C unit, supports etc. curbs over 2 feet wide will require insulation saddles sloped ½ inch per foot.

E. Provide adequate separation of insulation between hot exhaust stacks.

3.5 MEMBRANE APPLICATION [ELASTOMERIC]

A. General: Install roofing sheets as per manufacturer's recommendations and the following summary of requirements. Do not install membrane when precipitation/high wind is forecasted to occur within 24 hours of membrane bonding.

B. Beginning at the low point of the roof, place the membrane without stretching over the acceptable substrate and allow membrane to relax a minimum of 30 minutes before attachment or splicing.

C. After making sure the sheet is placed in its final position, fold it back evenly onto itself so as to expose the mating substrate. The membrane should be smooth, clean and free of wrinkles and buckles.

D. Adhere membrane with bonding adhesive to insulation/substrate to which it will be adhered at the rate as recommended by the manufacturer. Apply bonding adhesive to the substrate [not the EPDM membrane] so to provide an even and uniform film thickness using a roller. Do not apply bonding adhesive to areas that will be subsequently spliced or taped.

E. Roll the EPDM membrane immediately into the freshly applied adhesive, slowly and evenly so as to minimize wrinkles. Broom the membrane in place to the substrate with a stiff push broom.

F. Do not fully set any sheet edges that are to be lap over adjoining sheet. Leave 12 in. folded back for splicing/taping.

3.6 MEMBRANE APPLICATION AND BONDING [SELF ADHERED EPDM]

General: Install roofing sheets as per manufacturer's recommendations and the following summary of requirements. Only install membrane when outside temperature of 40-degree F or higher. Additional enhancements to the membrane will be required if a 30-year warranted system is specified herein, consult the manufacturer for these requirements. These requirements are in addition to what is specified herein.

A. Beginning at the low point of the roof, place the membrane without stretching over the acceptable substrate and allow membrane to relax a minimum of 30 minutes before attachment or splicing.

B. After making sure the sheet is placed in its final position seams shed water or parallel to the water flow, adjoin sheets in a manner that all lap seams along the length of the membrane overlap 3 inches for application of seam tape. The membrane should be smooth, clean, and free of wrinkles and buckles.

C. Starting from the center split of the exposed release liner, remove the liner on both sides at a 45-degree angle beyond the membrane edge. Remove approx. 5 feet of release liner from one end of the sheet and adhered it to the cover board. Do not fold the length of the roll in half. Keeping the membrane flat and secured and seams aligned continue removing the release liner. Removal of the liner should be accomplished by two people.

D. Use a stiff bristled broom and apply pressure to initiate adhesion. Broom the installed membrane across the width working towards the roof edge. Do not use a weighted roller.

3.7 MEMBRANE LAP SPLICING [ELASTOMERIC]

A. General: Position the sheet at the splice area by overlapping membrane 5 inches. Tack the sheet back with primer at 5' centers and at factory splices or as necessary to hold back the membrane at the splicing area.

B. Remove excess amounts of dusting agent on the sheet and at factory splices using a stiff push broom. Apply primer to both surfaces at the same time to allow the same flash off time. Additional scrubbing is required at areas that may have become contaminated or have excess amounts of dusting agent, and at all factory splices.

C. Position the seam splice tape on the bottom sheet, aligning the edge of the release paper with the markings. Immediately roll the splice tape with a 3"-4" wide silicone or silicone sleeved steel hand roller or a short nap 3" paint roller.

D. When the seam splice tape has been installed for the entire splice length allow the top sheet to rest on top of the tape's paper backing. Trim the top sheet as necessary to assure that 1/8"-1/2" of the seam splice tape will be exposed on the finished splice.

E. Roll back the membrane sheet, then peel the paper backing off the seam splice tape by pulling against the weight of the bottom sheet at approximately a 45 degree angle to the tape and parallel with the roof surface. Allow the top sheet to fall freely onto the exposed seam splice tape. Broom the entire length of the splice as the release paper is being removed.

F. Roll the splice using a 1-1/2"-2" wide silicone or silicone sleeved steel hand roller, first across the splice, and then along the entire length of the splice.

3.8 FLASHING APPLICATION [ELASTOMERIC] – VERTICAL SURFACES, ETC

A. General: Secure membrane when there is an angle change greater that 2 in. 12 inches with a reinforced perimeter fastening strip [RPS] fastened to the deck or wall, see manufacturer’s recommendations for exceptions.

B. Remove loose or unsecured flashings, mineral surfaced or coated flashings and excessive asphalt to provide a smooth, sound surface for new flashings.

C. Complete the splice between flashing and the main roof sheet with splice adhesive before adhering flashing to the vertical surface. Provide lap splices in accordance with manufacturers details.

D. Apply bonding adhesive to the surface in which it is being bonded so as to allow approximately the same flash off time. Apply bonding adhesive in a uniform coating, in accordance with the manufacturer’s recommended coverage rate.

E. Allow bonding adhesive to become tacky. Roll the flashing into the adhesive evenly and carefully so as to minimize wrinkles.

F. Install T-Joint covers at field and flashing splice intersections as required by manufacturer.

G. Provide termination directly to the vertical by a termination bar set in water block seal and other requirements as shown on the drawings.

3.9 FLASHING APPLICATION [ELASTOMERIC] – EDGE, PIPES, DRAINS

A. General: Install flashing sheets over cants strips and other vertical surfaces, at edges and penetrations through roof as per manufacture’s recommendations, requirements of FMG loss Prevention Data Sheet 1-49 including details and the following requirements.

B. EDGES
   1. Apply primer to the metal edging and membrane. Remove approximately 2'-3' of release paper from the seam flashing and apply to the metal flange and membrane. Lap adjacent rolls of seam flashing a minimum of one inch with a 2"-3" wide silicone or silicone sleeved steel hand roller, roll the seam Flashing ensure proper adhesion. Additional attention must be given to factory splice intersections and to any change in plane.
   2. Apply 6" length of seam flashing, a seam Joint Cover, or 6"x 6" form flash to the inside edge of the seam flashing at all overlaps and at all intersections between the seam flashing and field fabricated splices.

3. Apply seam edge treatment at the intersections of the flashing sections.
4. If the roof edge includes a metal edge and sealant is not applied between the laps in the metal edging, an additional piece of seam flashing shall be applied over the metal lap to the top of the metal edge, after the initial application of seam flashing. Seam edge treatment shall be applied at the intersections of the two flashing sections.

C. PIPES
1. Flash pipes with manufactures pre-molded flashing to max. extent possible or form flash only when per-molded flashing are not available. Prime and install an additional 12" seam flashing over pre-molded flange.

3.10 INSTALLATION OF SHEET METAL / ROOF SPECIALTIES

General: Sheet metal items shall be installed in accordance with manufacturers and NRCA's/SMACNA, FMG recommendations and details from their current manual.

A. Continuous cleat [for non-pre-manufactured metal components]: Cleats shall not exceed 12 feet in length; allow a ¼ inch gap between pieces. Fasten cleat to wood nailer or deck as applicable at 6 inches on center with corrosion resistant annular threaded nails [3/16-inch head], long enough to penetrate the wood 1 ¼ inch or metal 3/4 inch.

B. Pitch pans shall have mortar installed in the bottom of pitch pans with polyurethane pourable sealer [2 inches min.] filled to the top of the pan, then slope.

C. Bib Flashing shall be installed around all roof top units/supports and all items that cannot be removed and reinstalled. Position under unit curb and anchor to unit with corrosion resistance fasteners with EPDM washers at 12 inches on center unless otherwise noted.

D. Rail curbs and pipe supports shall be installed in accordance with the manufacturer's instructions. Place curbs on deck and position curbs ends to allow water to flow toward drains or gutters.

E. Equipment enclosure shall have mortar installed in the bottom with polyurethane pourable sealer [2-inch depth minimum] filled. Seal pipes that exit enclosure with sealant.

F. Counter-flashing [CF] that is surfaced mounted shall be attached with concrete self-tapping [Scots tapcon] or wood fasteners, as applicable fitted with an EPDM washer at 12 inches on center, 1 in. minimum embedment. Apply a bead of sealant on the top of 45-degree angle lip of the metal flashing. CF that is placed in existing reglet shall be installed with lead anchors, re-cut reglet as necessary. Apply a bead of sealant where metal enters the masonry. All CF shall overlap base flashing a minimum of three inches and shall terminate no lower than 4 inch above finished roof surface, unless approved by the manufacturer.

G. Termination bars shall be placed no more then 1 1/2 inches down from top of base flashing and be fastened at 6 inches o. c with 1/4 in. diameter self-tapping [Scots tapcon] or wood steel fasteners, as applicable, 1-inch minimum embedment. Provide sealant at top edge of bars, if applicable.

H. Pipe supports shall be installed in accordance with manufacturer's instructions and be spaced no longer than ten feet.

3.11 WATER CUT-OFF [NIGHT SEALS]

A. At the end of the day's work or when precipitation is imminent, a water night seal or other cut-off waterproof protection shall be provided to ensure a 100 % watertight condition is obtained, between the new and existing conditions, to prevent water from penetrating behind or beneath the new roofing, remove cut-off prior to resuming the installation of the roofing system.

3.12 CLEANING

A. In areas where finished surfaces are soiled by any other source of soiling caused by work of this section, consult manufacturer for cleaning advice.

END OF SECTION

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SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General provision of the contract and Division 1 Specification Sections apply to this section.

1.2 WORK INCLUDES BUT NOT LIMITED TO:

General: Intent of project is to provide new sheet metal components where required and as impacted by proposed renovation / scope of work. Install all components, including sheet metal items, accessories of the new roof system needed for a completed watertight installation.

A. Removal of existing sheet metal items as noted.

B. Installation of new sheet metal items:
1. Wind-rated coping, fascia/cover and edge, ANSI/SPRI/FM ES 1, tested and approved.
2. Sheet metal fasteners.
3. Bib / Skirt flashing [around units and curbs], counter flashing, and other sheet metal items.
4. Equipment support flashings.
5. Equipment line enclosures

1.3 SUBMITTALS

A. Conform under provisions of Section 01 33 00, Submittal Procedures.

1.4 APPLICABLE REFERENCES

General: The following references form a part of this specification.

A. ASTM A 653 Metallic Coated, Sheet Steel [Galvanized], Grade A, Hot Dipped, Zinc Coated, Coating Class G90.

B. ASTM A 792, Metallic Coated, Sheet Steel [Galvalume], Grade 40, Coating Class A250 [Galvalume] Zinc Alloy.

C. ASTM A 755, Pre-Finished, Sheet Steel [Galvanized/Galvalume], Grade 40, Coating Class A250 or G90, Pre-painted by the coil coating process.

D. ASTM B 209, Aluminum.

E. [NRCA] National Roofing Contractors Association - Current Roofing and Waterproofing Manual, including shop fabricated metal edge testing.

F. [AISC] Manual of Steel Construction

G. [SMACNA] Sheet Metal and Air Conditioning Contractors Association-Current Manual.

H. [OSHA] Occupational Safety and Health Administration, Guidelines

I. [ASCE/SEI] 7-22 Minimum Design Loads for Buildings

J. [ANSI/SPRI/FM 4435] standard ES-1-17 Wind Design for Edge Systems

K. [NFPA] National Fire Protection Association, 58 Liquefied Petroleum Gas Code

L. [ANSI/SPRI] WD-1 Wind Design Standards.

1.5 QUALITY ASSURANCE

A. Fabricator/Installer: Company specializing with skilled workers in sheet metal with minimum 5 years documented experience, never been terminated by a manufacturer for workmanship problems and be capable of providing the warranties as specified.

B. Sheet Metal items and installation shall comply with SMACNA's [Architectural Sheet Metal] and NRCA's [Roofing] current manuals.

1.6 COORDINATION

A. Coordinate sheet metal flashing, trim layout installation with adjoining roofing to provide a leakproof, secure non-corrosive installation.

1.7 PERFORMANCE REQUIREMENTS

A. Fire Hazard Classification: Underwriters Laboratories [UL], Use only Class A fire-rated materials as tested in accordance with ASTM E 108 or UL 790 for exterior fire.

B. Install sheet metal items to withstand wind loads, structural movement, by preventing buckling, opening of joints, hole elongation, failure of joint sealant, failure of connections and other detrimental effects.

C. All perimeter metal items [copings and edges] must have been tested to resist the wind design loads for the building.

1.8 DELIVERY, STORAGE and HANDLING

A. Do not overload the structure with storage of materials; verify roof deck weight capacity and location of structural supports, only items needed that day shall be stored on the roof. Limit loads on roof to 25 pounds per square foot for uniformly distributed loads for metal or gypsum decks, 75 pounds per square foot for uniformly distributed loads for concrete decks. Store and protect products in accordance with manufacturer's instructions.

B. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact. Protect sheet metal items during transportation and handling.

C. Store products in weather-protected environment [manufacturer's plastic wrap is accepted for proper protection, unless wrap is broken, torn or removed], clear of ground 4 inches minimum and protected from exposure from direct sunlight. Use breathable tarps for moisture protection as needed. Damaged materials will be marked 'rejected' by the contractor/owner or RDA and removed from the site.

D. Storage of flammable liquids in buildings is prohibited. All combustible debris shall be removed from the site daily.

1.9 WEATHER CONDITIONS

A. Do not apply materials during inclement weather, high winds or when the chance of rain is 60% or greater, percentage as listed on www: weather.com for the local area, percentage as listed when read at 7 A.M. local time or at time of work commencement.

1.10 MANUFACTURERS WARRANTIES

A. Provide a manufacturer's warranty for both repairs/replacements due to any faults in the material and workmanship. Any repairs/replacement due to normal wear and tear, material finish defects and workmanship defects.
   1. Sheet metal items shall be warranted watertight for [20] twenty years by the roof membrane manufacturer.
   2. Sheet metal manufacturer of record must provide a [20] twenty-year finish warranty for the metal fascia, coping and edge as outlined herein, Warranty shall cover finish fading, chalking, cracking, peeling or failure of paint to adhere to the base metal. The warranty

shall be a lifetime warranty for defects of material or failure to resist wind speeds as outlined.

3. Sheet metal coping and roof edges that terminate into/attach to [incorporated] into the roof membrane shall be warranted for winds up to *120 MPH* or higher by the roof membrane manufacturer [part of the roof warranty] or by the metal manufacturer. Pre-manufactured items regardless of their location must be warranted and be tested by the metal manufacturer to resist failure [blow off] for wind speeds up to *120* mph and be certified to meet or exceed the design pressure as stated herein. The installation of these items must be incompliance with the metal manufacturers installation requirements and field condition attachments guidelines and as shown. The roof manufacturer can incorporate this warranty requirement into their roof warranty if approved by their metal manufacturer/fabricator.

B. In the event of a default by the contractor, the manufacturer will provide a new contractor to fulfill the warranty obligation.

1.11 DEFINITIONS

A. Shop fabricated includes items that will be formed at the fabricators shop predominately by press brake. Prefabricated or manufactured items will be plant manufactured ready for installation and wind rated in compliance with ANSI/SPRI ES-1.

PART 2 - PRODUCTS

General: All products shall be State approved, and Building Code approved as applicable**.** *Some items below may not be required for this project but are outlined herein if required during the course of work due to changing conditions or changes in scope.*

2.1 FABRICATION

A. Fabricate sheet metal items to comply with recommendations in SMACNA [architectural Sheet metal manual] and NRCA's [the NRCA roofing manual]. Conceal fasteners and expansion provisions where possible on exposed to view items. Provide expansion provisions as recommended where lapped, or bayonet type expansion cannot be used.

2.2 FASTENERS/SPECIALTY ITEMS

General: Fasteners/Anchors: strength, type and configuration must meet the required pull test resistance for each attachment application. Fastener rate and pattern must be Factory Mutual or local code approved to meet the intent of the wind uplift rating specified. The contractor shall determine fastener lengths, minimum embedment: steel 3/4-inch, concrete/concrete block-1 ¼ inch, gypsum 2- inch, tectum 2-inch and wood-1 1/4 inch. Fastener manufacturers listed are ITW Buildex, IWT Red Head and Tru-Fast or equal. All fasteners shall be corrosion resistant steel [fluorocarbon coated] unless otherwise noted in accordance with meeting ASTM F 1667 [2015] or Type 304 stainless. *All exposed fasteners shall have EPDM or PVC sealing washing under fastener heads on weather side of metal. See details for selection of item and sheet metal fabrication requirements herein.*

A. Summary of fasteners and requirements are as follows, see roofing section:
   1. Metal Counterflashing and other LG metal sheets to Wood, ITW Buildex, 'tru-grip', self-piercing, # 9 – 11/64-inch diameter, corrosion resistance steel shank with EPDM washer, if applicable.
   2. Metal Counterflashing and Other LG Sheet Metal [exposed] to Masonry, ITW Red Head, 1/4-inch diameter, 'Scots Tapcon', stainless steel-hex head, HL treads, corrosion resistant steel shank, with EPDM washer.
   3. General Purpose Stainless Steel: Series 304 fasteners, with or w/out EPDM washers as required.

B. Summary of specialty items and requirements as follows:
General: Sheet Metal Items: All metal components not incorporated into the roof system and not outlined herein or shown on the drawings shall be fabricated with *.032-inch-thick pre-finished aluminum or 24-gauge stainless steel unless otherwise noted.*
1. Continuous Cleats: Galvanized steel, 22 gauge.
2. Counterflashing: Pre-finished, 0.032-inch-thick, aluminum metal, fabricated in lengths maximum 12 feet, designed to be removable. Counter flashing to be notched and lapped at inside corners and joints. Tile or stone coated metal roofing, 3 # lead formed over tile.
3. Equipment Enclosure shall be 22-gauge stainless steel or .040 aluminum with welded or soldered corners with the top fabricated [angled] to allow no moisture from entering the pipe areas, access to pipes required. Install spray-in foam insulation around the pipes to seal watertight where they exit the enclosure.
4. Skirt [bib] Flashing Metal: 24-gauge stainless steel or pre-finished .032-inch-thick aluminum, minimum 4 inch wide. Use stainless steel screws for anchoring.
5. Drip Edge or Fascia, Wind-Rated: [pre-manufactured/shop ES 1 fabricated] – face over 2 ½ inches long: pre-finished 0.040 Aluminum drip cover over extruded anchor bar, fastened to wood nailer with #10 screws, continuous cleated. Size, length, profile as shown [cleated extension may be required], roof membrane manufacturer approved and warranted to meet or exceed design pressures/winds [see wind warranty] and 20-year finish warranty by the metal manufacturer. ANSI/SPRI/FM 4435 standard ES-1-17 and tested and approved for winds up to *120 MPH* or higher. Pre-Manufactured by Metal Era's, Anchor Tite System [drip or fascia] or roof manufacturer's equivalent. Or fabricated to match Metal Era's installation requirements.
6. Drip Edge: [shop fabricated-not wind rated] - face under 2 ½ inches: Does not require a cleat and shall be fabricated with 0.032-inch thick, pre-finished aluminum.

2.3 SHEET METAL

General: Roof membrane manufacturer supplied and approved components [copings/roof edges - if required/shown] must be used, these sheet metal components must be pre-manufactured and be tested and approved in accordance with ANSI/SPRI/FM 4435/ES-1 test method standard and must be included into the roof warranty [as outlined]. Fabricated by Metal Panel System, Architectural Products, Metal Era, Pac-Clad Peterson, Una-Clad, Drexel Metals or Dimensional Metals, etc. *Some wind rated items may be shop fabricated, if pre-manufactured item is not currently available [a metal fabricator [see above] and roofing material manufacturer may allow the roofing contractor to use their metal/materials/installation methods and shop fabricate and install the items in accordance with their wind rated ANSI/SPRI/FM 4435-ES-1 standard approved tested requirements.] This will only be accepted if the contractor is an NRCA approved installer for ES-1 tested products and the item will comply/match RDA detail [size/gauge/installation method] and an ES-1 current product certification is provided for each item. In all cases, the roof material manufacturer must approve/warrant the sheet metal items in accordance with meeting/exceeding the wind resistance requirements and finish warranties as outline herein and any other design requirements].* All other metal shall be shop fabricated in accordance with SMACNA 6th Edition or other details or pre-manufactured as shown.

A. Pre-Finished Sheet Steel [Galvalume]: ASTM A792, grade 40, class A250, 24 or 22 gauge [as noted], primed and repainted by coil coating, finished exposed to view side with a fluoropolymer Kynar 500 [PVDF] thermally cured coating and a wash coat .5 mil thick applied to the reverse side; 20-year warranty covering fade, chalking and film integrity. Colors as selected by Architect.

B. Pre-Finished Sheet Steel [Galvanized]: ASTM A755/A653, G90, 24 or 22 gauge [as noted], primed and repainted by coil coating, finished exposed to view side with a fluoropolymer Kynar 500 [PVDF] coating and a wash coat .5 mil thick applied to the reverse side; 20-year warranty covering fade, chalking and film integrity. Colors as selected by Architect.

C. Pre-Finished Aluminum: ASTM B209, 3105 H15 alloy, thickness .032, .040 inches [as noted], primed and repainted by the coil coating, finished exposed to view side with a fluoropolymer kynar 500 [PVDF] thermally cured coating and a wash coat 0.5 mil thick applied to the reverse side; 20-year warranty covering fade, chalking and film integrity. Colors as selected by the Architect.

D. Galvanized Sheet Steel: ASTM A653, hot dipped, zinc coated, G90, gauges as shown.

E. Stainless Steel: ASTM A240/A 240M, dead soft fully annealed, smooth 24-gauge, Type/Grade 304 [painted or not] and 316 [exposed to view].

2.4 SEALANTS/TAPES

General Use: Provide joint sealants for sheet metal, backing and other materials as required to seal joint that are compatible with each other based upon industry test and field experience.

A. ASTM C920, Type, Grade, Class as required to seal joints, single component, elastomeric silicone polymer, non- staining, non-shrinking, non-sagging and ultra-violet resistant, clear or to match surrounding existing color.
   1. Refer to section 079201.

B. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release paper.

PART 3 - EXECUTION

3.1 EXAMINATION and CONDITIONS

A. Verify that surfaces and site conditions are ready to receive work.

3.2 PROTECTION

A. Protect building surfaces/interior spaces against damage from work.

B. Provide, erect barricades and guardrails as required by applicable regulatory advisory to protect occupants of building and workers.

3.3 INSTALLATION OF SHEET METAL AND SPECIALTY ITEMS

General: Sheet metal items shall be installed in accordance with **manufacturer's and NRCA's/SMACNA** recommendations and details from their current manual. Anchor sheet metal items securely in place with provisions for expansion. Use items as required to complete the sheet metal or drainage system. Where dissimilar metals contact each other, protect against galvanic action by coating material as recommended by the fabricator. Seal joints with sealant as required for a watertight condition.

A. Continuous cleat [for non-pre-manufactured metal components]: Cleats shall not exceed 12 feet in length; allow a ¼ inch gap between pieces. Fasten cleat to wood nailer top as applicable at 4 inches on center [staggered pattern-1 inch from edge] with corrosion resistant annular threaded nails [3/16-inch head], long enough to penetrate the wood 1 ¼ inch.

B. Skirt [Bib] flashing shall be installed around all roof top units/supports and all items that cannot be removed and reinstalled. Position under unit curb and anchor to unit with corrosion resistance fasteners with EPDM washers at 12 inches on center unless otherwise noted.

C. Termination bars shall be placed no more than 11/2 inches down from the top of the base flashing and be fastened at 6 inches on center with concrete self-tapping [tapcon] or wood fasteners, as applicable, fitted with an EPDM washer. Provide sealant at the top edge of bars.

D. Counterflashing [CF] shall be surfaced mounted [SM] or in existing or new reglets/receivers with lap joints 4 inches. Attach SM with concrete self-tapping [tapcon] or wood fasteners, as applicable fitted with an EPDM washer at 12 inches on center, 1-inch minimum embedment.

Apply a bead of sealant on the top of 45% angle lip of the metal flashing if SM type. CF shall overlap base flashing a minimum of three inches, fit tightly to base flashing and shall terminate no lower than 4 inch above finished roof surface, unless approved by the manufacturer.

E. Wind Rated, ANSI/SPRI/FM 4435/ES-1 approved roof fascia/drip shall have an extruded anchor bar, face fastened as outlined per the metal manufacturer, 12 inches on center to the nailer with 2-inch-long #10 stainless steel fasteners with the roofing membrane extending under the anchor bar and down face of nailer or wall surface. Fascia/drip cover plate shall be cleated and snapped in place with no exposed fasteners. The formed roof flange/cover plate shall be set in approved sealant/mastic on finished roof surface with the written manufacturer's guidelines. Edge face shall exceed down to overlap and cover nailers onto exterior wall minimum 2 inches or existing metal fascia as shown. Follow manufacturer installation instructions.

F. Drip edge [face under 2 ½ inches in length]. Anchor roof flange onto wood nailers with screws or nails driven flush at 4 inches on center, staggered. Drip edge face to extend into gutter or overlap fascia board minimum 3 inches.

G. Equipment enclosure shall have the unit anchored to the existing raised duct with stainless steel grommeted fasteners 6 inches on center. Ensure the top fabricated [angled] will prevent moisture from entering the pipe areas. Top of enclosure must be removable. Install mortar in the bottom of base with polyurethane pourable sealer poured around pipes [2-inch depth minimum]. Seal pipes that exit enclosure with foam.

3.4 CLEANING

A. In areas where finished surfaces are soiled by any other source of soiling caused by work of this section, consult manufacturer for cleaning advice.

END OF SECTION

SECTION 07 84 00 - FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Firestopping through-penetrations of fire rated assemblies.
   2. Firestopping joints in fire rated assemblies.
   3. Firestopping tops of fire rated walls.
   4. Smoke sealing at joints between floor slabs and exterior walls.
   5. Smoke sealing penetrations and joints of smoke partitions.

1.2 REFERENCES

A. ASTM International:
   1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
   3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
   4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

B. Forest Stewardship Council:
   1. FSC Guidelines - Forest Stewardship Council Guidelines.

C. Intertek Testing Services (Warnock Hersey Listed):
   1. WH - Certification Listings.

D. South Coast Air Quality Management District:
   1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

E. Underwriters Laboratories Inc.:
   1. UL 263 - Fire Tests of Building Construction and Materials.
   2. UL 1479 - Fire Tests of Through-Penetration Firestops.
   3. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
   4. UL - Fire Resistance Directory.

1.3 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.4 PERFORMANCE REQUIREMENTS

A. Conform to UL for fire resistance ratings and surface burning characteristics.

1.5 SUBMITTALS

A. Product Data: Submit data on product characteristics, performance and limitation criteria.

B. Manufacturer's Installation Instructions: Submit preparation and installation instructions.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements and applicable code requirements.

1.6 QUALITY ASSURANCE

A. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10 inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
   1. Floor / Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.

B. Through Penetration Firestopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion.

C. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.

D. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain this minimum temperature before, during, and for minimum 3 days after installation of materials.

B. Provide ventilation in areas to receive solvent cured materials.

PART 2 PRODUCTS

2.1 FIRESTOPPING

A. Manufacturers:
   1. Hilti
   2. 3M Fire Protection Products
   3. Tremco
   4. Equal.

B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
   1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
      a. Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
   2. Foam Firestopping Compounds: Single component foam compound.
   3. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber stuffing insulation with silicone elastomer for smoke stopping.
   4. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.

2.2 ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive firestopping.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.

B. Remove incompatible materials affecting bond.

C. Install backing materials to arrest liquid material leakage.

3.3 APPLICATION

A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.

C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating, to uniform density and texture.

D. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.

3.4 FIELD QUALITY CONTROL

A. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

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SECTION 07 90 00 - JOINT PROTECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes sealants and joint backing.

1.2 SUBMITTALS

A. Product Data: Submit data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

1.3 ENVIRONMENTAL REQUIREMENTS

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

1.4 QUALITY ASSURANCE

A. Sealant shall be installed by a qualified sealant applicator for any/all joint sealant exposed to view. Owner reserves the right to request a mockup of the quality for the joint sealant installation.

1.5 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: 2 years from date of Contract Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which silicone sealant manufacturer agrees to furnish silicone joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: 5 years from date of Contract Completion.

C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
   1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
   2. Disintegration of joint substrates from natural causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 PRODUCTS

2.1 JOINT SEALERS

A. Manufacturers:
   1. Tremco [basis of design]
   2. Sika
   3. GE Silicones.
   4. Pecora Corp.
   5. DAP

B. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

C. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

D. Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Liquid-Applied Sealants: Comply with ASTM C920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.

F. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

G. Additional Movement Capability: Where additional movement capability is specified, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C719, to withstand the specified percentage change in the joint width existing at the time of installation and remain in compliance with other requirements of ASTM C920 for uses indicated.

H. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range, unless otherwise noted.

2.2 SILICONE JOINT SEALANTS:

A. **Type S-1**: Single component, nonsag, Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, Use NT
   1. Tremco Spectrem 1 or Spectrem 800 or Equal

B. **Type S-2**: Single Component, nonsag, Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 50, use NT
   1. Tremco Spectrem 2 or Spectrem 3 or Equal

C. **Type S-3**: Multi-Component, Nonsag, Silicone Joint Sealant: ASTM C920, Type M, Grade NS, Class 50, Use NT
   1. Tremco Spectrem 4-TS or Equal

D. **Type S-4**: Single Component, nonsag, Traffic-Grade, Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, Use T
   1. Tremco Spectrem 800 or Equal

E. **Type S-5**: Mildew Resistant, Single Component, Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, Use NT
   1. Tremco Tremsil 200 Sanitary or Equal

2.3 URETHANE JOINT SEALANTS

A. **Type U-1**: Single Component, nonsag, Urethane Joint Sealant: ASTM C920, Type S, Grade NS, Class 25 or 35, Use NT:
   1. Tremco Dymonic or Dymonic FC or Equal

B. **Type U-2**: Single Component, nonsag, Traffic Grade, Urethane Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, Use T.
   1. Tremco Vulkem 116 or Equal.

C. **Type U-3**: Multi-Component, nonsag, Urethane Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, Use T.
   1. Tremco Dymeric 240 or Dymeric 240 FC or Equal

D. **Type U-4**: Multi-Component, nonsag, Urethane Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, Use NT.

1. Tremco Vulken 227 or Equal

E. **Type U-5**: Multi-Component, nonsag, Traffic Grade, Urethane Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, Use T.
   1. Tremco Vulken 227 or Equal

2.4 BUTYL JOINT SEALANTS

A. **Type B-1**: Butyl Rubber based Joint Sealants: ASTM C 1311
   1. Tremco General Purpose Butyl Sealant or Equal

2.5 LATEX JOINT SEALANTS

A. **Type L-1**: Latex Joint Sealant: Acrylic latex or Siliconized Acrylic Latex: ASTM C834, Type OP, Grade NF or better
   1. Tremco Tremflex 834 or Equal.

B. **Type L-2**: Paintable Mildew-Resistant Latex Joint Sealant: Acrylic Latex or Siliconized Acrylic Latex: ASTM C834, Type OP, Grade NF or better.
   1. Tremco Tremflex 834 or Equal.

2.6 ACCESSORIES

General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

A. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin) as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
   1. Oversized to 30 to 50 percent larger than joint width.

B. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

D. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated. Non-staining type, recommended by sealant manufacturer to suit application.

E. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate surfaces and joint openings are ready to receive work.

B. Verify joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

A. Remove loose materials and foreign matter impairing adhesion of sealant.

B. Clean and prime joints.

C. Perform preparation in accordance with ASTM C1193.

3.3 INSTALLATION

A. Perform installation in accordance with ASTM C1193.

B. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.

C. Install bond breaker where joint backing is not used.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Tool joints concave.

3.4 SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces and non-traffic horizontal surfaces.
   1. Joint locations such as, but not limited to:
      a. Construction joints in cast-in-place concrete.
      b. Control joints in unit masonry.
         1) Provide joint sealants slightly darker than the adjacent masonry units. Provide multiple colors as may be required for match.
      c. Perimeter joints between masonry, concrete, or stone and frames of doors, windows, storefronts, louvers, and similar openings.
      d. Lintels and shelf angles to masonry construction.
      e. Butt joints between metal panels.
      f. Control and expansion joints in ceiling/soffit and similar overhead surfaces.
      g. Exterior joints between dissimilar materials where the joining of the two surfaces leaves a gap between the meeting materials or components as may be dictated by various methods of construction to make building watertight.
      h. Other joints as indicated on Drawings.
   2. Provide one of the following acceptable sealants as approved by manufacturer for substrates and uses indicated: **Type S-1, Type S-2, Type S-3**
   3. Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
   1. Joint locations such as, but not limited to:
      a. Isolation joints in cast-in-place concrete slabs.
      b. Perimeter of floor slabs or concrete curbs which abut vertical surfaces.
      c. Areas around all piping systems that penetrate the slab or foundation walls below grade (utility trenches, electrical conduits, plumbing penetrations, etc.).
      d. Control and expansion joints in tile flooring.
      e. Other joints as indicated on Drawings.
   2. Provide one of the following acceptable sealants as approved by manufacturer for substrates and uses indicated: **Type S-4**
   3. Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces, subject to movement, unless otherwise noted.
   1. Joint locations such as, but not limited to:
      a. Control joints on exposed interior surfaces of exterior walls.
      b. Interior joints where interior partitions meet exterior walls of dissimilar materials and components.
      c. Other joints as indicated on Drawings.
   2. Provide one of the following acceptable sealants as approved by manufacturer for substrates and uses indicated: **Type U-1**

3. Color: As selected by Architect from manufacturer's full range of colors. Paintable Sealant, prep for painted finish.

D. Joint-Sealant Application: Interior joints in vertical surfaces subject to abuse and movement.
   1. Joint locations such as, but not limited to:
      a. Vertical joints, including control joints and joints between masonry and structural support members, on exposed surfaces of interior unit masonry walls and partitions.
   2. Provide one of the following acceptable sealants as approved by manufacturer for substrates and uses indicated: **Type U-1**
   3. Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior joints in vertical surfaces not subject to movement.
   1. Joint locations such as, but not limited to:
      a. Interior perimeter joints of exterior openings.
      b. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
      c. Interior joints between dissimilar materials where a gap is created where materials meet, unless otherwise noted.
   2. Provide one of the following acceptable sealants as approved by manufacturer for substrates and uses indicated: **Type L-1, Type L-2**
   3. Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Mildew-resistant interior joints in non-painted vertical surfaces and horizontal nontraffic surfaces.
   1. Joint locations such as, but not limited to:
      a. Interior joints between plumbing fixtures and adjoining floors and counters.
      b. Joints between countertops and backsplashes.
      c. For interior joints in non-painted vertical and horizontal surfaces where incidental food contact may occur.
      d. Tile control and expansion joints where indicated.
      e. Other joints as indicated on Drawings.
   2. Provide one of the following acceptable sealants as approved by manufacturer for substrates and uses indicated: **Type S-5**
      a. For potable water storage sealant shall be certified by National Sanitation Foundation as conforming to the requirements of NSF Standard 61 – Drinking Water System Components – Health Effect.
      b. For surfaces where incidental food contact may occur sealant must comply with United States Department of Agriculture (USDA) guidelines for incidental food contact with cured sealant.
   3. Color: As selected by Architect from manufacturer's full range of colors.

G. Joint-Sealant Application: Mildew-resistant interior joints in painted vertical surfaces and horizontal non-traffic surfaces.
   1. Joint locations such as, but not limited to:
      a. Interior joints between plumbing fixtures and adjoining painted walls.
      b. Joints where countertops or backsplashes intersect painted walls.
      c. For interior joints in painted vertical and horizontal surfaces where incidental food contact may occur.
   2. Provide one of the following acceptable sealants as approved by manufacturer for substrates and uses indicated: **Type L-2**
   3. Color: As selected by Architect from manufacturer's full range of colors.

H. Joint-Sealant Application: Interior or exterior joints in vertical surfaces between laps in fabrications of sheet metal.
   1. Provide one of the following acceptable sealants as approved by manufacturer for substrates and uses indicated: **Type U-1**
   2. Color: As selected by Architect from manufacturer's full range of colors.

I. Joint-Sealant Application: Exterior joints under metal thresholds and saddles, sill plates, or as bedding sealant for sheet metal flashing and frames of metal or wood.
   1. Provide one of the following acceptable sealants as approved by manufacturer for substrates and uses indicated: **Type S-1, Type U-1, Type B-1**
   2. Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes steel frames; non-rated.

1.2 SUBMITTALS

A. Shop Drawings: Indicate door and frame elevations, internal reinforcement, cut-outs for glazing, and finishes.

B. Product Data: Submit door and frame configurations, location of cut-outs for hardware reinforcement.

1.3 REFERENCE STANDARDS

A. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   1. ANSI/SDI A250.8 – Specifications for Standard Steel Doors and Frames.
   2. ANSI/SDI A250.4 – Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
   3. ANSI/SDI A250.6 – Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
   4. ANSI/SDI A250.10 – Test Procedure and Acceptance Criteria and Prime Painted Steel Surfaces for Steel Doors and Frames.
   5. ANSI/SDI A250.11 – Recommended Erection Instructions for Steel Frames.
   6. ASTM A1008 – Standard Specification for Steel Sheet, Cold-Rolled, Carbon Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
   7. ANSI/BHMA A156.115 – Hardware Preparation in Steel Doors and Frames.
   8. ANSI/SDI 122 – Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
   9. ANSI/NFPA 80 – Standard for Fire Doors and Fire Windows; National Fire Protection Association.
   10. ANSI/NFPA 105 – Standard for the Installation of Smoke Door Assemblies.
   11. NFPA 252 – Standard Methods for Fire Tests of Door Assemblies; Natural Fire Protection Association.
   12. UL 10C – Positive Pressure Fire Tests of Door Assemblies.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Perform Work in accordance with the following:
   1. ANSI 250.8 - Recommended Specifications for Standard Steel Doors and Frames.
   2. DHI - Door Hardware Institute - The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.

C. Fire Rated Door Construction: Conform to NFPA 252.

D. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as indicated on Drawings.

E. Attach label from agency approved by authority having jurisdiction to identify each fire rated door.

F. Surface Burning Characteristics:
   1. Foam Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

G. Apply label from agency approved by authority having jurisdiction to identify each foam plastic insulation material.

1.5 SUBMITTALS

A. Product Data: For each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, fire resistance and temperature rise ratings, profiles, and finishes.

B. Schedule: Provide schedule of hollow-metal work prepared by the supplier. Coordinate with door hardware schedule.

C. Shop Drawings: Include the following in accordance with Steel Door Institute (SDI) 111D.
   1. Elevations of each door type.
   2. Details of doors, including vertical and horizontal edge details and metal thickness.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition. Drawings must show actual wall conditions.
   6. Details electrical raceway and preparation for electrified hardware, access control systems, and security systems.
   7. Details of anchorages, joints, field splices, and connections.
   8. Details of accessories.
   9. Details of moldings, removable stops, and glazing.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
   1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 PRODUCTS

2.1 STEEL FRAMES

A. Manufacturers:
   1. Ceco Door Products.
   2. Curries
   3. Steelcraft.

B. Product Description: Standard shop fabricated steel doors, and frames; non-rated types; flush face.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 metallic coating.

2.3 HOLLOW METAL FRAMES

General: Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.

A. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
   1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
   2. Frames: Minimum 16 gauge thick steel sheet, factory applied baked on primer, for Level 2 and Level 3 steel doors and wood doors.
   3. Frames Face Dimension: interior door openings and borrowed lights fabricated with 2 inch face at jambs, heads, and mullions, unless otherwise indicated:
   4. 16 gauge steel, cold rolled,

B. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

D. Mortar/Plaster Guards: Provide minimum 26 gauge steel plaster guards or mortar boxes, welded to the frame, at back of door hardware cutouts where materials might obstruct hardware operation.

E. Provide minimum 9 MSG hinge reinforcement, including all doors with continuous type hinges.

F. Provide minimum 12 MSG frame head reinforcement for closers, surface, and concealed overhead stop and holders, removable mullions, flush bolts, and top latch of vertical rod exit devices.

G. Door Silencers: Drill stops and install 3 silencers on strike jambs of single swing frames and 2 silencers on heads of double swing frames.

H. Hollow metal frames requiring continuous hinges shall have a continuous mortar guard of a minimum 26 gauge steel, welded to frame, the full height of the door. Mortar guards shall be shop applied by frame supplier.

2.4 FRAME ANCHORAGE

A. Jamb Anchors
   1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
   2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
   3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Provide head anchors at door or window heads over 5 feet wide at minimum 3 feet o.c. mounted in metal-stud partitions.

2.5 LOUVERS

A. Metal Louvers: Unless otherwise indicated provide louvers to meet the following requirements.
   1. Blade Type: Vision proof inverted V or inverted Y.
   2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.
   1. Manufacturers: Subject to compliance with requirements, provide louvers to meet rating indicated.
   2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

2.6 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.
   1. Glazing beads for exterior frames shall be on the interior side of transoms and sidelights. Glazing beads for interior frames shall be on the same side of door.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.7 FABRICATION

A. Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects, warp, or buckle. Accurately form metal to required sizes and profiles. Wherever practicable, fit and assemble units in the manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at the Project site.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Frames:
   1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
   2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
6. Electrical Knock Out Boxes: Factory weld 18 gauge electrical knock out boxes to frame for electrical hardware preps; including but not limited to, electric through wire transfer hardware, electrical raceways and wiring harnesses, door position switches, electric strikes, magnetic locks, and jamb mounted card readers as specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware".
   a. Provide electrical knock out boxes with a dual 1/2-inch and 3/4-inch knockouts.
   b. Conduit to be coordinated and installed in the field (Division 26) from middle hinge box and strike box to door position box.
   c. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 08 Section "Door Hardware".
   d. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.
7. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
8. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches on-center and as follows:
      1) Two anchors per jamb up to 60 inches high.
      2) Three anchors per jamb from 60 to 90 inches high.
      3) Four anchors per jamb from 90 to 120 inches high.
      4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
   b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      1) Three anchors per jamb up to 60 inches high.
      2) Four anchors per jamb from 60 to 90 inches high.
      3) Five anchors per jamb from 90 to 96 inches high.
      4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
      5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
9. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".

D. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
   1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
   2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
   3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.8 STEEL FINISHES

A. General: Comply with recommendations in “Metal Finishes Manual by Architectural and Metal Products (AMP) Division of National Association of Architectural Metal Manufacturers (NAAMM) for applying and designating finishes.
   1. Finish standard steel door and frames after assembly.

B. Metallic Coated Steel Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A780.
   1. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in steel, complying with SSPC Paint 20.

C. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP1, SSPC-SP 3, SSPC-SP 6/NACE No. 3.

D. Factory Priming for Field Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.
   1. Shop Primer: Manufacturer’s standard, fast curing, lead and chromate free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field applied finish paint system indicated; and providing a sound foundation for field applied topcoats despite prolonged exposure.

2.9 GLAZING

A. Refer to Section 08 80 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify opening sizes and tolerances are acceptable.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

E. Verify tolerances against manufacturers installations instructions for tornado and hurricane storm shelter openings.

3.3 INSTALLATION

General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

A. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
   1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
   3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
   4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

B. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
   1. Non-Fire-Rated Standard Steel Doors:
      a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
      b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
      c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
      d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
   2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

C. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 SCHEDULE

A. Refer to Drawings.

END OF SECTION

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SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Flush wood doors.
      a. Five-ply flush wood veneer-faced doors for transparent finish.
      b. Factory-preparation of wood doors for hardware specified in Division 08 Section “Door Hardware”.
      c. Doors shall be factory-finished, unless otherwise noted.
      d. Factory-fitting flush wood doors to frames.
      e. Factory-glazing.
   2. Door glazing.

1.2 SUBMITTALS

A. Product Data: Submit door manufacturer's product data, specifications, and installation instructions for each type of wood door, including door construction description and WDMA I.S.1-A and AWS classifications.
   1. Include details of core and stile construction, trim for openings and louvers (if any), and similar components.
   2. Include factory-finishing specifications.

B. Shop Drawings: Indicate locations, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
   1. Door schedule indicating door location, type, size, fire protection rating, and swing.
   2. Door elevations, dimension, and locations of hardware, lite and louver cutouts, and glazing thickness.
   3. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
   4. Dimensions and locations of blocking for hardware attachment.
   5. Dimensions and locations of mortises and holes for hardware.
   6. Undercuts and clearances.
   7. Requirements for veneer matching.
   8. Doors to be factory finished and finish requirements.
   9. Include details of sound control seals and door bottoms.Product Data:

C. Samples:
   1. Two of door construction, veneer cut and grain pattern. Show veneer slices, pattern, joints, etc. Illustrate wood grain, stain color and sheen and variation in finish color.

1.3 QUALITY ASSURANCE

A. Comply with the applicable requirements of the following standards unless otherwise indicated:
   1. ANSI/WDMA I.S. 1, "Industry Standard for Wood Flush Doors," published by Window and Door Manufacturers Association (WDMA), formerly the National Wood Window and Door Association (NWWDA).

B. Openings shall be provided to conform to the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and State and Local Regulations. Where, in the opinion of the supplier/manufacturer, openings do not conform, notify the Architect.

C. Perform Work according to AWI AWS Section 9, Premium Grade.

D. Finish doors according to AWI AWS Section 5 Premium Grade.

E. Fire-Rated Door Construction: Conform to one of following:

1. NFPA 252; with neutral pressure level at 40 inches maximum above sill at five minutes into test.
2. UL 10C.
3. Twenty-Minute Fire-Rated Corridor and Smoke Barrier Doors: Fire tested without hose stream test.

F. Installed Fire-Rated Door Assembly: Conform to NFPA 80 for fire-rated class as indicated.

G. Smoke and Draft Control Doors: Tested according to UL 1784 and installed according to NFPA 105.
   1. Air Leakage: Maximum 3.0 cfm/sq ft of door opening with 0.10 inch w.g. pressure differential.

H. Attach label from agency approved by authority having jurisdiction to identify each fire-rated door.
   1. Indicate temperature rise rating for stair doors.
   2. Attach smoke label to smoke and draft control doors.

I. Manufacturer: Company specializing in manufacturing products specified in this Section with three years' experience.

1.4 COORDINATION

A. Coordinate Work with door opening construction, door frame and door hardware installation.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect wood doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced ANSI standard and recommendations of WDMA pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors," as well as with manufacturer's instructions.

B. Identify each door with individual opening numbers that correlate with designation system used on shop drawings for door, frames, and hardware, and STC or fire rating where applicable, using temporary, removable, or concealed markings.

C. Polybag protect each door for shipment and handling.

D. Environmental Limitations: 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 requirements of the referenced quality standard for Project's geographical location.

1.6 WARRANTY

A. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

B. Interior Doors:
   1. Factory-Finished Doors: Furnish life of installation warranty from Manufacturer.

PART 2 PRODUCTS

2.1 FLUSH WOOD DOORS - MANUFACTURERS

A. Manufacturers:
   1. Five Lakes Manufacturing
   2. VT Industries
   3. Algoma
   4. Graham
   5. Mohawk

B. Source Limitations: Obtain doors from a single manufacturer to ensure uniformity in quality of appearance and construction.

2.2 DOOR CONSTRUCTION

A. Performance / Design Criteria:
   1. Performance Duty Level: WDMA I.S. 1A.
   2. Fire Resistance: As indicated on drawings / door schedule.
   3. Sound Transmission Resistance: ASTM E413; minimum STC 35 for door and frame assemblies indicated as acoustically rated.

B. WDMA I.S. 1-A-Performance Grade: Extra Heavy Duty

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing a positive pressure according to NFPA 252 or UL 10C.
   1. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
   2. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.

D. Smoke-and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.

E. Cores:
   1. Particleboard-Core Doors: Particleboard: ANSI A208.1, Grade LD-2.
      a. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices, light openings, or louvers.
   2. Structural-Composite-Lumber-Core Doors: Structural Composite Lumber: WDMA I.S.10.
      a. Screw Withdrawal, Face: 700 lbf (3100 N).
      b. Screw Withdrawal, Edge: 400 lbf (1780 N).
   3. Mineral-Core Doors:
      a. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
      b. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as follows:
         1) Two 4-1/2-by-10-inch lock blocks, in doors indicated to have exit devices.
      c. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split-resistance. Comply with specified requirements for exposed edges.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

General: new doors must match existing doors for species, veneer, veneer match, finish, etc. Contractor to verify and provide samples to ensure a match to existing doors.

A. Interior Solid-Core Doors, General:
   1. Thickness: 1-3/4 inches.
   2. Size: as indicated on door schedule.
   3. ANSI/WDMA I.S. 1A Grade: Custom (Grade A faces).
   4. Species: Red oak.
   5. Faces: Single-ply wood veneer not less than 1/50 inch thick.
   6. Cut: Plain sliced.
   7. Match between Veneer Leaves: Slip match.
   8. Assembly of Veneer Leaves on Door Faces: Running match.
   9. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
   10. Exposed Vertical Edges: Solid wood of same species as faces or a compatible species edge Type A.

11. Core:
    a. Doors without Exit Devices, Light Openings, or Louvers: Provide particle board core (PC), unless otherwise noted.
    b. Doors with Exit Devices, Doors with Light Openings and Doors with Louvers (and where otherwise noted): Provide structural composite lumber core (SCLC).
        1) Lock-to-lite-cutout shall not be less than 1 1/2 inches.
12. Top rail and vertical stiles shall be a minimum of 6 inches wide, bottom rail shall be a minimum of 10 inches wide.
13. Construction: Five plies. Stiles and rails are bonded to core, then abrasive-plane entire unit before veneering. Faces are bonded to core using a hot press.
14. Adhesives: Type 1 in accordance with WDMA T.M.6.

B. Fire-Rated Solid Core Doors, General:
1. Thickness: 1-3/4 inches.
2. Size: as indicated on door schedule.
3. ANSI/WDMA I.S. 1A Grade: Custom (Grade A faces).
4. Species: Red oak.
5. Faces: Single-ply wood veneer not less than 1/50 inch thick.
6. Cut: Plain sliced (flat sliced).
7. Match between Veneer Leaves: Slip match.
8. Assembly of Veneer Leaves on Door Faces: Running match.
9. Core Construction: Manufacturer's standard core construction as required to provide fire resistance rating indicated.
10. Stile Construction: Provide stiles that will provide the maximum screw withdrawal rate for use with full mortise hinges. Withdrawal rate shall be not less than 740 lbs. Stiles shall be manufacturer's standard. Test results for screw withdrawal shall be submitted to the Architect upon request.
    a. Preps for mortise butt hinges and continuous hinges shall have factory-predrilled pilot holes per hinge manufacturer’s template.
11. Edges: Provide Category “A” edge construction.
12. Blocking: Provide lock blocks for mortise and bored locks, minimum 5 inches by 10 inches, and 2 lock blocks for rim-, mortise-, and vertical-rod-type exit devices. Provide 5 inch top rail for attachment of closers and bottom rail (heights as required) for attachment of vertical rod exit device bottom latch and automatic flush bolts. Both blocking and through-bolt attachment of hardware items, shall be required as specified.
13. Pairs of wood doors with a 20-, 30-, 45-, 60-, and 90-minute fire rating with 3 point latching (lockset and flush bolts), shall be supplied with manufacturer's standard steel edges and steel astragal, factory-applied and factory-prepared for hardware as scheduled.

2.4 VISION PANEL / LITE KITS

A. Door supplier shall provide wood stops for nonrated and 20-minute doors. Stop shall be flush with face veneer; recessed stops will not be acceptable.
1. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.
    a. Wood Species: Any closed-grain hardwood.
    b. Profile: Manufacturer's standard shape.
    c. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

B. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch thick, cold-rolled steel sheet; factory-primed for paint finish; and approved for use in doors of fire-protection rating indicated.

2.5 PREFITTING AND PREPARATION FOR HARDWARE

A. Prefit and pre-machine wood doors at factory, including beveling both edges 1/8 inch in 2 inches. Where pairs of doors are scheduled, prefit and pre-machine as pairs. Where pairs of doors are scheduled with 3 point latching (lockset and flush bolts), the strike edge of the inactive leaf shall be square equal to WDMA meeting edge option E1.

B. Rated and nonrated doors shall comply with tolerance requirements of NFPA 80 for pre-fitting. Machine doors for hardware requiring cutting of doors. Comply with final hardware schedules and door frame shop drawings and with hardware templates and other essential information required to ensure proper fit of doors and hardware.
   1. Top and hinge edges: 1/8 inch maximum.
   2. Single door, lock edge: 1/8 inch maximum.
   3. Pair meeting edge: 1/16 inch per leaf maximum.
   4. Bottom (rated or nonrated):
      a. 1/2 inch from decorative floor covering.
      b. 3/4 inch maximum from top of noncombustible floor.
      c. 3/8 inch maximum from top of noncombustible sill or threshold.
      d. Doors with vertical rod exit devices, manual or automatic flush bolts shall be undercut for latching of bolts to a flush floor strike or threshold.
      e. See Division 09 Section “Room Finish Schedule”, for floor finish materials.

C. Coordinate with the metal frame supplier the locations of hardware mortises in metal frames to verify dimensions and alignment before proceeding with machining in factory.

D. Factory-machine doors for hardware that is not surface-applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame, shop drawings, DHI A115-W series standards, and hardware templates.

2.6 FABRICATION

A. General:
   1. The utility or structural strength of the doors must not be impaired in fitting to the opening in applying hardware, in preparing for lights, louvers, plant-ons or other detailing.
   2. Pilot holes must be drilled for all screws that act as hardware attachments.
   3. In fitting for height, do not trim top or bottom edge by more than 3/4 inch, unless accommodated by additional blocking. Do not trim top edge of fire doors.

B. Factory-fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
   1. Comply with clearance requirements of referenced quality standard for fitting, unless otherwise indicated.
   2. Comply with requirements in NFPA 80 for fire-rated doors.

C. Factory-machine doors for hardware that is not surface-applied.
   1. Locate hardware to comply with DHI-WDHS-3.
   2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W and hardware template standards, and hardware templates.
   3. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory-machining.
   4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
   5. Metal Astragals: Factory-machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

D. Openings: Cut and trim openings through doors in factory.
   1. Light Openings: Trim openings with moldings of material and profile indicated.

2. Glazing: Factory-install glazing in doors indicated to be factory-finished. Comply with applicable requirements in Division 08 Section "Glazing."

2.7 FINISHES

A. Complete fabrication, including fitting of doors for openings and hardware prior to finishing.

B. Transparent Finish System: Stained, semi-gloss sheen to match existing.
   1. Grade: Custom
   2. Finish: WMA TR-6 catalyzed polyurethane or TR-8 UV cured acrylated.

C. Factory finish doors according to approved sample.

PART 3 EXECUTION

3.1 EXAMINATION

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

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Ensure frames are solidly anchored, allowing no deflection when doors are installed.

3.2 INSTALLATION

A. Install doors according to manufacturer's instructions.

B. Field Fitting and Trimming:
   1. Trim non-rated door width by cutting equally on both jamb edges.
   2. Trim door height by cutting bottom edges to maximum of 3/4 inch.
      a. Trim fire door height at bottom edge only, according to fire-rating requirements.
   3. Machine cut doors for hardware installation.

C. Coordinate installation of doors with installation of frames specified in Section 08 11 13 and hardware specified in Section 08 71 00.

D. Coordinate installation of glass and glazing as specified in Section 08 80 00.

3.3 SCHEDULE

A. Refer to Door and Frame Schedule on Drawings.

END OF SECTION

SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes aluminum-framed storefronts including aluminum and glass doors, frames, hardware, receivers, column covers, closures, anchors, and accessories.

1.2 SYSTEM DESCRIPTION

A. Aluminum-Framed Storefront System: Tubular aluminum sections with supplementary internal support framing as required, factory fabricated, factory finished, glass infill, related flashings, anchorage and attachment devices. Thermally broken system.

B. System Assembly: Site assembled or Factory unitized assembly as applicable.

C. System Design: Provide for expansion and contraction within system components caused by temperature cycling. Design and size members to withstand loads caused by pressure and suction of wind.

D. Air Infiltration: Limit air leakage through assembly to 0.06 cfm/min/sq ft of wall area, measured at reference differential pressure across assembly of 6.24 psf when tested in accordance with AAMA/WDMA 101/I.S.2 or ASTM E283.
   1. Entrance Doors
      a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq.ft. at a static-air-pressure differential of 1.57 lbf/sq.ft.
      b. Single Doors: Maximum air leakage of 0.5 cfm/sq.ft. at a static-air-pressure differential of 1.57 lbf/sq.ft.

E. Water Leakage: None, when measured in accordance with AAMA 501 or ASTM E331 with test pressure difference of 10 psf. CSA A440 B5 Rating.

F. Uniform Load Structural: ASTM E330, static air design locat of 30 psf applied in the positive and negative direction. Maximum deflection of L/175 of the span of any framing member. No glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans. CSA A440 C2 Rating.

G. Thermal Transmittance: AAMA Specification 1503, maximum U-Factor of 0.40 per AAMA 507 utilizing a 1 inch clear high-performance insulated glass [1/4 inch glass, 1/2 inch warm edge spacer, argon gas, and 1/4 inch glass]

H. Condensation Resistance Factor [CRF]: AAMA Specification 1503, CRF not less than 71 frame and 68 glass with Low-E glass.

I. System Internal Drainage: Drain water entering framing system to exterior.

J. Sound Transmission Class [STC]: AAMA 1801, Front Plane, non-laminated glass, not less than STC 31.

1.3 SUBMITTALS

A. Product Data: Submit component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details, hardware.

B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work and expansion and contraction joint location and details.

C. Samples: Submit two samples illustrating color and finish.

D. Delegated Design Submittal [as required by conditions / system design]: For aluminum-framed storefronts including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Indicate member sizes and reinforcement necessary to meet performance requirements and support hardware.
   2. Detail fabrication and assembly of aluminum-framed systems, including fastener and fastener locations.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain aluminum framed storefront system through one source from a single manufacturer, inclusive of accessory components.

B. Perform Work in accordance with AAMA SFM-1 and AAMA MCWM-1 - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

C. Accessible Entrances: Conform to ICC ANSI A117.1-2009 accessibility requirements and any other State and Local Regulations.
   1. Opening-Force Requirements:
      a. Egress Doors: Not more than 30 lbf required to set door in motion and not more than 15 lbf required to open door to minimum required width.
      b. Accessible Interior Doors: Not more than 5 lbf.

D. Surface Burning Characteristics:
   1. Foam Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

E. Apply label from agency approved by authority having jurisdiction to identify each foam plastic insulation board.

F. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years experience.

G. Installer: Company specializing in performing Work of this section with minimum five years experience.

1.5 WARRANTY

A. Furnish five year manufacturer warranty for insulated glass and factory finishes.

PART 2 PRODUCTS

2.1 ALUMINUM-FRAMED STOREFRONTS

A. Manufacturers:
   1. Kawneer
   2. EFCO
   3. Graham
   4. Oldcastle
   5. Tubelite
   6. YKK
   7. Approved Equal

B. Product Description: Aluminum-framed storefronts, extruded aluminum, including interior systems, with aluminum and glass doors, glazing, and hardware.

2.2 COMPONENTS

A. Framing members, transition members, mullions, sills, adapters, and mountings [including sill anchors, frame receptors at jambs, and other frame trim and accessories whether shown

specifically on Drawings or not, and as required to meet Performance Requirements, shall be extruded aluminum with alloy and temper consistent with the method of manufacturer.

1. Framing members shall be of thickness required and reinforced as required to support imposed loads.
2. Construction: Where indicated, members shall incorporate a thermal-barrier by one of the following methods:
   a. Framing members shall be composite assemblies of two separate extruded aluminum components permanently bonded by an elastomeric material of low thermal conductance.
   b. High-performance plastic connectors separate framing members exposed to the exterior from members exposed to the interior.
3. Glazing System: Retained mechanically with gaskets on four sides.
4. Glazing Plane: Center or front.
5. Fabrication Method: Field-fabricated stick system.
6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
7. Steel Reinforcement: As required by manufacturer.

B. Aluminum Extrusions: Alloy and temper recommended by aluminum storefront manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" wall thickness at any location for the main frame and complying with ASTM B 221: 6063-T6 alloy and temper. Extrusions for aluminum doors shall be 0.125” wall thickness and glazing stops to be 0.060” thick.
   1. Fabricate custom extrusions as required for a complete installation and to suit conditions. Coordinate with Architect and Owner as applicable.

C. Frames: Thermally broken extruded aluminum; flush glazing stops. Frames for interior glazing need not to be thermally broken. Framing member sizes per system types.

D. Doors: 1 3/4 inches thick, nominal 5 inch wide top rail and vertical stiles, 12 inch wide bottom rail, square glazing stops.

E. Hardware: As specified in Section 08 71 00.
   1. Weather Stripping: Manufacturer’s standard replaceable components. Compression Type: Mode of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
   2. Silencers: BHMA A156.16, Grade 1.

F. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated. [as required by work].

G. Flashings: Minimum 0.32 inch thick aluminum.

H. Steel Sections: ASTM A36/A36M, Structural shapes to suit mullion sections; galvanized.

I. Primer: Zinc chromate for factory application and field touch-up.

J. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum members, trim hardware, anchors, and other components.

K. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

L. Thermal Barrier: A minimum 1/4 inch separation between the interior and exterior aluminum created by intermittent polymer clips.

M. Perimeter Sealant and Backing Materials: Specified in Section 07 90 00.

N. Weatherstripping: Manufacturer standard, replaceable compression type of molded neoprene or molded PVC.

O. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

P. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Stainless steel where exposed

Q. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action

2.3 STOREFRONT SYSTEMS

A. Type 1 – Exterior Entrance Storefront System – 2 inch by 6 inch. Framing members for front glazing of one inch insulated glass by use of elastomeric gaskets on both sides of glass, no projecting stops, thermally broken system. [Kawneer – Tri-Fab VersaGlaze 601T basis of design]

B. Type 2 – Interior Entrance Storefront System – 1-3/4 inch by 4-1/2 inch. Framing members for center glazing of 1/4 inch glass by use of elastomeric gaskets on both sides of glass, no projecting stops, non-thermally broken system. [Kawneer – Tri-Fab VersaGlaze 450 basis of design]

2.4 GLAZING

A. Glass and Glazing:
   1. Exterior Storefront Systems: 1 inch insulated glazing as specified in Section 08 80 00. Physically and thermally isolate from framing members.
   2. Interior Storefront Systems: 1/4 inch glazing as specified in Section 08 80 00.

B. Glazing Gaskets: Manufacturer’s standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.

C. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer’s standard permanent, nonmigrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.

D. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.

2.5 FABRICATION

A. Fabricate aluminum framed storefront systems, allowing for minimum clearances and shim spacing around perimeter of assembly, to the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fitted joints with ends coped or mitered.
   3. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
   4. Physical and thermal isolation of glazing from framing members.
   5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
      a. Provide minimum clearances for thickness and type of glass indicated according to FGMA’s “Glazing Manual”.
   6. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or panels.

7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
8. Where aluminum will contact dissimilar metals, protect against galvanic action.

B. Arrange fasteners, attachments, and jointing to ensure concealment from view.

C. Prepare components with internal reinforcement for door hardware [and door operator / hinge hardware].

2.6 SHOP FINISHING

A. Color Anodized Aluminum Surfaces: AA-M12C22A44, Architectural Class I 0.7 mils dark bronze anodized coating conforming to AAMA 611.

B. Concealed Steel Items: Galvanized to ASTM A123/A123M; galvanize after fabrication.

C. Apply bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar metals.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

B. Proceed with work only after correcting unsatisfactory conditions.

3.2 INSTALLATION

A. Install doors, frames, glazing, hardware, and flashings in accordance with AAMA MCWM-1 - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

B. Use anchorage devices to securely attach frame assembly to structure.

C. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

D. Coordinate attachment and seal of air and vapor retarder materials. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

E. Coordinate installation of hardware with Section 08 71 00.
1. Coordinate with security access contractor for location and installation of conduit/wiring required for electrified hardware items mounted to doors and frames, including, but not limited to, cutting/drilling any access holes required for pulling wires.

A. through frame head/jambs to the electrified hardware items.

B. Coordinate installation of glass with Section 08 80 00; separate glass from metal surfaces.

C. Coordinate installation of perimeter sealants with Section 07 90 00.

D. Tolerances:
1. Variation from Plane: 1/8 inch per foot maximum or 1/4 inch per 30 feet; whichever is less.

3.3 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer that ensure entrance and storefront systems are without damage or deterioration at the time of Contract Completion.

END OF SECTION

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SECTION 08 71 00 - DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes commercial door hardware for the following:
   1. Swinging doors.

B. Door hardware includes, but is not necessarily limited to, the following:
   1. Mechanical door hardware.
   2. Electromechanical door hardware.
   3. Automatic Operators

C. Related Sections:
   1. Division 08 Section “Hollow Metal Doors and Frames”.
   2. Division 08 Section “Flush Wood Doors”.
   3. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
   4. Division 28 Section “Access Control Hardware Devices”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
   2. ICC/IBC - International Building Code.
   3. NFPA 70 - National Electrical Code.
   4. NFPA 80 - Fire Doors and Windows.
   5. NFPA 101 - Life Safety Code.
   6. NFPA 105 - Installation of Smoke Door Assemblies.
   7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
   8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
   1. ANSI/BHMA Certified Product Standards - A156 Series.
   2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
   3. ANSI/UL 294 - Access Control System Units.
   4. UL 305 - Panic Hardware.
   5. ANSI/UL 437- Key Locks.

1.2 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
   2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:
   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.
   h. Warranty information for each product.
4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:
1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
   a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
   b. Complete (risers, point-to-point) access control system block wiring diagrams.
   c. Wiring instructions for each electronic component scheduled herein.
2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete access control and site management installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and telephone number of the supplier/integrator providing the installation and the nearest service representatives for each item of equipment included in the system. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.
1. As-Built Drawings: During system installation, the Contractor to maintain a separate hard copy set of drawings, elevation diagrams, and wiring diagrams of the access control system to be used for record drawings. This set to be kept up to date by the Contractor with all changes and additions to the access control system accurately recorded.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.3 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
   1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
   2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
   1. Function of building, purpose of each area and degree of security required.
   2. Plans for existing and future key system expansion.
   3. Requirements for key control storage and software.
   4. Installation of permanent keys, cylinder cores and software.
   5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
   1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
   2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
   3. Review sequence of operation narratives for each unique access controlled opening.
   4. Review and finalize construction schedule and verify availability of materials.
   5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.5 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.6 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
   1. Structural failures including excessive deflection, cracking, or breakage.
   2. Faulty operation of the hardware.
   3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   4. Electrical component defects and failures within the systems operation.

C. Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:
   1. Ten years for mortise locks and latches.
   2. Twenty five years for manual overhead door closer bodies.
   3. Two years for electromechanical door hardware, unless noted otherwise.

1.7 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.8 PRE-INSTALLATION MEETING

A. Establish final provisions related to security and key control. Examine hardware items of unusual provisions including special operational features, security devices, UL labels, and similar considerations related to installation.

B. Inspect and discuss preparatory work performed by other trades.

C. Review manufacturer's installation procedures related to the schedule of hardware, doors, and frames. Review the wiring diagrams for related electronic hardware and connection to the security access system and intended function.

D. Inspect and discuss electrical rough-in for electrified door hardware.

E. Review sequence of operation for each type of electrified door hardware.

F. Keying Conference: Conduct conference at Project site.
   1. Flow of traffic and degree of security required.
   2. Preliminary key system schematic diagram.
   3. Requirements for key control system.
   4. Requirements for access control.

PART 2 PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
   1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
   1. Quantity: Provide the following hinge quantity:
      a. Two Hinges: For doors with heights up to 60 inches.
      b. Three Hinges: For doors with heights 61 to 90 inches.
      c. Four Hinges: For doors with heights 91 to 120 inches.
      d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
   2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
      a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
      b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
   3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
      a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.

b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:
   a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
5. Manufacturers:
   a. Hager Companies (HA) - BB Series, 5-knuckle.
   b. McKinney (MK) - TA/T4A Series, 5-knuckle.
   c. dormakaba BEST (ST) - F/FBB Series, 5-knuckle.

2.3 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
   1. Where specified, provide modular continuous geared hinges that ship in two or three pieces and form a single continuous hinge upon installation.
   2. Manufacturers:.
      a. Hager Companies (HA).
      b. dormakaba BEST (ST).

2.4 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
   1. Manufacturers:
      a. Pemko (PE) - EL-CEPT Series.
      b. Securitron (SU) - EL-CEPT Series.
      c. dormakaba BEST (ST) EPT-12C Series.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
   1. Manufacturers:
      a. Hager Companies (HA) - Quick Connect.
      b. McKinney (MK) - QC-C Series.
      c. dormakaba BEST (ST) - WH Series.

2.5 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.
   1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
   2. Furnish dust proof strikes for bottom bolts.

3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:
   a. Burns Manufacturing (BU).
   b. Rockwood (RO).
   c. Trimco (TC).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls, where applicable, shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
6. Manufacturers:
   a. Burns Manufacturing (BU).
   b. Rockwood (RO).
   c. Trimco (TC).

2.6

2.7 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
1. Manufacturers:
   a. Sargent Manufacturing (SA).
   b. Match Existing LA Keyway.
   c. No Substitution – Owner’s Standard.

C. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Match Facility Standard.

D. Keying System: Each type of lock and cylinders to be factory keyed.
1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.

2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

E. Key Quantity: Provide the following minimum number of keys:
1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

F. Construction Keying: Provide construction master keyed cylinders.

G. Key Registration List (Bitting List):
1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.8 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.
1. Manufacturers:
a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

2.9 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.
1. Manufacturers:
a. Sargent Manufacturing (SA) - 8200 Series – “LNL” lever trim..
b. No Substitution.

2.10 CYLINDRICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed cylindrical locksets. Listed manufacturers shall meet all functions and features as specified herein.
1. Electromechanical locksets shall have the following functions and features:
a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
c. Options to be available for request-to-exit or enter signaling, latchbolt and deadbolt monitoring.
d. Two-year limited warranty on electrified functions.
2. Manufacturers:
a. Sargent Manufacturing (SA) - 10X Line – “LL” lever trim.
b. No Substitution.

2.11 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:
1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.12 ELECTRIC STRIKES

A. Standard Electric Strikes: Electric strikes conforming to ANSI/BHMA A156.31, Grade 1, for use on non-rated or fire rated openings. Strikes shall be of stainless steel construction tested to a minimum of 1500 pounds of static strength and 70 foot-pounds of dynamic strength with a minimum endurance of 1 million operating cycles. Provide strikes with 12 or 24 VDC capability, fail-secure unless otherwise specified. Where specified provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.
1. Manufacturers:
a. HES (HS) - 1500/1600 Series.
b. Rutherford Controls (RC) - F2100/F2300 Series.
c. Von Duprin (VD) - 6200/6400 Series.

B. Surface Mounted Rim Electric Strikes: Surface mounted rim exit device electric strikes conforming to ANSI/BHMA A156.31, Grade 1, and UL Listed for both Burglary Resistance and for use on fire rated door assemblies. Construction includes internally mounted solenoid with two heavy-duty, stainless steel locking mechanisms operating independently to provide tamper resistance. Strikes tested for a minimum of 500,000 operating cycles. Provide strikes with 12 or 24 VDC capability supplied standard as fail-secure unless otherwise specified. Option available for latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike. Strike requires no cutting to the jamb prior to installation.
1. Manufacturers:
a. HES (HS) - 9400/9500/9600/9700/9800 Series.
b. Rutherford Controls (RC) - 0162/F0162/0163/0563 Series.
c. Von Duprin (VD) - VD3146/6200/6300 Series.

C. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.13 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.
    1. Provide exit devices with functions and features as follows:
        a. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
        b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
        c. Extended cycle test: Exit devices to have been cycle tested in ordinance with ANSI/BHMA 156.3 requirements to 5 million cycles or greater.
        d. Five-year limited warranty for mechanical features.
    2. Manufacturers:
        a. Sargent Manufacturing (SA) - 80 Series – “ETL” lever trim.
        b. No Substitution.

2.14 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:
    1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
    2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
    3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
    4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
    5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
    6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
   1. Heavy duty surface mounted door closers shall have a 30-year warranty.
   2. Manufacturers:
      a. Sargent (SA) – 351 Series
      b. No Substitution.

2.15 ELECTROHYDRAULIC DOOR OPERATORS

A. Electrohydraulic Door Operators (High Traffic): Provide ANSI/BHMA A156.19 Certified Products Directory (CPD) listed low energy operators that meet ANSI/BHMA A156.4 requirements and are UL listed for use on fire rated doors and UL10C certified that comply with requirements for the Americans with Disabilities Act (ADA). Operators shall be verified by GreenCircle to offer energy savings of 19% when compared to similar products to accommodate openings up 250 pounds and 48” wide.
   1. Provide operators with features as follows:
      a. Non-handed with push and pull side mounting.
      b. Operates as mechanical surface closer during close cycles, when door is opened manually or if power is off.
      c. Activation by push button, hands-free or radio frequency devices.
      d. On board electronics to collect usage and cycle count data to facilitate preventative maintenance/diagnostics.
      e. Two-year limited warranty.
      f. Wi-Fi interface where the operator is a secure, password protected WiFi hot spot with no connection to building’s IT required.
         1) Simple setup with no app required.
         2) View status and make adjustments without removing the cover.
         3) Built-in logic to support single use restroom applications with no external relay boards, logic modules, position switches required.
      g. Mounting backplate to simplify and speed up installation.
   2. Operators shall have the following functionality:
      a. Adjustable Hold Open: Amount of time a door will stay in the full open position after an activation.
      b. Blow Open for Smoke Ventilation: Door opens when signal is received from alarm system allowing air or smoke to flow through opening. Door will stay open until signal from alarm system is stopped.
      c. Infinite Hold Open: Door will hold open at set position until power is turned off.
      d. Obstruction Detection: Door closes if it hits an obstruction while opening; door will reverse to open position if it hits an obstruction while closing. Door will stop once it hits an obstruction and will rest against the obstruction until removed.
      e. Open Delay: Delays operator opening for locking hardware.
      f. Overload Safety Shut-Off: After two minutes of receiving a door activation signal, inverter times out and door closes to prevent motor/inverter damage.
      g. Presence Detector Input: Input for external sensor to detect presence at door open or close position only.
      h. Push & Go: As the door is manually opened, the operator "senses" movement and opens door to the full-open position.
      i. Selector Mode Switch: Off disables the signal inputs unless Blow Open is activated, on activates the signal inputs, hold open activates the unit (unless Blow Closed is activated) to the hold open position.

j. Vestibule Delay: When the wall switch is pressed, first door in vestibule will open. Second door will open once vestibule door delay has expired. Delay is adjustable.

3. Manufacturers:
   a. Norton Rixson (NO) - 6000 Series.

2.16 ARCHITECTURAL TRIM

A. Door Protective Trim
   1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
   2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
   3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.
   4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
      a. Stainless Steel: 300 grade, 050-inch thick.
   5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
   6. Manufacturers:
      a. Burns Manufacturing (BU).
      b. Rockwood (RO).
      c. Trimco (TC).

2.17 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
   1. Manufacturers:
      a. Burns Manufacturing (BU).
      b. Rockwood (RO).
      c. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
   1. Manufacturers:
      a. Norton Rixson (RF).
      b. Rockwood (RO).
      c. Sargent Manufacturing (SA).

2.18 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and

provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
   1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
   1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:
   1. National Guard Products (NG).
   2. Pemko (PE).
   3. Zero (ZE).

2.19 ELECTRONIC ACCESSORIES

A. Key Switches: Key switches furnished standard with stainless steel single gang face plate with a 12/24VDC bi-color LED indicator. Integral backing bracket permits integration with any 1 1/4" or 1 1/2" mortise type cylinder. Key switches available as momentary or maintained action and in narrow face plate options.
   1. Manufacturers:
      a. Alarm Controls (AK) - MCK Series.
      b. Security Door Controls (SD) - 800 Series.
      c. Securitron (SU) - MK Series.

B. Push-Button Switches: Industrial grade momentary or alternate contact, back-lighted push buttons with stainless-steel switch enclosures. 12/24 VDC bi-color illumination suitable for either flush or surface mounting.
   1. Manufacturers:
      a. Alarm Controls (AK) - TS Series.
      b. Security Door Controls (SD) - 400 Series.
      c. Securitron (SU) - PB Series.

C. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.
   1. Manufacturers:
      a. Sargent Manufacturing (SA) - 3280 Series.
      b. Security Door Controls (SD) - DPS Series.
      c. Securitron (SU) - DPS Series.

2.20 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.21 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

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

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical source power to verify actual locations of wiring connections before electrified and integrated access control door hardware installation.

C. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
   1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
   1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
   2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
   3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
   4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and

reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Door Closers:
   1. Install closers on room side of corridor doors, and stair side of stairways.
   2. Lobby doors: Mount on vestibule side.
   3. Exterior doors: Parallel rigid arm installation.
   4. Where through-bolts are required, install closers using only manufacturer-furnished through-bolts.
   5. Install closers using only manufacturer-furnished template machine screws for metal doors and manufacturer -furnished wood screws for wood doors.
   6. Coordinate with door supplier to provide proper blocking for surface mounting.
   7. Use of self-drilling or self-tapping fasteners is not allowed.
   8. Where full glazed door units are specified, use closer arm and mounting configuration as required to avoid use of drop brackets whenever possible.

E. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.

F. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

G. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
   1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
   1. Quantities listed are for each pair of doors, or for each single door.
   2. The supplier is responsible for handing and sizing all products.
   3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
   4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. REFER TO DRAWINGS FOR HARDWARE SETS

C. Manufacturer’s Abbreviations:
   1. MK - McKinney
   2. PE - Pemko
   3. SU - Securitron
   4. RO - Rockwood
   5. SA - SARGENT
   6. HS – HES
   7. RF - Rixson
   8. NO - Norton
   9. OT - Other
   10. AK – Alarm Controls

END OF SECTION

SECTION 08 80 00 - GLAZING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Glass glazing for interior and exterior windows and doors.

1.2 SYSTEM DESCRIPTION

A. System performance to achieve continuity of building enclosure air barrier and vapor retarder with glass and glazing materials of this section.

B. Glass Thickness: Select minimum thickness in accordance with ASTM E1300 to resist specified design loads.

C. Structural Design: Design in accordance with applicable code for most critical combination of wind, snow, seismic, and dead loads.

D. Exterior Glass Deflection: Maximum of 1/175 of glass edge length or 3/4 inch, whichever is less with full recovery of glazing materials.

E. Interior Glass Deflection: Maximum differential deflection for two adjacent unsupported edges when 50 plf force is applied to one panel at any point up to 42 inches above finished floor less than thickness of glass.

F. Thermal and Solar Optical Performance: Measured or calculated in accordance with the following:
   1. U-Values: NFRC 100.
   2. Solar Heat Gain Coefficients: NFRC 200.
   3. Solar Optical Properties: NFRC 300.

1.3 SUBMITTALS

A. Product Data:
   1. Glass: Provide structural, physical, and thermal and solar optical performance characteristics, size limitations, special handling or installation requirements.

B. Samples: Submit two samples, illustrating glass, coloration.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual for glazing installation methods.

B. Apply label from agency approved by authority having jurisdiction to identify each fire rated glass lite.

C. Source Limitations: Obtain glass from a single source from a single manufacturer for each glass type.

1.5 WARRANTY

A. Furnish ten year manufacturer warranty including coverage for sealed glass units from seal failure, interpane dusting, misting, and replacement of defective glass.

PART 2 PRODUCTS

2.1 GLASS PRODUCTS - GENERAL

A. MANUFACTURERS
   1. AGC Glass
   2. Cardinal Glass
   3. Guardian

4. Pilkington
5. Vitro Architectural Glass

B. Glazing Publications: Comply with published recommendations of glass manufacturers, glass product fabricators, and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. Glass Association of North America (GANA):
      a. Glazing Manual (2009).
      b. Sealant Manual (2008).
   2. American Architectural Manufacturers Association (AAMA):
      a. Glass Design for Sloped Glazing (AAMA GDSG-1-87).
      b. Sloped Glazing Guidelines (AAMA TIR-A7-83).
   3. Insulating Glass Manufacturers Alliance (IGMA):
      a. SIGMA TM-3000 “Glazing Guidelines for Sealed Insulating Glass Units”.
      b. IGMA Guidelines for Sloped Glazing (IGMA TB-3001-01).

C. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer’s name, type of glass, thickness, and safety glazing standard with which glass complies.

D. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IgCC.

E. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

F. Strength: Where float glass is indicated, provide Kind-FT heat-treated float glass.

2.2 FLOAT GLASS MATERIALS

A. Annealed Glass: ASTM C1036, Type 1 transparent flat, Quality Q3, float glass.
   1. Furnish annealed glass except where heat strengthened or tempered glass is required to meet specified performance requirements.

B. Tempered Glass: ASTM C1048, Type 1 transparent flat, Quality Q3, Kind FT fully tempered, Condition A uncoated, float glass with horizontal tempering.

2.3 FLOAT GLASS PRODUCTS

A. Clear Glass: Annealed, Tempered float glass as specified; Class 1 clear.
   1. Clear annealed glass (FG-CA)
   2. Clear tempered glass (FG-CT).
   3. Minimum Thickness: 1/4 inch.

B. Tinted Glass: Annealed, Tempered float glass as specified; Class 2 tinted.
   1. Tinted annealed glass (FG-TA).
   2. Tinted tempered glass (FG-TT).
   3. Minimum Thickness: 1/4 inch.
   4. Tint: Dark Bronze to match existing glazing

C. Low E Glass: Annealed, Tempered float glass as specified; Class 2 tinted.
   1. Tinted Low E annealed glass (FG-ETA).
   2. Tinted Low E tempered glass (FG-ETT).
   3. Minimum Thickness: 1/4 inch.
   4. Tint: Dark Bronze to match existing glazing
   5. Solar Light Transmittance: 40 percent minimum.
   6. Solar Heat Gain Coefficient: 0.40 maximum.

2.4 INSULATING GLASS PRODUCTS

A. Insulating Glass: ASTM E2190; factory assembled units consisting of sealed lites of glass separated by a dehydrated interspace. glass elastomer edge seal; place reflective film within unit; purge interpane space with dry hermetic air.
   1. Total Unit Thickness: 1 inch unless otherwise indicated.
      a. 1/4-inch outer pane thickness, gray tinted [Dark Bronze to match existing glazing]
      b. 1/2-inch air space – argon filled
      c. 1/4-inch inner pane thickness, low E coated [Guardian Sunguard SuperNeutral 68]
   2. Spacer: Chromatech warm edge spacer bar or Equal
   3. Sealing System: Dual-Seal
   4. Insulating Glass Unit Edge Seal Construction: Aluminum, thermally broken, as required to meet thermal performance requirements of the opening.

2.5 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
   1. EPDM, ASTM C 864.
   2. Silicone, ASTM C 1115.
   3. Thermoplastic polyolefin rubber, ASTM C 1115.

2.6 GLAZING SEALANTS

A. Elastomeric Glazing Sealants: Materials compatible with adjacent materials including glass, and glazing channels.

B. Pre-Formed Glazing Tape: Butyl-based elastomeric tape, Size to suit application.

2.7 GLAZING ACCESSORIES

A. Setting Blocks: Elastomeric material recommended by glass manufacturer, 80 to 90 Shore A durometer hardness.

B. Spacer Shims: Elastomeric material recommended by glass manufacturer, 50 to 60 Shore A durometer hardness.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings for glazing are correctly sized, within tolerance, and glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.2 PREPARATION

A. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

B. Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION

A. Perform installation in accordance with GANA Glazing Manual.
   1. Glazing Sealants: Comply with ASTM C1193.

B. Exterior Dry Method (Gasket Glazing) Installation:
   1. Cut glazing gasket to length; install on glazing pane. Seal corners by butting tape and sealing junctions with compatible butyl sealant.
   2. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
   3. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.

4. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.

C. Interior Dry Method (Tape and Tape) Installation:
1. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.
2. Place setting blocks at 1/3 points.
3. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
4. Place glazing tape on free perimeter of glazing in same manner described above.
5. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
6. Knife trim protruding tape.

3.4 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

3.5 SCHEDULE

A. Exterior doors / Sidelights / Storefronts: 1 inch insulated, low-E, tinted glass. Tempered glazing where indicated / required by Code.

B. Interior Windows / Doors: 1/4 inch, clear, tempered glass.

END OF SECTION

SECTION 08 87 00 – WINDOW FILM

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Window Film for Interior and Exterior Glazing.
      a. Privacy Window Film
      b. Decorative Patterned Film

1.2 REFERENCES

A. ASTM E903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.

B. ASTM E308 – Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931 System.

1.3 PERFORMANCE REQUIREMENTS

A. Flammability: Surface burning characteristics when tested in accordance ASTM E 84, demonstrating film applied to glass rated Class A for Interior Use:
   1. Flame Spread Index: no greater than 25.
   2. Smoke Developed Index: no greater than 55.

1.4 SUBMITTALS

A. Product Data:
   1. Window Film: Manufacturer Data Sheets, preparation and installation instructions.

B. Samples: Submit two samples, illustrating color and pattern.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten years experience.
   1. Provide documentation that the adhesive used on the specified films is a Pressure Sensitive Adhesive (PSA).

B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.
   1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.

1.6 MOCKUP

A. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques, application workmanship and Color Rendition
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Follow Manufacturer's instructions for storage and handling.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.9 WARRANTY

A. At project closeout, provide to Owner or Owners Representative an executed current copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

B. In order to validate warranty, installation must be performed by an Authorized 3M dealer and according to Manufacturer's installation instructions. Verification of Authorized 3M dealer can be confirmed by submission of active 3M dealer code number.

PART 2 PRODUCTS

2.1 WINDOW FILM MANUFACTURERS

A. 3M Commercial Solutions [basis of design]

B. Material Properties:
   1. General: Glass and plastic finishes field-applied application to glass or plastic material as visual opaque or decorative film.
   2. Film: Polyester.
   3. Decorative Pattern: Printed.
   4. Adhesive: Acrylic, Pressure Sensitive, Permanent.
   5. Liner: Silicone-coated Polyester.
   6. Thickness (Average): 3.2 mils (80 microns).
   7. Fire Performance: Surface burning characteristics when tested in accordance with ASTM E84: Class A:
      a. Flame Spread: 25 maximum.
      b. Smoke Developed: 450 maximum.

2.2 PRIVACY WINDOW FILM

A. 3M FASARA, Opaque Black
   1. Frosted style, durable polyester film with pressure sensitive adhesive.

2.3 PATTERNED FILM

A. Fasara – Prism / Dot Film, #1270 Kanon
   1. Dotted style, durable polyester film with pressure sensitive adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

A. Film Examination:
   1. Glass surfaces receiving new film should first be examined to verify that they are free from defects and imperfections, which will affect the final appearance.
   2. Do not proceed with installation until glass surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.
   3. Commencement of installation constitutes acceptance of conditions.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Refer to Manufacturer's installation instructions for methods of preparation for Impact Protection Adhesive or Impact Protection Profile film attachment systems.

3.3 INSTALLATION

A. Film Installation, General:
   1. Install in accordance with manufacturer's instructions.
   2. Cut film edges neatly and square at a uniform distance of 1/8 inch to 1/16 inch of window sealant. Use new blade tips after 3 to 4 cuts.
   3. Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.
   4. Apply film to glass and lightly spray film with slip solution.
   5. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
   6. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.
   7. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.
   8. If completing an exterior application, check with the manufacturer as to whether edge sealing is required.

3.4 CLEANING

A. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.

B. Touch-up, repair or replace damaged products before Substantial Completion.

C. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION

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SECTION 08 88 56 – BALLISTIC GLAZING

PART 1 GENERAL

1.1 WORK INCLUDES

A. Ballistic glazing system, storefront framing, and related components.

1.2 REFERENCE

A. Underwriters Laboratory UL 752-Standard for Bullet Resisting Equipment

B. ASTM E119-98- Standard Test Methods for Fire Tests of Building Construction and Materials

C. ASTM B 209/B 209M- Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate

D. ASTM A 666-Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar.

1.3 SUBMITTALS

A. Submit for approval prior to fabrication: samples, product data, cuts & anchor spacing, reinforcement & location, product specifications, shop drawings, test reports (current UL Listing Verification & UL 752 Test Results as provided by Underwriters Laboratories), and printed data in sufficient detail to indicate compliance with the contract documents.

B. Manufacturer's Instructions for installation and cleaning of TSS Bullet Transaction Window Assemblies. All required submittals shall be approved prior to installation.

1.4 DESIGN PERFORMANCE

A. Through the design, manufacturing techniques and material application the TSS Aluminum Voice Around Transaction Window and TSS Horizontal Slider Transaction Window shall be of the "non-ricochet" type. This design is intended to permit the encapture and retention of an attacking projectile lessening the potential of a random injury or lateral penetration. This design shall employ a spacer within the frame to allow for natural sound transmission. Each transaction position shall have a stainless steel dip tray as shown on the drawings. Components must be manufactured in strict accordance with the specifications, design and details. All vision panels shall be cut to size with all exposed edges polished. Necessary holes shall be pre drilled and tapped where required. Stainless Steel assembly screws and acrylic spacers shall be provided. Frame and channel shall be provided. Anchor screws shall be provided by the installer.

B. No field alterations to the construction of the units fabricated under the acceptable standards shall be allowed unless approved by the manufacturer and the architect. Standard manufacturing tolerances shall be +/- 1/16".

C. Materials shall meet or exceed UL 752 requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer shall be a Company that specializes in manufacturing products of the specified type with a minimum of five years experience. Installer shall be a Company that specializes in product type specified and Certified for the installation by the manufacturer. Manufacturer shall provide a Mock-up, if required, for evaluation of surface preparation and application workmanship and color/finish to the Architect for approval prior to start of work.

1.6 DELIVERY, STORAGE & HANDLING

A. Handle the materials with care to prevent damage. Store materials inside and under cover, stack flat and off floor. Project conditions (temperature, humidity, and ventilation) shall be within the maximum limit recommendations set by manufacturer. Do not install products that are under conditions outside these limits.

1.7 WARRANTY

A. All materials shall be warranted against defects for a period of 1 year for the date of receipt at the project site. Certificates of manufacturer's standard limited warranty shall be provided at project completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Total Security Solutions [Basis of Design]

B. Approved Equal

2.2 BULLET RESISTANT ALUMINUM VOICE AROUND TRANSACTION WINDOW [TYPE 'A']

A. The window system consists of custom prefabricated bullet resistant glazing section with secure air passage through frames for natural voice transmission. Includes frame with plastic laminate base and recessed deal tray. All accessories for installation are included. Available frame selections (aluminum).

B. Glazing Options:
   1. Bullet-Resisting Glazing Material Options:
   2. Bullet Resistant Level 3
   3. 1 1/4" LP 1250 Laminated
   4. TSS 003 L/S

C. Deal tray: Brushed Stainless Steel Counter Mounted or Recessed
   1. Deal tray to be 18 ga. stainless steel, # 4 finish 16" x 10" from the outside edge of flanges with a clear opening.

D. Provide a shelf 1 1/2" thick with a recessed cash tray. The shelf to be full width of window, 18" deep, centered under the glazing and covered with a black high pressure laminate.

E. Aluminum sections to be manufactured in accordance with ASTM B209, Extruded aluminum alloy 6063 T5 Anodized or powder coated finish to match the existing décor and be free of sharp edges or burrs when in place. Glazing Channel: U-Channel specifically designed for securing transparencies tightly in place. Angles and stops are only acceptable for top attachment.

F. Frame to be dark bronze anodized aluminum. The bottom of the glazing to be capped with corresponding material on the frame.

G. Product size shall be: TSS Aluminum Voice Around Transaction Window

2.3 BULLET RESISTANT HORIZONTAL SLIDING TRANSACTION WINDOW [TYPE 'B1 / B2']

A. The Product shall be: TSS Horizontal Sliding Transaction Window. The window system consists of custom prefabricated bullet resistant glazing section with secure air passage through frames with black foam & wood spacers as required for natural voice transmission. Includes frame with plastic laminate base and recessed cash tray. All accessories for installation are included. Available frame selections (aluminum, steel or stainless steel).

B. Glazing Options:
   1. Bullet-Resisting Glazing Material Options:
   2. Bullet Resistant Level 3
   3. 1 1/4" LP 1250 Laminated
   4. TSS 003 L/S

C. Deal tray: Brushed Stainless Steel Counter Mounted or Recessed
   1. Deal tray to be 18 ga. stainless steel, # 4 finish, 16" x 10" from the outside edge of flanges with a clear opening.

D. Provide a shelf 1 1/2" thick with a recessed deal tray. The shelf to be full width of window, 18" deep, centered under the glazing and covered with a black high pressure laminate.

E. Aluminum sections to be manufactured in accordance with ASTM B209, Extruded aluminum alloy 6063 T5 Anodized or powder coated finish to match the existing décor and be free of sharp edges or burrs when in place. Glazing Channel: U-Channel specifically designed for securing transparencies tightly in place. Angles and stops are only acceptable for top attachment.
   1. Frame to be dark bronze anodized aluminum. The bottom of the glazing to be capped with corresponding material on the frame.

PART 3 EXECUTION

3.1 PREPARATION

A. Prior to installing the bullet resistive material, the contractor shall verify that all supports have been installed as required by the contract documents, architectural drawings, and approved shop/CAD drawings, if required. Installer shall notify architect of any unsatisfactory preparation that is responsibility of another installer.

B. Clean and prepare all surfaces per manufacturer's recommendations for achieving the best results for the substrate under the project conditions.

3.2 INSTALLATION

A. Do not begin installation until openings have been verified and surfaces properly prepared in accordance with Drawings. Install in accordance with manufacturer's instructions and UL 752. Set all equipment plumb. All products shall be installed per installation instructions provided by Total Security Solutions, if warranty is to be issued.

B. Bullet Resistant Transaction Window shall arrive on site as a completed unit. Unit shall be installed in provided opening (wall/door), secured to structure (anchors by others).

3.3 POST APPLICATION

A. Bullet Resistant Transaction Window shall be installed in accordance with manufacturer's printed recommendations, including adhering to anchoring and finishing details.

B. Inspection and Cleaning: Verify installation is complete and complies with manufacturer's requirements. Clean product and accessories, removing excess sealant, labels and protective covers.

C. Touch-up, repair or replace damaged products before Substantial Completion.

D. Product Warranty: Applicable warranty shall be issued to owner upon final release of completed project.

END OF SECTION

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SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Gypsum board and joint treatment.

1.2 SUBMITTALS

A. Product Data: Submit data on gypsum board, accessories.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with:
   1. ASTM C840.
   2. GA-201 - Gypsum Board for Walls and Ceilings.
   3. GA-214 - Recommended Specification: Levels of Gypsum Board Finish.
   4. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.
   5. GA-600 - Fire Resistance Design Manual.

B. Furnish framing materials in accordance with SSMA - Product Technical Information.

C. Fire Rated Wall and Floor Construction: Rating as indicated on Drawings.
   1. Tested Rating: Determined in accordance with ASTM E119.
   2. Fire Rated Partitions: Listed assembly by UL.
   3. Fire Rated Ceilings and Soffits: Listed assembly by UL.

D. Surface Burning Characteristics:
   1. Textile Wall Coverings: Comply with one of the following:
      a. Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.4 MOCKUP

A. Gypsum Board Finish Mockups: Before finishing gypsum board assemblies, install mockups of at least 100 sq.ft. in surface area to demonstrate aesthetic effects and qualities of materials and execution.
   1. Install mockups for the following applications:
      a. Surfaces with texture finish.
      b. Level 4 and level 5 finish.
   2. Simulate finished lighting conditions for review of mockups.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected from weather, condensation, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum boards flat to prevent sagging.
   1. Protect joint compounds from freezing.

C. Handle gypsum board to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.6 FIELD CONDITIONS

A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C840 and with gypsum board manufacturer's recommendations. Do not install gypsum board when ambient temperature is below 40 deg. F.
   1. Do not install paper-faced gypsum boards until installation areas are enclosed and conditioned.

B. Ventilation: Ventilate building spaces, as required, for dry joint-treatment materials.

C. Do not install boards that are wet, those that are moisture-damaged, and those that are mold damaged.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

A. Manufacturers:
   1. United States Gypsum Co. [basis of design]
   2. BPB Americas Inc.
   3. G-P Gypsum Corp.
   4. National Gypsum Co.
   5. Certainteed.

B. General Requirements: Comply with ASTM C 1396. Provide in maximum lengths and widths available that will minimize joints in each area, that will minimize joints in each area, and that correspond with support system indicated.
   1. Unless otherwise noted all gypsum board shall be fire-resistance-rated. Refer to Code Plan in Construction Drawings for specific locations and requirements of fire-resistance rated assemblies indicated.
   2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
   3. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 COMPONENTS

A. Gypsum Board Materials: ASTM C1396/C1396M; Type X fire resistant where indicated on Drawings.
   1. GB-1: Standard Gypsum Board: 5/8 inch thick, maximum available length in place; ends square cut, tapered and beveled edges.
   2. GB-2: High-Impact / Impact-Resistant Gypsum board: 5/8 inch thick, maximum available length in place; ends square cut, tapered and beveled edges.
   3. GB-3: Moisture Resistant Gypsum Board: 5/8 inch thick, maximum available length in place; ends square cut, tapered and beveled edges.
   4. GB-4: Noise Reduction Gypsum Board: 5/8 inch thick; maximum available length in place; ends square cut, tapered and beveled edges.
      a. Certainteed SilentFX: Laminated noice-reducing gypsum board consisting of two layers of dense gypsum board encased in smooth, moisture, and mold resistant paper facings laminsted together with a viscoelastic polymer compound.

B. Cement Backer Board Materials: Complying with ANSI A118.9 and ASTM C1288 or 1325 of thickness indicated and in maximum lengths available to minimize end-to-end butt joints. Ends and edges shall be square cut and finished smooth; formed in a continuous process of aggregated Portland-cement slurry; and reinforced with vinyl coated, woven glass-fiber mesh embedded in both surfaces.
   1. CB-1: Cement Board: 1/2 or 5/8 inch thick, standard sizes.

2.3 ACCESSORIES

A. Acoustic Insulation: ASTM C665, preformed glass fiber, friction fit type, unfaced,
   1. 3 inch thick in 3 5/8 inch metal stud walls.
   2. 6 inch thick in 6 inch metal frame walls.

B. Gypsum Board Accessories: ASTM C1047; metal; corner beads, edge trim, and expansion joints.
   1. Metal Accessories: Galvanized steel.
   2. Edge Trim: Type LC, L, or U bead as appropriate for conditions

C. Joint Materials: ASTM C475/C475M, GA-201 and GA-216, reinforcing tape, joint compound, and water.

D. Fasteners: ASTM C1002, GA-216; length to suit application.

E. Gypsum Board Screws: ASTM C954, ASTM C1002; length to suit application.
   1. Screws for Steel Framing: Type S.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions are ready to receive work.

3.2 INSTALLATION

A. Gypsum Board:
   1. Install gypsum board in accordance with GA-216 and ASTM C840.
   2. Fasten gypsum board to furring or framing with screws.
   3. Place control joints consistent with lines of building spaces as directed by Architect.
   4. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.
   5. Seal cut edges and holes in gypsum board as appropriate for the condition.

B. Joint Treatment:
   1. Finish in accordance with GA-214 for all new work.
      a. Level 4: All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Two separate coats of joint compound shall be applied over all flat joints and one separate coat of joint compound shall be applied over interior angles. Fastener head and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges.
         1) This level is to be used at areas to receive flat paints.
      b. Level 5: All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Two separate coats of joint compound shall be applied over all flat joints and one separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. A thin skim coat of joint compound trowel applied, or a material manufactured especially for this purpose and applied in accordance with manufacturer's recommendations, applied to the entire surface. The surface shall be smooth and free of tool marks and ridges.
         1) This level is to be used at areas to receive eggshell and semi-gloss and gloss paint and areas subject to severe lighting, where indicated.
   2. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   3. Feather coats onto adjoining/existing surfaces so camber is maximum 1/32 inch.

4. Taping, filling, and sanding is not required at concealed surfaces**.**

C. Tolerances: Maximum Variation from Flat Surface: 1/8 inch in 10 feet in any direction.

3.3 SCHEDULE

A. Coordinate with Installation of ballistic wall protection system over the framing where indicated on the Drawings. Install to manufacturer standards, including laps, seams, as well as required reinforcement of all seams and edges.

B. New Gypsum Board Wall Finishes: GB-1: Level 4 finish.

C. New Gypsum Board Ceiling Finishes: GB-1: Level 4 finish.

D. New Gypsum Board Wall / Ceiling Finishes at Toilet Rooms, Wet Areas: GB-3: Level 4 finish.

E. New Gypsum Board Wall Finishes at Conference Room: GB-4, Level 4 finish.

F. Existing Walls / Ceilings: Repair existing gypsum board / plaster finishes where required by work and/or damaged. Restore to like new condition.

END OF SECTION

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Metal stud framing and accessories at interior locations.

1.2 SYSTEM DESCRIPTION

A. Interior Walls: Metal stud framing system with insulation as specified in Section 07 21 00 and as indicated on wall types on Drawings, interior gypsum board as specified in Section 09 21 16.

B. Maximum Allowable Deflection for wall assemblies: 1: 240 of the wall height based upon horizontal loading of 5 lbf/SF.

C. Design Loads: 5 lbf/SF minimum.

D. Design framing systems to accommodate deflection of the primary building structure and construction tolerances and to withstand design loads as outlined.

E. Wall System:
   1. Design to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
   2. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

1.3 PERFORMANCE REQUIREMENTS

A. Select stud thickness to resist minimum 5 psf uniform load and maximum 1/240 deflection.

1.4 QUALITY ASSURANCE

A. Perform Work according to ASTM C754.

B. Form, fabricate, install, and connect components according to NAAMM ML/SFA 540.

C. Furnish framing materials according to SSMA - Product Technical Information.

PART 2 PRODUCTS

2.1 COMPONENTS

A. Framing System Components: ASTM C645.

B. Studs: ASTM A653/A653M, non-load bearing rolled steel, channel shaped, punched for utility access, as follows:
   1. Depth / Thickness:
      a. 3 5/8 inches x 20 gauge
      b. Unless otherwise noted on the drawings, or as required to suit conditions to meet deflection requirements.

C. Joists: ASTM A653/A653M, non-load bearing rolled steel, channel shaped:
   1. Depth / Thickness:
      a. 6 inches x 20 gauge unless otherwise required by conditions.

D. Tracks and Headers: Same material and thickness as studs, bent leg retainer notched to receive studs.

E. Headers and Jambs: Metal stud manufacturers proprietary shape used to form headers and jambs, columns, etc.

F. Furring Channels: ASTM A653 G40
   1. Cold Rolled Channels: 16 gauge with 1/2 inch wide flanges, 3/4 inch deep.
   2. Hat Channels: ASTM C645-07: 25 gauge, 7/8 inch deep

G. Channel Bridging:
   1. 16 gauge, 1-1/2 inch x 1/2 inch flange
   2. Clip angles: 1-1/2 inch x 1-1/2 inch, galvanized steel

H. Radius Framing: Steel sheet runner for non-load bearing curves, bends, variable radii, and arches, etc.

I. Furring and Bracing Members: Of same material as studs; thickness to suit purpose.

J. Fasteners: ASTM C1002; Type S, GA-216; length to suit application.

K. Anchorage Devices: Power actuated.

L. Grid Suspension System of Interior Ceilings: ASTM C645-07, manufacturer's standard direct-hung grid suspension system composed of main beams and cross furring members that interlock forming a modular support system.

2.2 SUSPENSION SYSTEM COMPONENTS

A. Hangers, Tie Wires, Carrying Channels, and Furring Channels as required for suspended ceiling systems.
   1. Tie Wire: ASTM A641, Class 1 zinc coating, soft temper, 0.062 inch diameter wire, or double strand 0.048 diameter wire.
   2. Wire Hangers: ASTM A641, Class 1 zinc coating, soft temper, .016 inch diameter.
   3. Carrying Channels [Main Runners]: Cold formed, commercial sheet sheet with base steel thickness of 0.0538 inch and minimum 1/2 inch wide flanges. Depth as indicated on drawings.
   4. Design load shall be 5 times the imposed load by construction per ASTM E488.

B. Grid Suspension System of Interior Ceilings: ASTM C645-07, manufacturer's standard direct-hung grid suspension system composed of the main beams and cross furring members that interlock to form a modular supporting network.
   1. Contractor’s Option for gypsum board ceilings where appropriate.

2.3 FABRICATION

A. Fabricate assemblies of framed sections to sizes and profiles required.

B. Fit, reinforce, and brace framing members to suit design requirements.

C. Fit and assemble in largest practical sections for delivery to Site, ready for installation.

2.4 SHOP FINISHING

A. Studs: Galvanize to G40 coating class.

B. Tracks and Headers: Galvanize to G40 coating class.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify rough-in utilities are in proper location.

3.2 INSTALLATION - GENERAL

A. Installation Standard: ASTM C754.
   1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

F. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

G. Align stud web openings horizontally.

H. Secure studs to tracks using fasteners. Do not weld.

I. Stud splicing not permissible.

J. Brace stud framing system rigid.

K. Coordinate erection of studs with requirements of door frames, window frames, and openings; install supports and attachments.

L. Coordinate installation of wood bucks, anchors, and wood blocking with electrical and mechanical Work to be placed within or behind stud framing.

M. Blocking: Secure wood blocking or steel channels to studs.

N. Refer to Drawings for indication of partitions extending to finished ceiling only and for partitions extending through ceiling to structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Install extended leg ceiling runners.

O. Coordinate placement of insulation in stud spaces after stud frame erection.

3.3 INSTALLATION OF FRAMED ASSEMBLIES

A. Install framing system components in accordance with spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
   1. Single-Layer Application: As required by horizontal deflection performance requirements, 16 inches o.c. unless otherwise indicated.
   2. Multilayer Application: As required by horizontal deflection performance requirements, 16 inches o.c. unless otherwise indicated.
   3. Tile Backing Panels: As required by horizontal deflection performance requirements, 16 inches o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
   1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
   2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
      a. Install two studs at each jamb unless otherwise indicated.
      b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.

c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:
   a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
   b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.

E. Direct Furring:
1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

3.4 INSTALLATION OF CEILING SUSPENSION SYSTEMS

A. Install suspension system components in accordance with spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches o.c.
2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 24 inches o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.5 ERECTION TOLERANCES

A. Maximum Variation from Indicated Position: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb: 1/8 inch in 10 feet.

3.6 SCHEDULES

A. Refer to wall types and sections on drawings.

END OF SECTION

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SECTION 09 30 00 - TILING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes porcelain tile, ceramic tile for interior floor and wall applications; metal edge and transition strips, and thresholds at door openings.

1.2 SUBMITTALS

A. Product Data: Submit product data for each type of tile, grout, and accessories.

B. Shop Drawings: Indicate patterned applications and thresholds.

C. Samples: Submit [2] samples of each tile and grout, illustrating pattern, color variations, and grout joint size variations.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with TCA Handbook and ANSI A108.1 Series/A118.1 Series.

B. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

C. Installer: Company specializing in performing Work of this section with minimum five years documented experience and approved by manufacturer.

1.5 MOCKUP

A. Build mockup, in place, to verify installation details and techniques. Mockup once approved by Architect and Owner shall remain in place and will be used as the benchmark for remaining installations.

1.6 ADDITIONAL MATERIALS

A. Furnish extra materials that match and are from the same production runs as the products installed. Package with protective covering for storage.
   1. Tile: Furnish tile and accessories in the amount of 5% for each type.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not install adhesives in unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store liquid latexes and emulsion adhesives in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

PART 2 PRODUCTS

2.1 PRODUCTS – GENERAL

A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Source Limitation for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
   1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregates, from single manufacturer.

D. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1/.2, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
   2. For facial dimensions of tile, comply with requirements relating to tile sizes specified.

E. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced, ANSI standards referenced by TCNA installation methods specified in tile installation scheduled and other requirements specified.

F. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.2 TILE PRODUCTS

A. Refer to Finish Specifications on Drawings.

2.3 WATERPROOFING AND CRACK-SUPPRESSION MEMBRANES FOR THIN-SET TILE INSTALLATIONS

A. General: Manufacturer's product selected from the following, that complies with ANSI A118.10 and A118.12 for high (greater than 1/8 inch) performance and is recommended by the manufacturer for the application indicated. include reinforcement and accessories recommended by manufacturer.
   1. Chlorinated-Polyethylene Sheet Product
   2. PVC-Sheet Product
   3. Fabric Reinforced, Fluid Applied Membrane

2.4 CRACK-ISOLATION MEMBRANE

A. Manufacturer’s product selected that complies with A 118.12 for high (greater than 1/8 inch) performance and is recommended by the manufacturer for the application indicated.
   1. Fabric Reinforced, Fluid Applied Membrane
   2. Fluid Applied Membrane

2.5 WATERPROOFING ONLY MEMBRANES FOR TILE INSTALLATIONS

A. General: Manufacturer's standard product, selected from the following that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
   1. Provide waterproofing at showers that do not have a prefabricated receptor.
      a. Chlorinated Polyethylene Sheet
      b. PVC Sheet
      c. Polyethylene Sheet
      d. Fabric Reinforced Fluid Applied Membrane
      e. Fluid Applied Membrane

2.6 SETTING AND GROUTING MATERIALS

A. Products: Subject to compliance with requirements, provide one of the following:
   1. Improved Modified Dry-Set Mortar (Thinset): ANSI A118.15
      a. MAPEI Corporation; Kerabond T/Keralastic System
      b. LATICRETE SUPERCAP, LLC; 4-XLT
   2. Polymer-Modified, Unsanded Tile Grout: ANSI A118.7 and ISO 13007; CG2WA
      a. MAPEI; Keracolor U
      b. Laticrete; 600 Series/LATICRETE 1776
   3. Polymer-Modified, Sanded Tile Grouts: ANSI A118.7 and ISO 13007; CG2WA
      a. MAPEI, Keracolor S
      b. Laticrete: Laticrete 1500 Sanded Grout; Laticrete 1776 Grout Admix Plus

B. Mortar Bed Materials: ANSI A108.1A; Portland cement, sand, latex additive and water.
   1. Create mortar bed to accommodate difference in thickness of original floor materials and new floor materials.

C. Improved Modified Dry-Set Mortar (Thinset): ANSI A118.15.
   1. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added to Project site.
   2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to other requirements in ANSI A118.15.

D. Polymer-Modified, High-Performance, Tile Grout: ANSI A118.7, color as indicated.
   1. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.
      a. Unsanded grout mixture for joints 1/8 inch and narrower.
      b. Sanded grout mixture for joints 1/8 inch and wider.

2.7 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

2.8 ACCESSORIES AND MISCELLANEOUS MATERIALS

A. Tile Backer Board: Refer to Section 09 21 16.

B. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

C. Metal Edge Strips, Terminations, and Transitions: Angle or L-shape, height to match tile and setting-bed thickness, metallic, designed specifically for floor and wall applications, satin anodized aluminum; sized and profiles to suit conditions and as noted on drawings. Meet accessibility requirements for transitions at floor applications.
   1. Schluter Systems or Equal

D. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
   1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.
   2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

E. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

F. Floor/Grout Sealer: Manufacturer's standard product for sealing grout joints that does not change color or appearance of grout.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
   1. Verify substrate mix design for additives i.e. hardeners, moisture vapor reduction admixture, and other ingredients that might affect performance of installed tile.
   2. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films or silicones, and curing compounds; and within flatness tolerances required by referenced ANSI A108 of tile installation standards for installations indicated.
   3. Verify that concrete surfaces for tile floors installed with bonded mortar bed or thinset mortar comply with surface finish requirements in ANSI A108.1 for installations indicated.
      a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
      b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
   4. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
   5. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected and manufacturer has approved substrate for material to be installed without compromise.

3.2 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials, using mechanical methods recommended by manufacturer. Do not use solvents.

B. Provide concrete substrates for tile floors installed with thin-set mortar that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.
   1. Remove protrusions, bumps, and ridges by sanding or grinding.
   2. All concrete substrates at least 28 days old, completely cured and free of hydrostatic conditions.
      a. If concrete additives have been included in the mix or suspected to be in the mix that might affect the performance of the flooring installation, test the bond.

1) Perform bond and additional tests as recommended by the TCNA and grout manufacturer. If tests do not produce satisfactory results, coordinate with concrete admixture manufacturer and grout manufacturer on possible solutions. Retest until a satisfactory result can be obtained.

C. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

D. Mortar Bed: Create mortar bed for setting of new floor tile to accommodate difference in thickness between existing finish floor and proposed finish floor. Field verify existing conditions.

E. Wall Preparation: Comply with ANSI A108.01, Section 2.5.

F. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

G. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.
   1. Shower pan membranes shall extend 3 inches minimum above finished floor to form pan, unless otherwise noted.
   2. Materials adversely affected by moisture in areas immediately adjacent to showers or tubs shall be properly protected.
   3. All horizontal surfaces, for example shower seats, sills, curbs, etc. must slope towards drain or other surfaces sloped toward drain. Waterproofing must also be sloped.

B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.4 CRACK ISOLATION MEMBRANE INSTALLATION

A. Install crack-suppression membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness bonded securely to substrate.
   1. Crack-suspension membrane must be installed over entire substrate.

B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.5 GENERAL INSTALLATION

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1 through A108.10, and TCA Handbook recommendations.

B. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor, base and wall joints to the extent possible

C. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated on drawings. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
   1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
   2. Where tiles are specified or indicated to be whole integer multiple of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

3. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

3.6 ADJUSTING/CLEANING AND PROTECTING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
   1. Remove latex-portland cement grout residue from tile as soon as possible.
   2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
   3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

3.7 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCNA installation methods and ANSI A108 Series of tile installation standards.

B. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
   1. Locate transition under doors, unless otherwise noted.

C. Floor/Grout Sealer: Apply grout sealer to cementitious grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints,
   1. remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

3.8 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCNA installation methods and ANSI setting bed standards.

B. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
   1. Locate transition at corners and where indicated on drawings.

3.9 INTERIOR, FLOOR TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor
   1. Tile Installation: Interior floor installation on concrete; thin-set mortar; TCNA F113 (on-ground concrete) TCNA F113A (above-ground concrete) and ANSI A108.5.
      a. Tile Type: Unglazed ceramic mosaic tile.
      b. Thin-Set Mortar: Improved modified dry-set mortar.
      c. Grout: polymer-modified, high-performance unsanded grout.
   2. Tile Installation: Interior floor installation on waterproof membrane over concrete; thin-set mortar; TCNA F122A (elevated slabs) and ANSI A108.13.
      a. Tile Type: Unglazed ceramic mosaic tile.

b. Thin-Set Mortar: Improved modified dry-set mortar.
c. Grout: Polymer-modified, high-performance, unsanded grout.

3. Tile Installation: Interior floor installation on concrete; thin-set mortar on crack isolation membrane; TCNA F125-Full and ANSI A108.1.
   a. Tile Type: Unglazed paver tile.
   b. Thin-Set Mortar: Improved modified dry-set mortar.
   c. Waterproofing and Crack Suppression Membrane Installed: Full coverage of substrate.
   d. Grout: Polymer-modified, high-performance, sanded grout.

3.10 INTERIOR, WALL (BASE) TILE INSTALLATION SCHEDULE

A. Interior Wall Installations, Masonry or Concrete
   1. Tile Installation: Interior wall installation over sound, dimensionally stable masonry or concrete; thin-set mortar; TCNA W202I and ANSI A108.5.
      a. Tile Type: Unglazed ceramic mosaic and glazed wall tile.
      b. Thin-Set Mortar: Improved modified dry-set mortar.
      c. Grout: Polymer-modified, high-performance, unsanded grout.

B. Interior Wall Installations, Metal Studs or Furring:
   1. Tile Installation: Interior wall installation over glass-mat, water-resistant backer board; thin-set mortar; TCNA W245 or W248 and ANSI A108.5.
      a. Tile Type: Unglazed ceramic mosaic and glazed wall tile.
      b. Thin-Set Mortar: Improved modified dry-set mortar.
      c. Grout: Polymer-modified, high-performance, unsanded grout.

END OF SECTION

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SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Acoustic tile.
   2. Acoustic panels.
   3. Suspended metal grid ceiling system and perimeter trim.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data.

B. Samples: Submit ceiling tile and suspension system.

1.3 QUALITY ASSURANCE

A. Surface Burning Characteristics: Comply with the following when tested in accordance with NFPA 286.
   1. During 40 kW Exposure: No flame spread to ceiling.
   2. During 160 kW Exposure: No flame spread to perimeter of tested sample and no flashover.
   3. Total Smoke Release: Maximum 1,000 cu m.

B. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver material in the manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Provide labels indicating brand name, source of procurement, style, size and thickness.

C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

D. Handling: Handle materials to avoid damage.

1.5 PROJECT CONDITIONS

A. Coordination: Coordinate work of this section with installation of mechanical and electrical components and with other construction activities affected by work of this section.
   1. Review with affected installers those locations of facility services lines and equipment within ceiling plenum that prevent installation of hangers at spacings compliant with limitations established in referenced standards. Arrange for each affected mechanical or electrical installer to provide necessary number of additional structural support points for ceiling installer.

B. Maintain environmental conditions [temperature, humidity, and ventilation] within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

C. Sequencing: Schedule work of affected trades to minimize or eliminate installation conflicts and rework.

1.6 EXTRA MATERIALS

A. Provide 3% additional materials for each ceiling type.for use by the Owner.

PART 2 PRODUCTS

2.1 SUSPENDED ACOUSTICAL CEILINGS

A. Manufacturers:
   1. Armstrong [Basis of Design].
   2. United States Gypsum Company.

B. Performance / Design Criteria:
   1. Provide system capable of supporting imposed loads with deflection limited to 1/360 of span.

2.2 COMPONENTS

A. Acoustic Tiles: ASTM E1264, Class A conforming to the following:
   1. Armstrong Tundra, Beveled Tegular Lay-in [basis of design], match building standard
   2. Nominal Size: 24 x 24 inches.
   3. Thickness: 5/8 inches.
   4. Surface Finish: Non-directional fissured.
   5. Edge: Beveled Tegular.
   6. Color: White.
   7. NRC: 0.50

B. Grid:
   1. Non-Fire Rated Grid: ASTM C635, standard duty, non-fire rated, exposed T configuration; components die cut and interlocking.
   2. Accessories: Stabilizer bars, clips, splices, edge moldings required for suspended grid system.
   3. Grid Materials: Commercial quality cold rolled steel with galvanized coating.
   4. Exposed Grid Surface Width: 15/16 inch.
   5. Perimeter Molding Width: Match grid width.
   6. Grid Finish: White color.
   7. Suspension Wire: ASTM A580, 12 gauge
   8. Support Channels and Hangers: Galvanized steel, size and type to suit application and ceiling system flatness requirements specified.

2.3 CEILING PERFORMANCE REQUIREMENTS

A. Design for maximum deflection of 1/360 of span.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify layout of hangers does not interfere with other work.

3.2 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636 and manufacturer's instructions and as supplemented in this section.

B. Install hangers and inserts coordinated with overhead work. Provide additional hangers and supports as required.

C. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1/360.

D. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

E. Locate system on room axis according to reflected ceiling plan.

F. Suspension System, Nonseismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

G. Where ducts, facility services, or equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels as applicable to span the extra distance.

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 system or induce rotation of runners.

J. Edge Moldings: Install at intersection of ceiling and vertical surfaces and penetrations, using components of maximum length; set level. Provide edge moldings at junction with other ceiling finishes; Miter corners; Provide preformed edge closures to match bullnosed cornered partitions.
   1. Use longest practical lengths.
   2. Miter; Overlap; or Overlap and rivet corners.

3.3 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit edge trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.
   3. Double cut and field paint exposed reveal edges.

F. Where round obstructions; bullnose concrete block corners; and other penetrations occur, provide preformed closures to match perimeter molding.

G. Install hold-down clips where required adjacent to exterior doors.

H. Tolerances: Variation from Flat and Level Surface: 1/8 inch in 10 feet.

END OF SECTION

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SECTION 09 65 13 - RESILIENT FLOORING / BASE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes resilient rubber base and stair treads.

1.2 SUBMITTALS

A. Product Data: Provide for each type of resilient flooring and base product, including all accessories and transitions.

B. Samples:
   1. Submit manufacturer's complete set of color samples for initial selection.
   2. Submit three samples, 2x2 inch in size illustrating color and pattern for each resilient flooring product specified.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit maintenance instruction and data.

1.4 QUALITY ASSURANCE

A. Surface Burning Characteristics:
   1. Base Material: Class I, minimum 0.45 watts/sq cm when tested in accordance with NFPA 253.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature in storage area between 55 degrees F and 85 degrees F.

B. Store materials for not less than 48 hours prior to installation in area of installation at temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.1 RUBBER STAIR TREAD WITH INTEGRAL RISER

A. Manufacturers:
   1. Johnsonite [Fastlane, basis of design, Refer to Finish Specifications on Drawings]
   2. Approved Equal

B. Stair Treads: ASTM F1861; Type TV, Group 1, Vinyl
   1. Height: 4 inch and 6 inch as noted
   2. Thickness: 0.080 inch thick.
   3. Finish: Matte.
   4. Length: full width of stair in [1] piece
   5. Classification: ASTM F2169, Group 2 contrasting color for visually impaired.
   6. Nosing: Square or as required to suit existing conditions.

C. Test data:
   1. Hardness (ASTM D2240): ≥ 85 Shore A
   2. Resistance to Chemicals (ASTM F925): Passes
   3. Resistance to Heat (ASTM F 1514): $\Delta E \leq 8$
   4. Static Coefficient of Friction (ASTM D 2047): ≥ 0.5 SCOF
   5. Flamability (ASTM E648, Critical Radiant Flux): Class 1 (≥ 0.45 W/cm2)
   6. Limited Commercial Warranty: 5 years

2.2 RESILIENT BASE

A. Manufacturers:
   1. Johnsonite [basis of design, match building standard, Refer to Finish Specifications on Drawings]
   2. Approved Equal

B. Base: ASTM F1861; Type TV, Vinyl; top set coved:
   1. Height: 4 inch and 6 inch as noted
   2. Thickness: 0.125 inch thick.
   3. Finish: Matte.
   4. Length: 4 foot pieces
   5. Outside Corners: Premolded or precut. Corners shall be a minimum of 4 inches in length each direction.
   6. Inside Corners: Job formed

C. Test Data:
   1. Flexibility, ASTM F137: Passes 1/4 inch mandrel
   2. Resistance to light, ASTM F1515: Passes
   3. Resistance to chemicals, ASTM F925: Passes
   4. ASTM E 648, Standard Test Method for Critical Radiant Flux of 0.45 watts/cm2 or greater, Class 1.

2.3 ACCESSORIES

A. Primers and Adhesives: Waterproof, types recommended by floor material manufacturer.

2.4 MOLDINGS / TRANSITION STRIPS

A. Moldings and Edge Strips: Metal; extruded aluminum with mill finish of height required by finish floor materials, and in maximum lengths to minimize running joints.
   1. Schluter or Equal. Size / type to suit conditions.

B. Moldings and Transition Strips: Rubber, extruded rubber as required by floor materials, and in maximum lengths to minimize running joints.
   1. Johnsonite or Equal: Size / type to suit conditions.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean substrate.

B. Apply primer as required to prevent "bleed-thru" or interference with adhesion by substances that cannot be removed.

C. Prepare concrete substrates in accordance with ASTM F710.

D. Fill cracks, holes, depressions and irregularities in the substrate with good quality Portland cement based underlayment leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

3.2 INSTALLATION

A. Adhere stair treads, risers, stringers, and base tight to wall and floor surfaces.

B. Fit joints tightly and make vertical. Miter internal corners. Install pre-molded interior and exterior corners.

C. Remove excess adhesive from surfaces without damage.

END OF SECTION

SECTION 09 65 10 – RESILIENT TILE FLOORING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes resilient tile flooring.

1.2 SUBMITTALS

A. Product Data: Submit data describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

B. Samples:
   1. Submit manufacturer's complete set of color samples for initial selection.
   2. Submit **two** samples, illustrating color and pattern for each resilient flooring product specified.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning

1.4 QUALITY ASSURANCE

A. Surface Burning Characteristics:
   1. Floor Finishes and Stair Coverings: Class I, minimum 0.45 watts/sq cm when tested in accordance with NFPA 253.
   2. Base Material: Class I, minimum 0.45 watts/sq cm when tested in accordance with NFPA 253.

B. Accessibility: Flooring shall comply with accessibility requirements ICC/ANSI A117.1.
   1. Exceed Federal Standards and ADA requirements for slip-resistance.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
   1. Manufacturers Qualifications: Flooring product manufacturer will have a technical installation representative available at the job site at the start of the installation to insure there are no conditions which will compromise the installation of the material and that the material is being installed according to industry standards, practices and manufacturers guidelines. The manufacturer’s technical representative will document and confirm that the substrate, material, and installation are in compliance with manufacturer’s guidelines and accepted industry standards and practices.
      a. Any noticed defect with the product or installation system will require the response of the manufacturer’s technical field service personnel on site to determine cause, correction or replacement.

B. Installer: Company specializing in performing Work of this section with minimum ten years documented experience.

1.6 MOCKUP

A. Provide a mockup of the floor installation in an approximate 100 SF area showing the color and pattern of the floor, layout, seams, etc.

B. Provide a mockup of each type of floor / floor pattern as indicated.

C. Coordinate locations with Owner and Architect.

D. Approved mockups may be left in place.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by the manufacturer, but not less than 65 deg F or more than 85 deg F.

1.8 PROJECT CONDITIONS / ENVIRONMENTAL REQUIREMENTS

A. Install resilient products after other finishing operations, including painting, have been completed. If that is not possible due to the compressed schedule, provide all required protection of the floor system after installation until turnover of the space.

B. Maintain ambient temperatures within range recommended by the manufacturer, but not less than 65 deg F or more than 85 deg F in spaces to receive resilient products during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

C. Maintain the ambient relative humidity between 40% and 60% during installation.

D. Until Substantial Completion, maintain ambient temperatures within range recommended by the manufacturer, but not less than 55 deg F or more than 85 deg F.

1.9 EXTRA MATERIALS

A. Furnish an additional 5% of each type of floor, base, and accessories.

B. Document attic stock, properly label, and turn over to Owner.

1.10 WARRANTY

A. Provide ten [25] year manufacturer warranty for all resilient tile flooring, and accessories.

PART 2 PRODUCTS

2.1 TILE FLOORING

A. Manufacturers:
   1. Patcraft [Refer to Finish Specifications on Drawings]
   2. Approved Equal

B. Testing Requirements: ASTM F1700
   1. Slip Resistance ASTM D2047: ADA Compliant
   2. Static Load Limit ASTM F970: 1500 psi
   3. Residual Indentation F1914: passes , 8%
   4. Flexibility ASTM F137: Passes
   5. Resistance to Heat ASTM F1514: Passes
   6. Resistance to Light ASTM F1515: Passes
   7. Resistance to Chemicals ASTM F925: Passes
   8. Radiant Flux ASTM E648: / 0.45 W/sq. cm., Class I
   9. Smoke Density ASTM E662: Passes, <450

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: As determined by a qualified testing agency by testing identical products.
   1. Critical Radiant Flux Classification (ASTM E 648 or NFPA 253): Class I (not less than 0.45 watts per cm^2).
   2. Smoke Generation (ASTM E 662 or NFPA 258): Maximum specific optical density of 450 or less.

B. Accessibility: Flooring shall comply with accessibility requirements of ICC/ANSI A117.1 as required by local authorities with jurisdiction.
   1. Comply with ASTM D 2047, Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring: Exceeds Federal Standards and ADA requirements for slip-resistance.

2.3 ACCESSORIES

A. Transition Moldings and Edge Strips, same material as flooring or metal as applicable. Refer to drawings.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated and coordinate with substrate.

B. Primer: A primer may be required and must be verified by the manufacturer.

C. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.
   1. Adhesives shall be approved by manufacturer for use over concrete substrates

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Verify concrete floors are dry to maximum moisture content as recommended by manufacturer, and exhibit negative alkalinity, carbonization, and dusting.

E. Verify floor and wall surfaces are free of substances capable of impairing adhesion of new adhesive and finish materials.

3.2 PREPARATION

A. Provide all required field verification of conditions, quantity take-offs, layout confirmations, etc. as applicable to the work.

B. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
   1. Prepare concrete substrates in accordance with ASTM F 710.

C. Prohibit traffic until filler is cured.

D. Clean substrate.

E. Apply primer as required to prevent "bleed-thru" or interference with adhesion by substances cannot be removed.

F. Do not install flooring products until they are same temperature as the space where they are to be installed.
   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

G. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 INSTALLATION – RESILIENT TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.

C. Install tile to a pattern as indicated or as recommended by the manufacturer for the conditions. Allow minimum 1/2 full size tile width at room or area perimeter.

D. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

E. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.

F. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

G. Install flooring in recessed floor access covers. Maintain floor pattern.

H. Install feature strips and floor markings where indicated. Fit joints tightly.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
   1. Prohibit traffic on resilient flooring for 48 hours after installation.
   2. No heavy traffic, rolling loads, or furniture placement for 72 hours after installation.

D. Wait 72 hours after installation before performing initial cleaning.

E. A regular maintenance program must be started after the initial cleaning.

END OF SECTION

SECTION 09 67 00 - FLUID-APPLIED FLOORING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Fluid-applied flooring and base; divider strips and accessories; and integral colored finish system.

1.2 SUBMITTALS

A. Product Data: Describe physical and performance characteristics; sizes, patterns and colors available.

B. Manufacturer’s Certificate: Certify products meet or exceed specified requirements.

C. Manufacturer's Installation Instructions: Special procedures, perimeter conditions requiring special attention.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Include procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.4 QUALITY ASSURANCE

A. Surface Burning Characteristics:
   1. Floor Finishes: Class I, minimum 0.45 watts/sq cm when tested according to NFPA 253.

B. Manufacturer: Company specializing in manufacturing products specified in this Section with five years' experience.

C. Installer: Company specializing in performing Work of this Section with five years' experience and approved by manufacturer.

D. Floor System Thickness Verifications:
   1. At Owner’s discretion, the Contractor shall take [2] 1 inch random cores per 1,000 SF through the system into the substrate to verify proper system thickness. Cored areas less than the specified thickness shall be removed and replaced or increased in thickness by the installing contractor in a manner that does not affect the performance or integrity of the system. Cored areas which comply with the recommended system thickness shall be built-up to match the surrounding surface elevation prior to applying the top coats.
   2. Cores taken and patched will be noticeable. Cores shall be taken from areas where they will not impact the finished aesthetic of the system.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Maintain minimum temperature in storage area of 55 degrees F.

B. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials, or in accordance with manufacturer requirements

C. Moisture Testing for Concrete Slab: Test existing and new concrete floor slabs for moisture as part of the prep work for the new epoxy floor system. Follow the directives of the epoxy floor system manufacturer if the moisture content exceeds the maximum threshold.

1.6 MOCK UP

A. Apply mockup to verify selections made as part of sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution for each flooring type.
   1. Apply full-thickness mockup system at no less than 25 SF of floor area, including a section of base if applicable.

2. Approved mockups may become part of the completed Work.

PART 2 PRODUCTS

2.1 FLUID-APPLIED FLOORING

A. Epoxy Resin Coating System: Manufacturers:
   1. Sherwin Williams / General Polymer [Basis of Design]
   2. SIKA

2.2 FLOOR SYSTEM

A. Quartz Finish Floor System [Floor Type EP-1]: Two-component, Epoxy Resin Coating System, low odor, high solids epoxy floor coating system with a urethane top coat.
   1. Primer: Resuprime 3579
   2. First Body Coat: Resuflor 3746 with Decorative vinyl chips broadcast to rejection
   3. Second Body Coat: Resuflor 3746 with Decorative vinyl chips broadcast to rejection
   4. Grout Coat: Resuflor 3746
   5. Top Coat: Resutile 4638

B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

2.3 MATERIALS / SYSTEM COMPONENTS

A. Primer: General Polymers – Resuprime 3579 is a two-part, high-solids, clear or pigmented epoxy primer and binder resin.

B. Body Coats: General Polymers – Resuflor 3746 is a two-component, recoatable epoxy and bonder resid for use over primed substrates.

C. Top Coat: General Polymers – Resutile 4638, two-components, high-gloss polyurethane enamel UV stable finish.

D. Color as selected with the following properties:

E. Broadcast Aggregate: Vinyl Chips

F. Cove Base: Epoxy mortar Cove Base.

2.4 ACCESSORIES

A. Control Joint and Divider Strips: Extruded anodized aluminum, height to match flooring thickness, with anchoring features. Locate as recommended by manufacturer. Field confirm conditions with Owner / Architect to address variations in the floor thickness. Alternate: butt floor systems together with clean lines. Provide mockup as applicable to the conditions.

B. Base / Fillet Strips: Molded of flooring resin material or material compatible with flooring.

C. Subfloor Filler: type recommended by flooring material manufacturer.

D. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify floor surfaces are smooth and flat with maximum variation as specified and are ready to receive Work.

B. Verify concrete floors have cured minimum 28 days [or per manufacturer requirements], exhibit negative alkalinity, carbonization, and dusting, and are acceptable to flooring manufacturer.

C. Verify floor and lower wall surfaces are free of substances capable of impairing adhesion of adhesive and finish materials.

D. Moisture Testing for Concrete Slab: Test concrete floor slabs for moisture as part of the prep work for the new epoxy floor system. Follow the directives of the epoxy floor system manufacturer if the moisture content exceeds the maximum threshold.

E. Substrate moisture:
   1. Measure and confirm Substrate Moisture Content, Ambient Relative Humidity, Ambient and Surface Temperature and Dew Point.
   2. Confirm and record above values at least once every 3 hours during installation, or more frequently whenever conditions change (e.g. Ambient Temperature rise/fall, Relative Humidity increase/decrease, etc.).

3.2 PREPARATION

A. Prepare surfaces as required by manufacturer, remove all laitance, grease, curing compounds, bond inhibiting materials, waxes, and other contaminants.

B. Cracks: evaluate any cracks in the concrete to determine the required repairs prior to the application of the flooring system. Refer to manufacturer requirements. Provide all crack repair necessary.

C. Surface Preparation: Remove all surface contamination, loose or weakly adherent particles, laitance, grease, oil, curing compounds, paint, dust and debris by blast track method or approved mechanical means. If surface is questionable try a test patch. Create a minimum surface profile for the system specified in accordance with the methods described in ICRI No. 03732 to achieve profile numbers as follows:
   1. Thin film, to 10 mils: CSP-1 to CSP-3.
   2. Thin and medium films, 10 to 40 mils: CSP-3 to CSP-5.
   3. Self-leveling mortars, to 3/16 inch: CSP-4 to CSP-6.
   4. Mortars and laminates, to 1/4 inch or more: CSP-5 to CSP-9.

D. Remove and dress all sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.

E. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above surface level. Prohibit traffic until filler is cured.

F. Clean substrate.

G. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.3 INSTALLATION

A. Install floor system to manufacturer requirements including prep, application procedures, application rates, cure times, etc.

B. Accurately saw cut substrate to install control joints and/or divider strips as applicable to the system, and where recommended by manufacturer.
   1. Install strips straight and level at locations indicated.

C. Install fillet strips at base of walls where flooring is to be extended up wall as base as required by site conditions.

D. Apply each coat of flooring within thickness range required by manufacturer.

E. Install resinous floor over properly prepared concrete surface in strict accordance with the manufacturer's directions.
   1. Install the primer / base coats over thoroughly cleaned and prepared concrete.
   2. Install intermediate coat with integral color additive / broadcast flakes / quartz as outlined.
   3. Install topcoat over intermediate coat[s].

F. Note: Contractor shall change applicator roller at intervals not exceeding 1,000 SF or as otherwise recommended by manufacturer.
   1. Roller shall not break down or leave fibers in the floor system.

G. Contractor to provide and maintain barriers to minimize the construction dust in the work area of the floor application. Contractor to take all measures necessary to ensure a quality installation free of contaminants.

H. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
   1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
   2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
   3. At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.

I. Sealant: Saw cut resinous floor topping at expansion joints in concrete slab where applicable. Fill saw cuts with sealant prior to final seal coat application. Follow manufacturer's written recommendations.

J. Primer: Apply primer over prepared substrate at manufacturer's recommended spreading rate.

K. Slip Resistant Finish: Provide grit for slip resistance, coordinate requirements with Owner.

L. Finish to smooth level surface.

M. Install cove base where indicated on drawings.

3.4 PROTECTION

A. Protect finish floor after installation to prevent damage to the floor system.

B. Do not allow construction equipment onto floor system that will damage the floor.

C. Freshly applied material should be protected from dampness, condensation and water for at least 72 hrs.

D. Beware of air flow and changes in air flow. Introduction of dust, debris, and particles, etc. may result in surface imperfections and other defects.

E. Follow manufacturer’s written recommendation with respect to cure, wait time and return to service.

END OF SECTION

SECTION 09 68 00 - CARPETING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Carpet tile, fully adhered.
   2. Accessories.

1.2 REFERENCES

A. ASTM Standards:
   1. ASTM F-1869 – Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Calcium Chloride.
   2. ASTM F-710 – Standard Practice for Preparing Concrete to Receive Resilient Flooring.
   3. ASTM F-2170 – In-situ Relative Humidity Testing.
   4. ASTM F3191-16 – Standard Practice for Field Determination of Substrate Water Absorption (Porosity).

1.3 SUBMITTALS

A. Product Data: Describe physical and performance characteristics; sizes, patterns, colors available, and method of installation.

B. Samples:
   1. Two carpet tile samples illustrating color and pattern design for each carpet color selected.

C. Manufacturer's Instructions: Special procedures, perimeter conditions requiring special attention.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Include suggested schedule for cleaning.

1.5 QUALITY ASSURANCE

A. Surface Burning Characteristics:
   1. Floor Finishes: Comply with one of following:
      a. Class II, minimum 0.22 watts/sq cm when tested according to NFPA 253.
      b. CPSC 16 CFR 1630 and ASTM D 2859.

B. Installer: Company specializing in performing Work of this Section with five years' experience.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Store materials in area of installation for 48 hours prior to installation.

B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Materials:
   1. Furnish 100 SF of carpet tiles of each color and pattern selected.

1.8 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
   1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
   2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge, and delamination.
   3. Warranty Period: 20 years from date of Contract Completion.

PART 2 PRODUCTS

2.1 CARPET TILE

A. Manufacturers:
   1. Refer to Finish Schedule on Drawings.
   2. Approved Equal.

B. Testing Requirements
   1. Pill Test CPSC FF 1 70: Pass
   2. Radiant Panel ASTM E648: Class I
   3. NBS smoke ASTM E662 NF: <450
   4. Static AATCC 134: <3.5 kv
   5. Coefficient of Friction: 0.6 (Meets ADA requirements)

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated, as determined by testing identical products per ASTM E 648 and NFPA 253 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Critical Radiant Flux Classification: Not less than 0.45 W/sq.cm.
   2. Flooring Radiant Panel Test: Meets NFPA Class 1 when tested under ASTM E-648 glue down.
   3. Smoke Density: NBS Smoke Chamber NFPA-258, less than 450 flaming mode.

B. Chemical Emission/Indoor Air Quality: Carpet shall comply with the Carpet and Rug Institute (CRI) Green Label Plus Program. The program label and registration number serve as evidence of compliance.

C. Accessibility: Flooring shall be provided to comply with accessibility requirements of ICC/ANSI A117.1 as required by local authorities with jurisdiction.

2.3 ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer. Material must be compatible and coordinated with concrete slab mix.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and high-moisture subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

C. Moldings, Transitions, and Edge Strips: Rubber, profiles as required, color as selected by Architect.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify floor surfaces are smooth and flat within tolerances specified and are ready to receive Work.

3.2 PREPARATION

A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

C. Clean substrate.

3.3 INSTALLATION – CARPET TILE

A. Install carpet tile according to CRI Carpet Installation Standard.

B. Do not mix carpet from different cartons unless from same dye lot.

C. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

D. Install carpet tile in square pattern, with pile direction alternating to next unit, set parallel to building lines.

E. Locate change of color or pattern between rooms under door centerline.

F. Fully adhere carpet tile to substrate.

G. Trim carpet tile neatly at walls and around interruptions.

H. Complete installation of edge strips, concealing exposed edges.

END OF SECTION

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SECTION 09 72 00 - WALL COVERINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes surface preparation and wall covering.

1.2 SUBMITTALS

A. Product Data: Submit data on covering and adhesive including test reports verifying flame/smoke ratings.

B. Samples: Submit two samples of covering illustrating color, finish, and texture.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit maintenance and cleaning instructions.

1.4 QUALITY ASSURANCE

A. Surface Burning Characteristics:
   1. Textile Wall Coverings: Comply with one of the following:
      a. Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by adhesive or vinyl covering product manufacturer.

B. Maintain these conditions 24 hours before during and after installation of adhesive and covering.

1.6 EXTRA MATERIALS

A. Provide 25 linear feet of each color of covering selected.

PART 2 PRODUCTS

2.1 WALL COVERING

A. Manufacturers:
   1. Refer to Finish Schedule on Drawings

2.2 COMPONENTS

A. Wall Covering: ASTM F793, roll stock, conforming to the following:
   1. Total Weight: Type II, 20 oz/lyd.
   2. Content: 100% Vinyl
   3. Backing: Osnaburg
   4. Width: 54 inch
   5. Repeat: Random Match

B. Adhesive: Type recommended by covering manufacturer to suit application type.

C. Substrate Filler: As recommended by adhesive and covering manufacturers compatible with substrate.

D. Substrate Primer and Sealer: As recommended by covering manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate surfaces are flat, ready to receive work.

B. Measure moisture content of surfaces using electronic moisture meter. Do not apply coverings unless moisture content of surfaces are below recommended maximum.

3.2 PREPARATION

A. Fill cracks in substrate and smooth irregularities with filler, sand smooth. Vacuum clean surfaces.

B. Apply one coat of primer to substrate surfaces, allow to dry, sand lightly.

3.3 INSTALLATION

A. Razor trim edges on flat work table, changing blade often to prevent rough cut edges. Do not razor cut on gypsum board surfaces.

B. Apply adhesive and covering smooth, without wrinkles, gaps or overlaps. Ensure full bond to substrate surface.

C. Horizontal seams are not acceptable.

D. Do not seam within 2 inches of internal corners or within 6 inches of external corners.

E. Cover spaces above and below windows, above doors, in pattern sequence from roll.

F. Remove excess wet adhesive from seams.

END OF SECTION

SECTION 09 90 00 - PAINTING AND COATING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes surface preparation and field application of paints, stains, varnishes, and other coatings.

B. Paint/Stain all exposed surfaces that are not pre-finished items, finished metal surfaces, operating parts, labels, or materials obviously intended to be left exposed such as brick and tile.
   1. CMU
   2. Steel and iron
   3. Galvanized metal
   4. Gypsum board.
   5. Hollow metal doors and frames
   6. Interior Wood Doors

C. Unless otherwise indicated do not paint concealed surfaces.
   1. Do not paint cabling, and protect communication cabling from overspray. Paint voids the warranty of cable and if painted shall be replaced at the painting contractor's expense.
   2. Do not paint fire alarm devices or sprinkler heads.

D. Obtain primers and undercoat materials for each coating system from the same manufacturer as the finish coats. Primer and finish coat shall be factory applied, finish coat shall be field applied.

E. Extra Materials: Deliver to Owner any leftover paint materials, properly labeled.

F. Minimum surface temperature of 50 degrees required for all coating systems.

G. Store all materials in tightly closed containers when not in use, away from heat, electrical equipment, sparks and open flames. Use approved bonding and grounding procedures. Keep out of the reach of children and residents.

H. Transfer materials to approved containers with complete and appropriate labeling.

1.2 SUBMITTALS

A. Product Data and Color Samples: Provide product data on each coating system component indicating VOC and environmental requirements. Coordinate coating systems for each material/substrate.

B. Provide draw down samples of each coating for final review and approval by Owner.

1.3 QUALITY ASSURANCE

A. Conform to all work place safety regulations for storage, mixing, application, and disposal of all paint related materials.

B. Surface Burning Characteristics:
   1. Fire Retardant Finishes: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.4 REFERENCES AND REGULATIONS:

A. Standards: Comply with applicable provisions and recommendations of the following, except when otherwise shown or specified:
   1. OSHA Safety Standards for the Construction Industry
   2. SSPC Volume 1, Good Painting Practice,
   3. SSPC Volume 2, Systems and Specifications, Surface Preparation Guide and Paint Application Specifications of the Steel Structures Painting Council.

4. SSPC and NACE Painter Safety Guidelines, latest editions.

B. Requirements of Regulatory Agencies, conform with the following:
   1. Clean Air Act (CAA)
   2. Clean Water Act (CWA)
   3. Toxic Substances Control Act (TSCA)

1.5 ENVIRONMENTAL REQUIREMENTS

A. Store and apply materials in environmental conditions required by manufacturer's instructions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturer's name, label, and the following list of information:
   1. Product name and type (description)
   2. Application & use instructions
   3. Surface preparation
   4. VOC content
   5. Environmental handling and an SDS
   6. Batch date
   7. Color number

B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.

C. Handling: Maintain a clean, dry storage area to prevent contamination or damage to the coatings.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not apply coatings under environmental conditions outside manufacturer's absolute limits.

1.8 MOCKUP

A. Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections and demonstrate aesthetic effects and set quality standards for materials and execution.

PART 2 PRODUCTS

2.1 PAINTS AND COATINGS

A. Manufacturers:
   1. Sherwin Williams [basis of design]

B. Paints and Coatings - General:
   1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such a procedure is specifically described in manufacturer's product instructions. VOCs need to be confirmed by using the products EDS sheets.

C. Primers:
   1. Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

D. Coating Application Accessories:

1. Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and cleanup materials required per manufacturer's specifications.

E. Colors: As selected from a full range of manufacturer's offerings, including premium colors.

F. Contractor shall provide for a minimum of paint colors per the drawings.

G. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.
1. Lead: Measurable lead content in either the pigment or binder will not be permitted.
2. The finish coats shall match colors selected.

H. Finish Quality:
1. Finishes shall exhibit a high quality, commercial grade appearance of uniform thickness.
2. Finishes shall be free of runs, sags, drips, waves, orange peel, festoons, dry spray, cloudiness, spotting, ropiness, brush marks, roller marks, fish eyes or other surface imperfections, voids, discontinuities, pinholes, holidays and overspray.
3. Final coat shall be uniform in texture, color and gloss, and shall provide an acceptable match with the approved drawdown sample sheet.

2.2 INTERIOR PAINT APPLICATION SCHEDULE

A. Metals - Ferrous: [Semi-Gloss Finish]
1. 1st Coat: S-W Pro Industrial™ Pro-Cryl® Universal Primer, B66-1300 Series (5.0 mils wet, 1.9 mils dry)
2. 2nd Coat: S-W Pro Industrial™ Semi-Gloss Acrylic, B66-650 Series (6.0 mils wet, 2.2 mils dry per coat)
3. 3rd Coat: S-W Pro Industrial™ Semi-Gloss Acrylic, B66-650 Series (6.0 mils wet, 2.2 mils dry per coat)

B. Metals – Aluminum / Galvanized: [Semi-Gloss Finish]
1. 1st Coat: S-W Pro Industrial™ Pro-Cryl® Universal Primer, B66-1300 Series (5.0 mils wet, 1.9 mils dry)
2. 2nd Coat: S-W Pro Industrial™ Semi-Gloss Acrylic, B66-650 Series (6.0 mils wet, 2.2 mils dry per coat)
3. 3rd Coat: S-W Pro Industrial™ Semi-Gloss Acrylic, B66-650 Series (6.0 mils wet, 2.2 mils dry per coat)

C. Wood: [Semi-Gloss Finish]
1. 1st Coat: S-W Premium Wall & Wood Latex Primer, B28W8111 (4.0 mils wet, 1.6 mils dry)
2. 2nd Coat: S-W ProMar® HP 200 Zero VOC Latex Semi-Gloss, B31-1900 Series (4.0 mils wet, 1.5 mils dry per coat)
3. 3rd Coat: S-W ProMar® HP 200 Zero VOC Latex Semi-Gloss, B31-1900 Series (4.0 mils wet, 1.5 mils dry per coat)

D. Wood: [Eg-Shel/Satin Finish]
1. 1st Coat: S-W Premium Wall & Wood Latex Primer, B28W8111 (4.0 mils wet, 1.6 mils dry)
2. 2nd Coat: S-W ProMar® 200 HP Zero VOC Latex Eg-Shel, B20-1900 Series (4.0 mils wet, 1.7 mils dry per coat)
3. 3rd Coat: S-W ProMar® 200 HP Zero VOC Latex Eg-Shel, B20-1900 Series (4.0 mils wet, 1.7 mils dry per coat)

E. Gypsum Board Walls: [Semi-Gloss Finish]
1. 1st Coat: S-W ProMar® 200 Zero VOC Latex Primer, B28W2600 (4.0 mils wet, 1.0 mils dry)
2. 2nd Coat: S-W ProMar® 200 HP Zero VOC Latex Eg-Shel, B31-1900 Series (4.0 mils wet, 1.5 mils dry per coat)
3. 3rd Coat: S-W ProMar® 200 HP Zero VOC Latex Eg-Shel, B31-1900 Series (4.0 mils wet, 1.5 mils dry per coat)

F. Gypsum Board Walls: [Eg-Shel/Satin Finish]
   1. 1st Coat: S-W ProMar® 200 Zero VOC Latex Primer, B28W2600 (4.0 mils wet, 1.0 mils dry)
   2. 2nd Coat: S-W ProMar® 200 HP Zero VOC Latex Eg-Shel, B20-1900 Series (4.0 mils wet, 1.7 mils dry per coat)
   3. 3rd Coat: S-W ProMar® 200 HP Zero VOC Latex Eg-Shel, B20-1900 Series (4.0 mils wet, 1.7 mils dry per coat)

G. Gypsum Board Ceilings: [Flat Finish]
   1. 1st Coat: S-W ProMar® 200 Zero VOC Latex Primer, B28W2600 (4.0 mils wet, 1.0 mils dry)
   2. 2nd Coat: S-W ProMar® 200 Zero VOC Latex Flat, B30-12600 Series (4.0 mils wet, 1.4 mils dry per coat)
   3. 3rd Coat: S-W ProMar® 200 Zero VOC Latex Flat, B30-12600 Series (4.0 mils wet, 1.4 mils dry per coat)

H. Stained Interior Finish Carpentry / Wood Doors [Pre-finished]
   1. 1st Coat: Wood Conditioner: SW Min-Wax Pre-Stain Wood Conditioner, One Coat
   2. 2nd Coat: Wood Stain: SW Min-Wax Performance Series Tintable Wood Stain 250 VOC, One Coat
   3. 3rd Coat: Sealer: SW Min-Wax Performance Series Fast-Dry Sanding Sealer, one coat.
   4. 4th Coat: Satin Varnish: SW Min-Wax Fast-Dry Polyurethane, two coats.

2.3 PRE-CLEANING AND SURFACE PREPARATION PRODUCTS

A. Pre-cleaning Agents
   1. SW No Rinse Prepaint Cleaner
   2. Krud Kutter
   3. Potable water

B. Pre-cleaning (Power Wash) Equipment
   1. Capacity to continuously deliver 3-5 gpm at 2,500 psig of 180-200 degree F hot water.
   2. Cleaning system shall affect the 32-ounce per gallon dilution.
   3. Manufacturer: Alkota, Model 565T with model 520 water heater or approved equal.
   4. Power wash with 15 degree tip capable of delivering hot water at 2500 psig.

C. Power Tool Surface Preparation Media:
   1. Scotch Brite No. 07451 by 3 M Corporation, Surface Conditioning disc.
      a. Texture: A Medium
      b. Maximum Speed: 18,000 RPM
   2. Clean ‘N" Strip Disco No CSD2 by 3 M Corporation
      a. Texture: Course
      b. Maximum Speed: 8,000 RPM

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of coatings until substrates have been properly examined and prepared. Notify Architect of unsatisfactory conditions before proceeding.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Proceed with work only after conditions have been corrected, and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

D. Previously Painted Surfaces: Verify that existing painted surfaces do not contain lead based paints, notify Architect immediately if lead based paints are encountered.

3.2 SURFACE PREPARATION

A. Comply with paint manufacturer's written instructions for surface preparation, environmental and substrate conditions, product mixing, and application.

B. Perform all surface preparation in accordance with SSPC specifications, guidelines and good painting practices.

C. Proper product selection, surface preparation, and application affect coating performance. Coating integrity and service life will be reduced because of improperly prepared surfaces. Selection and implementation of proper surface preparation ensures coating adhesion to the substrate and prolongs the service life of the coating system.

D. Selection of the proper method of surface preparation depends on the substrate, the environment, and the expected service life of the coating system. Economics, surface contamination, and the effect on the substrate will also influence the selection of surface preparation methods.

E. The surface must be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion. Recognize that any surface preparation short of total removal of the old coating may compromise the service length of the system.

F. Prior to attempting to remove mildew, it is always recommended to test any cleaner on a small, inconspicuous area prior to use. Bleach and bleaching type cleaners may damage or discolor existing paint films. Bleach alternative cleaning solutions may be advised.

G. Mildew may be removed before painting by washing with a solution of 1 part liquid bleach and 3 parts water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with water and allow the surface to dry before painting. Wear protective eyewear, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.

H. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50°F, unless products are designed specifically for these conditions. On large expanses of metal siding, the air, surface and material temperatures must be 50°F or higher to use low temperature products.

I. Methods:
   1. Aluminum: Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP1, Solvent Cleaning.
   2. Block (Cinder and Concrete): Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement, and hardeners. Concrete and mortar must be cured at least 30 days at 75°F unless the manufacturer’s products are designed for application prior to the 30-day period. The pH of the surface should be between 6 and 9 unless the products are designed to be used in high pH environments. On tilt-up and poured-in-place concrete, commercial detergents and abrasive blasting may be necessary to prepare the surface. Fill bug holes, air pockets, and other voids with a cement patching compound.
   3. Concrete, SSPC-SP13 or NACE 6: This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.

4. Cement Composition Siding/Panels: Remove all surface contamination by washing with an appropriate cleaner, rinse thoroughly and allow to dry. Existing peeled or checked paint should be scraped and sanded to a sound surface. Pressure clean, if needed, with a minimum of 2100 psi pressure to remove all dirt, dust, grease, oil, loose particles, laitance, foreign material, and peeling or defective coatings. Allow the surface to dry thoroughly. The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments.
5. Drywall—Exterior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting. Exterior surfaces must be spackled with exterior grade compounds.
6. Exterior Composition Board (Hardboard): Some composition boards may exude a waxy material that must be removed with a solvent prior to coating. Whether factory primed or unprimed, exterior composition board siding (hardboard) must be cleaned thoroughly and primed with an alkyd primer.
7. Galvanized Metal: Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP16 is necessary to remove these treatments.
8. Steel: Structural, Plate, etc.: Should be cleaned by one or more of the surface preparations described below. These methods are used throughout the world for describing methods for cleaning structural steel. Visual standards are available through the Society of Protective Coatings. A brief description of these standards together with numbers by which they can be specified follow.
9. Solvent Cleaning, SSPC-SP1: Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.
10. Hand Tool Cleaning, SSPC-SP2: Hand Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before Hand Tool Cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
11. Power Tool Cleaning, SSPC-SP3: Power Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before Power Tool Cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
12. White Metal Blast Cleaning, SSPC-SP5 or NACE 1: A White Metal Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPCSP1 or other agreed upon methods.
13. Commercial Blast Cleaning, SSPC-SP6 or NACE 3: A Commercial Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 33 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
14. Brush-Off Blast Cleaning, SSPC-SP7 or NACE 4: A Brush-Off Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose paint. Tightly adherent mill scale, rust, and paint may remain on

the surface. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP 1 or other agreed upon methods.

15. Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals, SSPC-SP16: This standard covers the requirements for brush-off blast cleaning of uncoated or coated metal surfaces other than carbon steel by the use of abrasives. These requirements include visual verification of the end condition of the surface and materials and procedures necessary to achieve and verify the end condition. A brush-off blast cleaned non-ferrous metal surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, metal oxides (corrosion products), and other foreign matter. Intact, tightly adherent coating is permitted to remain. A coating is considered tightly adherent if it cannot be removed by lifting with a dull putty knife.
16. Power Tool Cleaning to Bare Metal, SSPC-SP11: Metallic surfaces that are prepared according to this specification, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxide corrosion products, and other foreign matter. Slight residues of rust and paint may be left in the lower portions of pits if the original surface is pitted. Prior to power tool surface preparation, remove visible deposits of oil or grease by any of the methods specified in SSPC-SP1, Solvent Cleaning, or other agreed upon methods.
17. Near-White Blast Cleaning, SSPC-SP10 or NACE 2: A Near White Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 5 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
18. Water Blasting, NACE Standard RP-01-72: Removal of oil grease dirt, loose rust, loose mill scale, and loose paint by water at pressures of 2,000 to 2,500 psi at a flow of 4 to 14 gallons per minute.
19. Stucco: Must be clean and free of any loose stucco. If recommended procedures for applying stucco are followed, and normal drying conditions prevail, the surface may be painted in 30 days. The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments such as Loxon.
20. Wood—Exterior: Must be clean and dry. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied. Patch all nail holes and imperfections with a wood filler or putty and sand smooth.
21. Vinyl Siding, Architectural Plastics & Fiberglass or other PVC, plastic building products. Clean the surface thoroughly by scrubbing with warm, soapy water. Rinse thoroughly, prime with appropriate white primer. Do not paint vinyl with any color darker than the original color. Do not paint vinyl with a color having a Light Reflective Value (LRV) of less than 56 unlessVinylSafe® Colors are used. If VinylSafe® Colors are not used and darker colors lower than an LRV of 56 are, the vinyl may warp. Follow all painting guidelines of the vinyl manufacturer when painting. Only paint properly installed vinyl siding. Deviating from the manufacturer'spainting guidelines may cause the warranty to be voided.

3.3 APPLICATION

A. Examination and Verification of Condition: Contractor shall verify the areas and conditions under which the work is to be performed and notify the Owner in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until satisfactory conditions have been corrected. Do not coat over chalk, dirt, scale, moisture, oil, surface contaminants, coatings that have exceeded the manufacturer’s re-coat guidelines, or conditions otherwise detrimental to the formation of a durable high quality coating system.

B. Comply with manufacturer’s instructions and SSPC Good Paint Practices Volumes 1 and 2.

C. Comply with OSHA regulations, State of Ohio and Federal laws, ordinances, and guidelines.

D. Follow manufacturer's requirements for temperature and humidity at time of application.

E. Refer to SDS sheets before using any product.

F. All surfaces must be thoroughly dry before coating applications. Do not apply to wet or damp surfaces.
   1. Wait at least 30 days before applying to new concrete or masonry or follow manufacturer's procedures to apply appropriate coatings prior to 30 days.
   2. Test new concrete for moisture content.
   3. Wait until wood is fully dry after rain or morning fog or dew.

G. Apply coatings using brush or roller only.

H. Apply all coatings and materials with the manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendation.

I. Apply coatings using methods recommended by manufacturer.

J. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

K. Apply coatings at spreading rate required to achieve the manufacturer's recommended dry film thickness.

L. Regardless of number of coats specified, apply as many coats as necessary for complete hide.

M. Exterior Woodwork: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 2 weeks.

N. Inspection: The coated surface must be inspected and approved by the Architect or Engineer just prior to the application of each coat.

3.4 CLEAN UP

A. Clean site and remove debris and empty cans daily. Remove all paint from adjacent surfaces. Clean spills and splatters immediately.

B. Clean hands and tools immediately after use with soap and water for water based products and with mineral spirits for oil based products.

C. Follow manufacturer's safety recommendations when using mineral spirits.

3.5 ENVIRONMENTAL REQUIREMENTS

A. Store and apply materials in environmental conditions required by manufacturer's instructions.

END OF SECTION

SECTION 10 14 00 - SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Plastic interior panel signs for room identification.

1.2 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

B. Shop Drawings: Detail drawings showing sizes, lettering and graphics, construction details of each type of sign and mounting details with appropriate fasteners for specific project substrates.

C. Manufacturer's Installation Instructions: Printed installation instructions for each signage system.

D. Message List: Signage report indicating signage location, text, and sign type.

E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and available pictograms, characters, and Braille indications.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum three years documented experience in work of this Section.

B. Installer Qualifications: Minimum three years documented experience in work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in unopened factory packaging.

B. Inspect materials at delivery to verify there are no defects or damage.

C. Store products in manufacturer's original packaging until ready for installation in climate controlled location away from direct sunlight.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials in accordance with requirements of local authorities having jurisdiction.

1.5 PROJECT CONDITIONS

A. Install products in an interior climate controlled environment.

B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 INTERIOR SIGNAGE

A. Manufacturers
   1. ASI Sign Systems
   2. Diskey Architectural Signage
   3. Nova Polymers
   4. Equal

2.2 PERFORMANCE REQUIREMENTS

A. General Requirements:
   1. Comply with all applicable provisions of the ANSI A117.1 Accessibility Requirements.
   2. Character Proportion: Letters and numbers on signs must have a width-to-height ratio between 3:5 and 1:1 and a stroke width-to-height ratio between 1:5 and 1:10.
   3. Color Contrast: Characters and symbols must contrast with their background - either light characters on a dark background or dark characters on a light background.
   4. Raised Characters or Symbols: Letters and numbers on signs must be raised 1/32 inch minimum and be sans serif characters. Raised characters or symbols must be at least 5/8 in high but no higher than 2 inches. Symbols or pictograms on signs must be raised 1/32 in minimum.
   5. Symbols of Accessibility: Accessible facilities required to be identified must use the international symbol of accessibility.
   6. Braille: Type II with accompanying text.

2.3 MATERIALS

A. Acrylic Sheet: ASTM D4802, Category A-1 cell-cast sheet; Type UVF [UV filtering]

B. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.

C. Molded Plastic Characters: Thermoformed or injection molded
   1. Laminated impact acrylic sheet signage:
   2. Finish: non-Glare
   3. Engraving Method: Rotating carbinde
   4. Thickness: 1/8 inch
   5. Engraving Depth: 0.012
   6. Braille: Type II, Raised room numbers
   7. Colors: to be selected, 2 colors, with contrasting color scheme
   8. Installation: Adhered

2.4 INTERIOR SIGNS

A. Acrylic Panel, fabricated in accordance with one of the following methods:
   1. Inlayed acrylic signs
      a. Acrylic sheet shall be CNC cut to specifications with square or radius corners, and/or custom shapes, 0.080 inch minimum.
      b. 1/32 inch modified acrylic plate shall be adhered to the acrylic plate with a high bond chemical adhesive and the text and/or symbols shall be CNC cut to specifications.
      c. Corresponding text and/or symbols shall be CNC cut from 1/16 inch modified acrylic embedded 1/32 inch and bond with chemical adhesive to the acrylic plate.
      d. Domed grade 2 Braille shall be embedded in the surface.
      e. Comply with requirements indicated for material, color, finish, design, shape, size, and details of construction.
   2. Double panel (window) sign with changeable insert(s).
      a. Tactile appliqué: Opaque, single ply, modified acrylic sheet not less than 0.032 inch in thickness.
      b. Braille: Braille dots shall consist of 0.0625 optically clear UV stable acrylic spheres.
      c. Face laminate: Clear, non-glare, cast acrylic sheet not less than 0.080 inch in thickness.
      d. Backing sheet: Expanded PVC sign board or acrylic sheet not less than 0.125 inch in thickness.
      e. Changeable insert: Provide one of the following:
         1) Polystyrene not more than 0.032 inch in thickness with pressure sensitive vinyl copy or digitally printed graphics.

2) 0.020 inch thick clear lexan with vinyl letters.

B. Interior Panel Sign Types:
1. Provide capacity signs for rooms constituting a place of assembly.
a. Provide capacity sign on the interior of all assembly spaces indicating “MAXIMUM CAPACITY XX OCCUPANTS”. For number of occupants, refer to Room Finish Schedule.
2. Toilet Room Handicapped Signs: Provide one sign depicting International Men/Women Symbol along with the words “Men” or “Women” indicated on the sign at each toilet room, equipped with facilities for the handicapped.
3. Interior Room Name and Number Signs
a. Layout of room name and number shall be as directed by the A/E.
b. Number of signs required:
1) Doors off halls, corridors, and passages.
2) All spaces listed in Finish Schedule. If more than one door to a space, a sign will be required for each door.
c. Provide signs with clear acrylic nameplate as indicated on Signage Types.
4. Storage Signs: Provide signs at mechanical, electrical rooms to read as follows: “COMBUSTIBLE STORAGE NOT PERMITTED”
5. Equipment Intended for the Use of the Fire Department or Other Emergency Responders: Provide signs identifying and locating the following equipment. Locate signs in corridors near rooms containing the following:
a. Air-conditioning systems.
b. Sprinkler risers and valves.
c. Other fire-detection, -suppression, or -control elements.

C. Contractor to provide temporary signage as needed to obtain final inspections for building permits.

2.5 FABRICATION

A. General: Provide manufacturer's standard signs of configurations indicated.
1. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
2. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
3. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.
4. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

B. Subsurface-Applied Graphics: Apply graphics to back face of clear faced-sheet material to produce precisely formed image. Image shall be free of rough edges.

C. Shop and Subsurface-Applied Vinyl: Align vinyl film in final position and apply to surface. Firmly press film from the middle outward to obtain good bond without blisters or fish mouths.

2.6 ACRYLIC SHEET FINISHES

A. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for five years for application intended.

PART 3 EXECUTION

3.1 INSTALLATION

A. General: Install signs and accessories, using mounting methods of types described and complying with manufacturer's written instructions.
   1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
   2. Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.
   3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
   4. Install signs so they do not protrude or obstruct according to the accessibility standard.

B. Accessibility Signs: Installation height and location shall comply with applicable provisions in the U.S. Architectural and Transportations Barriers Compliance Board’s ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.
   1. Height above finish floor or ground: Tactile characters on signs shall be located 48 inches minimum above the “finish” floor or ground surface, measured from the base line of the lowest tactile character and 60 inches maximum above the finish floor or ground surface, measured from the baseline of the height tactile character.
   2. Location: Where a tactile sign is provided at a door, the sign shall be located alongside the door latch side. Where a tactile sign is provided at double doors with one active leaf, the sign shall be located on the inactive leaf. Where a tactile sign is provided at double doors with two active leafs, the sign shall be located to the right of the right hand door. Where there is no wall space at the latch side of a single door or at the right side of double doors, signs shall be located on the nearest adjacent wall. Signs containing tactile characters shall be located so that a clear floor space of 18 inches minimum by 18 inches minimum, centered on tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.

END OF SECTION

SECTION 10 21 13 - TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Solid phenolic toilet compartments.

1.2 SUBMITTALS

A. Product Data: Panel construction, hardware, and accessories.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall and ceiling supports, door swings.

C. Samples: Two compartment samples, illustrating panel finish, color, and sheen.

D. Manufacturer's Instructions: Special procedures, perimeter conditions requiring special attention.

E. Qualifications Statements:
   1. Qualifications for manufacturer and installer.
   2. Manufacturer's approval of installer.

1.3 EXISTING CONDITIONS

A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

1.4 WARRANTY

A. Furnish twenty five-year manufacturer's warranty for defects in material and workmanship.

PART 2 PRODUCTS

2.1 SOLID PLASTIC TOILET COMPARTMENTS

A. Manufacturer List:
   1. ASI Global Partitions: Black Phenolic Core [Basis of Design]
   2. Approved Equal.

B. Toilet Compartments: Floor Set, Overhead Braced

C. Urinal Screen: Wall hung with floor brace.

D. Door, Panel, and Pilaster Construction: Solid phenolic-core material with melamine facing on both sides fused to substrate during manufacture (not separately laminated), and with eased and polished edges. Provide minimum 3/4-inch- thick doors and pilasters and minimum 1/2-inch- thick panels. Provide with no-sightline system consisting of door and pilaster lapped edges on strike side of door and door and pilaster lapped edges on hinge side of door (unless continuous hinge is used).

E. Pilaster Shoes and Sleeves: Manufacturer’s standard design, stainless steel.
   1. 22 gage stainless steel with satin finish, 3 inch height.

F. Brackets:
   1. Full Height Continuous Type, unless otherwise noted. Manufacturer’s standard design, extruded aluminum or stainless steel.
   2. Provide stirrup type, ear, or U-brackets, clear anodized aluminum or stainless steel at accessible units as required to provide a minimum 32 inch wide clear width with the door open at 90 degrees.

G. Doors and Divider Panels: Privacy stile, no sightlines / gap free

1. Nominal 58 inch high doors, mounted 12 inches above the finished floor.
2. Dividing Panels: slotted on one edge to accept wall bracket.

H. Sightlines: Provide brackets and components to provide no minimum sightlines.

I. Phenolic Compartment Finish:
   1. Dark Color Phenolic: Manufacturer's standard dark color core and edge
   2. Facing Sheet Color: As selected by Architect from full range of available colors.

2.2 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design [commercial grade], heavy-duty operating hardware and accessories. Clear anodized aluminum or stainless steel.
   1. Hinges: concealed, self closing type, adjustable.
   2. Thumbturn latch, with emergency access, accessible type at accessible compartments. Provide visual indicator at public side of compartment.
   3. Door strike and keeper with rubber bumper
   4. Coat Hook, mounted on door panel, rubber tipped, sized to prevent door from hitting compartment mounted accessories.
   5. Door Pulls: locate at both sides of doors for accessible compartments, at pull side of standard compartments.

B. Anchorages and Fasteners: manufacturer's standard exposed fasteners of stainless steel or chrome plated steel or brass, finished to match hardware, with theft-resistant type heads.

2.3 FABRICATION

A. Fabricate toilet compartments to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

B. Floor-Anchored Units: Manufacturer's standard corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

C. Overhead-Braced Units: Provide manufacturer's standard corrosion resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit conditions. Make all required provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

D. Doors: provide doors sized as indicated on drawings. Provide required clearance for accessible compartments.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify:
   1. Field measurements are as indicated on Shop Drawings.
   2. Correct spacing of and between plumbing fixtures.
   3. Correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install compartments rigid, straight, level, and plumb. Secure compartments in position with manufacturer's recommended anchoring devices.

B. Maintain maximum of 1/2 inch space between wall and panels and between wall and end pilasters.

C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.

D. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with not less than two fasteners. Hang doors to align tops of doors with tops of panels and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

E. Wall-Hung Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb and to resist lateral impact. Attach panel brackets securely to walls using anchor devices.

3.3 TOLERANCES

A. Maximum Variation from Indicated Position: 1/4 in.

B. Maximum Variation from Plumb: 1/8 in.

3.4 FIELD QUALITY CONTROL

A. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.5 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 in.

B. Adjust hinges to position doors in partially open position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

3.6 CLEANING

A. Clean partition and screen surfaces with materials and cleansers according to manufacturer's recommendations.

END OF SECTION

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SECTION 10 26 41 – BALLISTIC FIBERGLASS PANELS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Ballistic Wall protection System

1.2 SUBMITTALS

A. Product Data: Submit data on ballistic wall panels.

1.3 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project site with the manufacturer's UL Listed Labels intact and legible. Handle the materials with care to prevent damage. Store materials inside and under cover, stack flat and off floor. Project conditions (temperature, humidity, and ventilation) shall be within the maximum limit recommendations provided by manufacturer. Do not install products stored in conditions outside manufacturer's recommended limits.

PART 2 PRODUCTS

2.1 BALLISTIC WALL PANELS

A. Manufacturers:
   1. Total Security Solutions [basis of design

B. Fiberglass Armor, Reinforced structural polyester laminate with bullet resisting characteristics. Flat, opaque panels, sized as required. UL 752, Level 1, approximately thickness of 1/4 inch, approximate weight of 2.55 lb/SF
   1. Fiberglass BR Opaque Armor, BB-1 by Total Security Solutions or Equal

C. General Requirements:
   1. Through the design, manufacturing techniques and material application, the TSS Total Armor Bullet Resistant Fiberglass panels shall be made of multiple layers of woven roving ballistic grade fiberglass cloth impregnated with a thermoset polyester resin and compressed into flat rigid sheets.
   2. TSS Total Armor Bullet Resistant Fiberglass will be rated and tested for UL 752 and NIJ—0108.01 at the Level indicated by the product selected

2.2 FABRICATION

A. Tolerances: All joints and connections shall be tight, providing hairline joints and true alignment of adjacent members.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions are ready to receive work.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and UL 752.

B. Install ballistic wall protection system over the framing where indicated on the Drawings. Install to manufacturer standards, including laps, seams, as well as required reinforcement of all seams and edges.

END OF SECTION

SECTION 10 28 00 – TOILET ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Toilet accessories.

1.2 SUBMITTALS

A. Product Data: Accessories, describing size, finish, details of function, and attachment methods.

1.3 QUALITY ASSURANCE

A. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirements as applicable.
   1. Where the bottoms of units are between 27 and 80 inches above the finished floor, accessories mounted on or in the wall cannot protrude more than 4 inches into a clear access aisle.

1.4 WARRANTY

A. Furnish fifteen-year manufacturer's warranty for mirror glass and stainless steel mirror frames.

PART 2 PRODUCTS

2.1 TOILET AND BATH ACCESSORIES

A. Manufacturer List:
   1. Bobrick
   2. ASI
   3. Bradley
   4. Approved Equal

B. Performance Requirements
   1. Accessibility Requirements: Comply with requirements applicable in jurisdiction of project, including but not limited to ADA and ICC/ANSI A117.1 requirements as applicable.
      a. Where bottoms of units are between 27 and 80 inches above finished floor, accessories mounted on or in wall cannot protrude more than 4 inches into a clear access aisle.
   2. Structural Performance: Accessories and fasteners to comply with the following requirements:
      a. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.
      b. Shower Seats: Installed units are able to resist 250 lbf applied in any direction and at any point.
   3. 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.
      a. Hand Dryers: Certified to Underwriters Laboratories (UL); bear UL or ETL markings.

2.2 MATERIALS

A. Stainless Steel: ASTM A 240 or A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.

B. Steel Sheet: ASTM A 1008, Designation CS (cold-rolled, commercial steel), 0.0359-inch minimum nominal thickness.

C. Galvanized-Steel Sheet: ASTM A 653, with G60 hot-dip zinc coating.

D. Galvanized-Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper and-theft resistant where exposed, and of galvanized steel where concealed.

F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0-mm thick.
   1. Provide mirror furnished with a uniform plastic film 8 mils nominal thickness with acrylic adhesive which is moisture resistant and non-corrosive, meeting 16 CFR 1201-11 and ANSI 297.1 requirements category II tape back.

H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.3 FINISHES

A. Stainless Steel: No. 4 satin brushed finish, unless otherwise indicated.

B. Chrome/Nickel Plating: ASTM B456, Type SC 2, polished finish, unless otherwise indicated.

C. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats electrostatic-baked enamel.

D. Galvanizing: ASTM A123; hot-dip galvanize after fabrication.

2.4 TOILET ROOM ACCESSORIES [COORDINATE WITH DRAWINGS]

A. Toilet Paper Dispenser: surface mounted, Provided and installed by Contractor.

B. Paper Towel Dispenser: surface mounted, Provided and installed by Contractor.

C. Waste Receptacle: semi-recessed, provided and installed by Contractor

D. Soap Dispenser: wall mounted, Provided and installed by Contractor

E. Mirrors: Stainless-steel-framed, 6-mm-thick float glass mirror, provided and installed by Contractor
   1. Size: as indicated on Drawings.
   2. Frame: 0.05 in angle shapes, with mitered**,** welded and ground smooth corners, and tamper-proof hanging system; satin stainless steel finish.
   3. Backing: Full mirror sized, galvanized steel sheet and nonabsorptive filler material.

F. Grab Bars: Stainless steel, 1-1/2 in outside diameter, minimum 0.05 in wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 in clearance between wall and inside of grab bar, provided and installed by Contractor
   1. Length and configuration: As indicated on Drawings.

G. Sanitary Napkin Disposal Unit: surface mounted, Provided and installed by Contractor

H. Toilet Seat Cover Dispenser: surface mounted, Provided and installed by Contractor

I. Pipe Wrap: Provided and installed by Contractor

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify:
   1. Exact location of accessories for installation.
   2. Field measurements and rough-in dimensions for recessed accessories are as indicated on product data or as instructed by manufacturer.

B. Coordinate locations for installation of blocking, reinforcing plates, concealed anchors in walls.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to Site for timely installation.

B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Do not install accessories until after completion of all finishes to adjacent wall and ceiling surfaces.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Turn over to Owner all keys and special tools required for lockable or secured accessories.

D. Mounting Heights and Locations: As required by accessibility regulations and as indicated on Drawings:

3.4 CLEANING

A. Clean mirrors and exposed surfaces using procedures as recommended by accessory manufacturer.

END OF SECTION

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SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Fire extinguishers; fire extinguisher cabinets.

1.2 PERFORMANCE REQUIREMENTS

A. Conform to **NFPA 10 and City of Moraine Fire Department Requirements**.

B. Provide extinguishers classified and labeled by UL for purpose specified and indicated.

C. Provide fire extinguisher cabinets classified and labeled by UL or testing firm acceptable to authority having jurisdiction for purpose specified and indicated.

1.3 SUBMITTALS

A. Shop Drawings: Indicate cabinet physical dimensions, rough-in measurements for recessed cabinets, wall bracket mounted measurements, location, fire ratings.

B. Product Data: Extinguisher operational features, color and finish, anchorage details.

C. Manufacturer's Installation Instructions: Special criteria and wall opening coordination requirements.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Test, refill or recharge schedules, and re-certification requirements.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not install extinguishers when ambient temperature are capable of freezing extinguisher ingredients.

PART 2 PRODUCTS

2.1 FIRE EXTINGUISHERS

A. Manufacturers:
   1. Larsen
   2. JL Industries
   3. Babcock Davis
   4. Equal

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, “Portable Fire Extinguishers”.

C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

D. Dry Chemical Type: Aluminum tank, with pressure gage; Class A: B: C, Size 10.

E. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

2.2 FIRE PROTECTION CABINETS

A. Manufacturers:

1. Larsen or
2. JL Industries
3. Babcock Davis
4. Equal.

B. Metal: Formed sheet steel, white baked enamel finish.

C. Configuration: Semi-recessed type with rolled edge trim, sized to accommodate accessories.

D. Door: Full Panel steel with clear acrylic glazing; latch access.

E. Cabinet Mounting Hardware: Appropriate to cabinet.

F. Form cabinet enclosure with right angle inside corners and seams.

G. Pre-drill for anchors.

H. Hinge doors for 180-degree opening with continuous piano hinge.

I. Weld, fill, and grind components smooth.

J. Glaze doors with resilient channel gasket glazing.

2.3 ACCESSORIES

A. Extinguisher Brackets: Formed steel, white enamel finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION

A. Install cabinets maximum 48 inches from finished floor to top of extinguisher handle.

B. Install wall brackets maximum 48 inches from finished floor to top of extinguisher handle.

C. Position cabinet signage as required by authorities having jurisdiction.

END OF SECTION

SECTION 12 48 13 - ENTRANCE FLOOR MATS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Entrance Carpet Tile.

1.2 SUBMITTALS

A. Product Data: Indicate mat characteristics, component dimensions.

B. Samples: Two samples, illustrating pattern, color, finish, edging.

1.3 WARRANTY

A. Lifetime Limited Warranty, including face wear, moisture barrier, wick-back, delamination, tuft bind, unraveling, and static protection.

B. Stain Resistance Warranty: 15 years

PART 2 PRODUCTS

2.1 FLOOR MATS

A. Manufacturers:
   1. Patcraft Access, Walk Forward – 5T032, 31751 [Basis of Design, Refer to Finish Schedule on Drawings]
   2. Approved Equal

B. Entrance Tile; carpet tiles shall be specifically designed for use in entries to reduce the amount of contaminates tracked into occupied space.
   1. Indoor Air Quality (IAQ): CRI IAQ Certification “Green Label Plus”.
   2. Flammability – Radiant Panel Test: Class I, ASTM E648.
   3. NBS Smoke: <450 Flaming Mode, ASTM E662.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install mats surface-applied to existing concrete flooring after cleaning / prep of existing concrete slab.

B. Provide all required transition strips at door thresholds at exterior doors and to new concrete finish flooring system at hallway / adjacent spaces.

END OF SECTION

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SPRINKLER/FIRE PROTECTION

SECTION 15300

INDEX

1. RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions and Division 1 - General Specifications, apply to work specified in this section.

2. SCOPE

A. The work included in this section shall consist of the furnishing of all materials, equipment and labor which is necessary to install all the sprinkler work as shown on the drawings and as specified hereinafter, including the testing and adjustment of same. All work shall be done in strict accordance with all applicable Local, State and Federal codes and regulations including the recommendations of the NFPA and the requirements of the NEC. In no case shall work be installed contrary to or below the minimum legal standards or in violation of applicable codes.

B. The following item presents a summary of the principal categories of work included in this section. Note, however, that this summary is for general information only and the work is not necessarily limited to these categories. The detailed drawings and the specifications cover the full extent of the work.

3. DESCRIPTION OF WORK

A. The work under this section shall include the following:

1. System modifications for a complete and fully operational fire suppression system as indicated on the drawings and as specified hereinafter.

2. All materials and equipment installed under this section shall be listed by Underwriter's Laboratories and shall be approved by Factory Mutual and the Owner's insurance carrier.

3. The systems shall be installed and tested in accordance with all applicable rules and regulations of the local fire department, the National Fire Protection Association, the State Inspection Bureau and Insurance Services Office, Industrial Risk Insurers, Factory Mutual Requirements, the Owner's insurance carrier.

4. Unless otherwise noted, wet sprinkler system(s) shall be provided in all areas.

5. Submittal of drawings and/or calculations made to local and/or state authorities for approval if required.

6. Complete responsibility for an acceptable and approved system(s) layout meeting the requirements indicated on the drawings. Any piping shown on the drawings shall be considered as diagrammatic. Fitting the piping and

equipment to job conditions and cooperation with other trades will be required under this section of the work. The system, as proposed, shall conform with National Fire Protection Association regulations as contained in NFPA No. 13, 14, 20 and the local Bureau of Fire Protection.

7. Note that all sprinklered areas shall be based on light hazard classification unless otherwise noted.

   a. All sprinklers in light hazard occupancies shall be of the quick-response type in accordance with the latest edition of NFPA 13.

8. All labor, material, tools, scaffolding and transportation which may be required to complete the work and carry it to a successful conclusion ready for operation when turned over to the Owner.

9. Complete testing and warranty of all work installed under this section.

B. All takeoffs to individual sprinklers shall be done with riser and swing joint.

C. All sprinkler piping concealed in areas with finished ceilings.

4. SITE INVESTIGATION

A. Prior to bidding, it is recommended that the contractor visit the job site and investigate all details which may have any effect on the installation, progress or completion of the project.

B. When a bid is received, it will be assumed that the contractor has made the job site visit(s) and is familiar with the conditions as they exist and any adjustments and/or modifications that may be necessary in order to perform and complete the work as specified.

C. At project start-up, certain areas will be designated for the storage of materials and equipment and cooperation with the Owner in minimizing interference with existing operations will be mandatory.

5. WORK DONE BY OTHERS

A. Each bidder shall become familiar with the entire project specification in order to properly delineate the areas of responsibility between trades.

B. Work to be done by others in connection with the work of this section shall include the following:

1. Painting of exposed pipes and equipment will be done by others, except where specifically noted in the following items of this specification.

2. Any related equipment for this system(s) that is to be furnished by others shall be roughed-in and, where indicated, connected as part of the work under this section.

6. DRAWINGS

A. The drawings prepared for this project are an outline to show where pipes, apparatus, equipment, etc. should be located in order to fit within the confines of available space and minimize conflicts with other trades. All work must be installed in accordance with the drawings insofar as possible. All drawings shall be carefully checked during the course of bidding and construction. If any discrepancies, errors or omissions are discovered prior to or during the construction phase, notify the Engineer immediately for interpretation or correction. Note that an overlap with another trade does not relieve the contractor from the obligation of performing the work indicated on the drawings for this section of the project unless written notification stating such is obtained from the Engineer.

B. Take all necessary measurements and be responsible for same, including clearances for all materials and equipment that will be furnished. The Architect/Engineer shall reserve the right to make minor location changes of piping and/or equipment where such adjustments are deemed desirable from an appearance or operational standpoint. Such changes will normally be anticipated sufficiently in advance to avoid extra work or unduly delay progress on the project.

C. The general building drawings shall be used to obtain dimensions and exact locations and as a check with other contractors to avoid interference with their work. Prior to making any layout drawings refer to applicable drawings on all branches of the work where other trades are involved on the project. Also, be involved with the other trades in producing coordination drawings so that added field work and/or job delays resulting from conflicts between crafts can be avoided. Piping that has been prefabricated before coordinating with the other trades will have to be re-done at no additional cost to the Owner if conflicts are encountered.

D. Note that the piping shown on the drawings shall be considered as diagrammatic for clearness in indicating the general run, connections required, etc., and may not in all cases be shown in its true position. The piping and equipment may have to be offset, lowered or raised as required or as directed at the site in order to accommodate field conditions.

7. SPECIFICATIONS

A. Specifications shall be interpreted in conjunction with the drawings hereinbefore described and if anything is shown on the drawings and not mentioned in the specifications or vice versa, it is to be included in the work the same as though clearly set forth by both.

B. Furthermore, all materials or labor obviously required to fully complete the work shall be included in the bid, even though each item necessarily involved is not specifically mentioned or shown. Such work and/or material shall be furnished and shall be of the same grade or quality as the parts actually specified and shown. Should there be a conflict between the plans and specifications, the greater quantity or better quality shall be furnished.

C. Should an overlap of work between the various trades become evident, the Engineer shall be notified. Such an event shall not relieve any trade of the responsibility for the work called for under his branch of the specifications until a written clarification or directive is issued concerning the matter.

D. When selecting equipment to be used on this project, refer to Item EQUIPMENT CLEARANCES AND REQUIREMENTS in these specifications.

E. All references made to codes, standards, etc. in these specifications or on the drawings shall be taken to mean the latest edition, amendment and/or revision of such reference in effect as of the date indicated on the Bid Documents.

8. PERMITS, FEES, INSPECTION, LAWS AND REGULATIONS

A. Obtain and pay for all permits required in connection with this section of the work. In addition, pay all necessary inspection fees or similar charges. Laws and regulations which bear upon or affect this work shall be complied with and are hereby made a part of this section of the work. All work which such laws require to be inspected shall be submitted to the proper public officials for inspection. In no case shall work be installed contrary to or below the minimum legal standards or in violation of applicable code requirements. Where the drawings and/or specifications exceed legal standards, the requirements of these bid documents shall govern.

B. All fees incidental to the physical connection of fire protection services shall be paid under this section of the work.

C. At completion of the project furnish to the Owner, at no additional charge, a certificate(s) of inspection issued by the authorized agency (or agencies) having jurisdiction over this portion of the project, stating that all work executed under this section complies with the minimum requirements.

D. Additional fees, charges, etc. imposed by other contractors and/or tradesmen, professional consultants, etc. for services rendered in connection with performing any portion of the work under this section shall be included as part of the work. This shall include surveys, profiles and/or other miscellaneous drawings, etc. that may be required in addition to the contract documents by any governing authority.

9. SHOP DRAWINGS

A. Prepare, or obtain from the manufacturer, certified shop or erection drawings of all items of equipment, piping and systems to be furnished under this section and submit copies of same as required for review. This shall be done as soon as possible, well prior to proceeding with installation or construction and in the proper sequence to avoid delays in the work, the work of the Owner or other contractors. Unless otherwise indicated, a minimum of six (6) hard copy sets OR one (1) electronic set shall be submitted. These drawings shall be complete in every respect, showing pertinent details of size, capacities, arrangement, fittings, piping kinds and thickness of materials, weight, loading required, clearances for service, maintenance, etc. Departures or deviations, if any, from the specifications, listed performance data, etc., shall be called out on the submittals. **NOTE:** Where departures or deviations from the specifications do occur, the contractor shall additionally itemize same on the cover sheet that accompanies the submittals. Failure to do so will risk subsequent delay or rejection at the job site (With regard to voluntary substitutions, refer also to Item BIDDING in this specification).

B. By submitting such drawings, the Contractor represents that he has selected and verified conformance of the proposed materials and equipment to the specifications, has verified the adequacy of the space available and/or taken necessary field measurements, and has noted field construction criteria, etc. related thereto, or will do so. In addition, it will be assumed that the Contractor has checked and coordinated the information contained within such submittals with the requirements of the Work and the Contract Documents as noted in the previous paragraph.

C. Materials and equipment to be furnished for this project shall be of current production by manufacturers regularly engaged in the manufacture of such items. When two or more units are required, they shall be the product of one manufacturer.

D. The review of shop drawings shall not be construed as a complete check but will indicate only that the rating, capacity, general method of construction and/or detailing is satisfactory. It does not involve determining the accuracy or completeness of such particulars as dimensions or quantities or indicating full and complete compliance with the specifications. In addition, it does not deal with the means, methods or procedures of fabrication and installation. The Contractor shall carefully check and verify dimensions for installation and service requirements before ordering equipment for the project.

E. Submittals and certified shop drawings prepared by the contractor shall be itemized on a standardized shop drawing submittal form. Equipment submittals and contractor prepared drawings shall include the name of the project, specification section, paragraph and/or drawing number(s) applicable to submittal and shall bear the contractor's review stamp as evidence that the items have been initially checked for compliance with Contract Documents as stated above.

F. After review, shop drawings will be returned five (5) hard copy sets OR one (1) electronic set, marked in one of the following ways:

1. "NO EXCEPTIONS NOTED" - Copies may be distributed as required for construction, shipment, etc. to proceed.

2. "EXCEPTIONS NOTED" - Contractor may proceed with and/or authorize construction, shipment, etc. taking into account the necessary corrections.

3. "EXCEPTIONS NOTED - REVISE AND RESUBMIT - Contractor will be required to resubmit shop drawings in their entirety. No fabrication, erection or installation shall be authorized or initiated until shop drawings so marked have been completely revised, resubmitted and subsequently marked in accordance with either of the two preceding subparagraphs. Only shop drawings officially marked "NO EXCEPTIONS NOTED" or "EXCEPTIONS NOTED" will be permitted on the job site.

G. Upon return of submittals, take appropriate action as specified above. Note that any shop drawing hard copies received beyond the number required will be destroyed (not returned).

H. Where resubmittal is required, four (4) hard-copies OR one (1) electronic copy will be so noted by the reviewer, of which two (2) hard-copies OR one (1) electronic copy will be returned for corrections (one (l) hard-copy for the contractor and one (l) hard copy for the supplier/subcontractor).

I. The following is a list, where applicable, of items requiring submittals.

1. Pipe
2. Pipe Fittings
3. Sprinklers
4. Certified Shop Drawings
5. Hydraulic Calculations, if required

J. Shop drawings will be provided by the Owner for any Owner furnished equipment requiring connections under this section.

K. Submittals and Shop Drawings for manufactured items shall be manufacturer's printed literature. Equipment selections shall be within manufacturer's printed recommended ratings.

L. A complete set of shop drawings, officially marked in the prescribed manner noted previously, shall be filed on the job site. Such drawings shall be kept together, maintained in good condition, and shall be readily available for reference.

10. MATERIALS AND WORKMANSHIP

A. Materials used shall be those specified herein unless proposals for the use of alternate materials have been submitted and accepted. Materials shall be strictly

first grade of their kind and shall be new and in first class condition when installed. Materials damaged in transit or otherwise will be rejected and must be replaced by proper and acceptable materials. Materials shall be similar and in accordance with the provisions of this specification.

B. Exact locations of electric outlets, piped equipment, piping, lighting fixtures, ducts, etc., shall be coordinated as described in Item DRAWINGS, so there will be no interference at installation.

C. Locate and install piping so 1/2" minimum clearance is maintained.

D. All pipe shall run straight between fittings and all work shall be run in straight horizontal and vertical lines and parallel to building lines wherever possible. Ream ends of pipes to remove fins, burrs, etc., to full inside diameter and see that insides of pipes are clean before being placed in position. Open ends of pipelines or equipment shall be properly capped or plugged until final connection to keep dirt or other foreign material out of system.

E. All piped equipment shall be connected using flanges, unions or grooved end couplings. Flanged joints shall be made with screw flanges making a tight joint without peening. Flanges shall be faced perfectly true, and joints shall be made with ring gaskets (See Item PIPE FITTINGS).

F. Valves and specialties shall be placed as to permit easy operation and access, and valves shall be regulated, packed and adjusted as required at the completion of work before final acceptance. Gate valves should be installed with their stems in the vertical (up) position if possible. These valves shall not be installed with their stems below the horizontal position. Control valves and other miscellaneous equipment requiring adjustment shall be adjusted to setting indicated or as directed.

G. Welding of steel piping shall be done by a competent welder certified per procedure suggested by published AWS Specifications and required by enforcing bodies.

H. Welding of beveled end steel pipe and/or butt weld fittings shall be accomplished using welding rings. Rings shall be groove type with knock-off spacer pins.

I. Changes in direction and intersections of pipelines shall be made with standard, specification type fittings as required and as called for under Item PIPE FITTINGS. Mitering of pipe or similar procedures will not be permitted. Welding shall be accomplished using butt or socket weld fittings, however, branch connections may be made using forged branch outlet fittings provided the nominal diameter of the branch line does not exceed 1/4 the diameter of the run. Branch outlet fittings shall be weld type, flared where attached to the run and shall conform to ANSI B31.1 requirements.

J. Non-ferrous piping may be used in lieu of steel where permitted by code. Such piping shall consist of hard temper copper water tube made up using wrot copper

tube fittings and an approved solder or brazing alloy. Joint preparation shall be in accordance with IAPMO Installation Standard IS3 and all sweat joints shall conform to the requirements of ANSI B9.1. In addition, brazing and soldering shall be in accordance with the Copper Development Association Copper Tube Handbook. Joints shall be made up using a tin-silver solder or with brazed joints using an AWS listed silver brazing alloy (BAg-1) or a B CuP series brazing material as recommended for the specific application. In lieu of the above, joints may be made using Harris Co. "Stay-Safe Bridgit" or Engelhard "Silvabrite 100" a proprietary, lead-free silver-copper brazing alloy.

K. Where the use of grooved end piping and mechanical couplings is permitted (see item PIPE AND PIPING), the requirements of installation shall include following manufacturer's recommendations regarding pipe and preparation, lubrication of gaskets, assembly of couplings, fittings, etc.

L. Joints shall be made in a first class manner and in accordance with the method required by Code regulations. In case of leaks, pipe or fittings are to be taken out and replaced.

M. Piping shall be concealed in pipe shafts, pipe spaces and furring, where possible. Ascertain that the proper space has been provided for pipes and exercise care in locating same in accordance with the requirements of the finish of various rooms. No pipes, etc., shall be placed where they will block access doors or in any way interfere with the swing of other doors or the operation and normal maintenance of equipment.

N. Where piping is run exposed through floors, walls, partitions or ceilings, provide escutcheons to cover the openings. Escutcheons shall be securely fastened with set screws or other satisfactory means that will positively hold them in place against wall, floor or ceiling.

O. Piping above electrical equipment shall be avoided wherever practical and possible.

P. Workmanship throughout shall conform to the standards of best practice and labor employed must be competent to do the work required. In assembling screwed piping, threaded connections shall be made using a thin coat of graphite and oil or Teflon tape on male threads only. Exposed screw pipe in finished parts of the building shall be assembled in such a manner that tool marks will be avoided. Tool marks or other irregularities WILL NOT be permitted on any exposed material, fixture or fitting. Work that is determined to be below normal industry standards for best practice shall be redone and/or replaced at the contractor's expense. Note: Refer to specification item WARRANTIES.

Q. Expansion and contraction of pipe shall be given consideration in pipelines throughout the system and shall be taken into account when making the installation.

R. Lubricate all rotating and/or reciprocating equipment according to manufacturer's directions before operation and as required at the completion of work. Where lubricating points are not easily accessible, provide extensions as required for such maintenance. Belts shall be checked for defects and tightened to proper tension.

S. All apparatus installed under the contract shall operate within the normal sound range for similar equipment and without vibration transmission to the structure. In case of excessive noise and/or vibration, make the necessary modifications to correct the conditions or replace the objectionable equipment. The Engineer shall judge the severity of the problem and will make the decision on acceptance. In situations where compliance is questionable, provide instrumentation, etc., as required for verification that equipment operation is within manufacturer's norm.

T. Note: Equipment furnished under this contract heading that will operate under conditions other than emergency shall meet acceptable sound power levels under these (normal) conditions. When requested, certification of compliance to OSHA standards must be supplied. Maximum sound levels shall not exceed the permissible noise levels listed by OSHA for the appropriate length of exposure that could normally be encountered.

U. Prior to placing an order for equipment, request certification of compliance to OSHA standards from all equipment suppliers. Maximum sound levels shall not exceed the permissible noise exposure listed by OSHA for a continuous 8 hour period.

11. EQUIPMENT CLEARANCES AND REQUIREMENTS

A. For many items of equipment described in these specifications several manufacturers may be listed. The first named in each instance is the make on which the design was based and on which service access, space requirements, electrical and plumbing characteristics, etc. have been checked. Additional manufacturers listed are considered as acceptable alternates.

B. Due to the possibility of restrictions imposed by space limitations, the responsibility for resolving conflicts resulting from the use of equipment other than first named or of alternate equipment shall rest with the equipment supplier and the Contractor. Submittals for said alternate equipment will be considered as a statement that clearances for installation, access, service, maintenance, etc. have been checked and found adequate.

C. Alternate equipment or the equipment of additional manufacturers named in these documents shall meet all base bid specifications. In the event such equipment, or any equipment which the bidder proposes to furnish, deviates from the requirements of equipment first named regarding electric service, power wiring, control wiring, plumbing and/or piping, sound attenuation, vibration damping, etc., it shall be the responsibility of the bidder to include in his price a sufficient sum to cover all additional costs or charges resulting therefrom.

D. Note that in all cases the contractor is responsible for checking the entrance access/clearance requirements for all equipment being furnished under this section and making the necessary provisions to accommodate the moving of such equipment to its final location. This may be of particular importance where an existing structure is involved and could include such activities as partial equipment disassembly, window removal, making temporary openings, etc.

12. WARRANTIES

A. Provide warranties to the Owner that all materials and equipment furnished are new, unless otherwise specified, and that all work is of good quality, free from faults and defects and in conformance with the Contract Documents.

B. Warranties on all work and equipment shall commence on the date of substantial completion of the work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. These warranties and all related documents shall be submitted, in accordance with the front part of the specifications, prior to the issuance of any certificates. Warranties shall include equipment manufacturers' written certificates warranting the equipment furnished complies with all requirements of the drawings and specifications including any extended warranties as well as the contractor's warranty statement for the project. This documentation shall be submitted in an appropriately marked, 3-ring hard cover binder.

C. If, within one year after the date of substantial completion of the work or within one year after acceptance by the Owner or within such longer period of time as may be prescribed by the terms of any applicable special warranty specified for a particular item, any work is found to be defective or not in accordance with the Contract Documents, it shall be promptly corrected upon receipt of official notification to do so. In addition, latent defects in material, equipment, or workmanship that are not discovered until sometime during the second year following acceptance shall remain the contractor's responsibility to correct. This obligation shall survive termination of the contract.

13. FOREMAN

A. With reference to the work under this section, a competent foreman shall be assigned to the project. The foreman shall be on the job when work is being accomplished relating to the sprinkler contract. He shall also attend all job meetings and shall be authorized to act as the Contractor's agent in the absence of said Contractor. He shall not be relieved of his duties on this project except by permission or by request of the Architect.

14. RECORD DRAWINGS

A. At the commencement of the work, the Sprinkler Contractor shall set aside two complete white print sets of the Sprinkler drawings. All variations and deviations from the work that occurred under this Section, including those required by Change Orders, if any, shall be recorded in a neat and legible manner with colored ink or colored pencil at the end of each working day on these drawings. These prints shall be available at all times for the Owner's and Architect's inspection. Note: Where the installation is to be made from contractor-developed drawings which were approved initially as shop drawings, then two sets of these drawings are to display all deviations, changes, etc., as stated above and shall serve as the record sets.

B. Prior to reviewing the Contractor's requisition for Final Payment or making any response thereto, the Architect will obtain from the Sprinkler Contractor one complete set of these record prints, indicating the completed installation of the work included under this contract. In addition, all piping system drains shall be accurately located on these prints. If subsequently approved, the Architect will forward the prints to the Consulting Engineer for final review and electronic file update.

C. Note that providing the completed "record" set of prints showing all changes to the original contract drawings is a requirement for project close-out.

15. CLEAN UP

A. Rubbish resulting from the work herein specified shall be removed from the premises by the trade which produced it as fast as it accumulates.

B. Upon completion of the work, remove from the project site all tools, equipment, surplus materials and rubbish pertaining to the work under this contract heading. Responsibility for this shall include paying all costs for removal and disposition including hauling, dumping, etc.

16. PROTECTION

A. Proper protection shall be provided during the execution of work involved under this section.

B. This protection shall include covering all apparatus, building surfaces and/or other materials to protect same from dirt; adequate temporary provisions to protect apparatus from damage of any sort; and required shielding to protect finished parts of the building. The following shall apply, where applicable:

1. Protect finished floors from chips and cutting oil by the use of metal chip receiving pans and oil proof floor covers.

2. Protect equipment and finished surfaces from welding and cutting spatters with baffles and spatter blankets.

3. Protect equipment and finished surfaces from paint drippings, etc. by use of drop cloths.

C. A 50 lb. CO_2 extinguisher on wheels shall be provided at all times by this contractor in the immediate vicinity of any welding or similar operations.

D. Provide protection of equipment from damage before, during and after installation. Do not use sprinkler supplied equipment for the storage of tools or materials nor as a support or platform. Every precaution shall be taken to avoid damage.

E. During installation and until final connections are made, all piping shall be protected against entry of foreign matter. Pump connections, etc., shall be tightly sealed until system tie-in.

17. INSERTS AND SLEEVES

A. Malleable iron inserts shall be furnished and set wherever piping, equipment, etc., is hung from concrete beams, slabs or walls. These inserts shall be fastened to the forms before concrete is placed. Inserts shall be similar to Dayton, Kalman or Kindorf adjustable type. Where not provided, install acceptable type of supports. Inserts for precast concrete members shall be acceptable to the precast unit manufacturer.

B. Sleeves shall be furnished for all pipeline penetrations of poured concrete and masonry work throughout. Material and installation shall be in accordance with the following.

C. Floor Slab Above Grade:

1. Exposed Areas (normally accessible area) - Sch. 40 steel pipe - sleeve to extend 2" above finish floor.

2. Concealed Areas (pipe chases, shafts, etc.) - Minimum 20 gage galvanized sheet metal.

D. Walls - General:

1. Poured Concrete, Masonry - Sch. 40 PVC pipe or Sch. 40 steel pipe - sleeve ends to be flush with face of wall. All sleeves shall be machine cut to have squared, finished ends. In exterior walls, steel pipe sleeves shall be galvanized. Note that sleeves are not required for drilled holes in poured concrete.

2. Stud/Gypsum Board - Minimum 20 gage galvanized sheet metal sleeves or thimbles shall be provided at pipe penetrations. They shall have flanged ends set flush with face of wall.

E. Walls - Fire Rated:

1. Fire rated walls shall be sleeved as described above except that non-metallic sleeve material is prohibited. The annular space between the sleeve or thimble and the penetrating item must be fire stopped as subsequently described.

2. Note: Steel pipe sleeves in exterior walls shall be galvanized. All sleeves of steel pipe or PVC pipe shall be machine cut to provide finished ends. Metal sleeves shall be lined where the possibility exists for contact with dissimilar metal.

3. In all cases where pipes, tubes, conduits, etc., pass thru floors, walls and/or fire rated partitions, the spaces between the structure or sleeve and the penetrating member shall be provided with an approved firestop sealant to produce a fire, smoke and water barrier.

4. Sealant material and installation shall be as described in Item FIRESTOPPING.

F. Pipe penetrations of walls, floors, etc. in exposed areas shall be provided with escutcheons. They shall have concealed hinge and set screw and shall be securely attached to the pipe. In finished areas, escutcheons shall be polished brass or chrome plated steel. In mechanical or service areas, escutcheons shall be galvanized cast iron. Floor penetrations shall be provided with deep pattern floor plates set flush with the floor and designed to cover the entire sleeve projection. Note: Where required by code considerations, non-metallic sleeves shall be covered by escutcheons.

G. Unused sleeves in floors and walls are to be plugged and finished to match the adjoining surface.

H. All sleeves shall be large enough to permit free movement of pipe. The pipe shall be centered in the sleeve and separated from it. No wood wedges or other similar devices will be permitted for centering the pipe in the sleeve. All ferrous sleeves penetrating exterior walls shall be coated with bitumastic paint.

18. FIRESTOPPING

A. Furnish and install the required firestopping as referenced in the item of the specifications covering inserts and sleeves. Materials, installation, etc., shall be as described below. Products shall be as manufactured by Hilti Inc. or United States Gypsum Co.

B. Definition:

1. Firestopping is defined as the material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, water and hot gases through penetrations in fire rated wall and floor assemblies.

C. Application:

1. Tested firestop systems shall be used for all penetrations for the passage of ductwork and piping through floors, fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

D. Quality Assurance:

1. A manufacturer's direct representative (not distributor or agent) shall be on site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

2. Firestop system installations must meet requirements of ASTM E-814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated. In addition, proposed firestop materials and methods shall conform to applicable governing codes having jurisdiction.

3. For those firestop applications that occur for which no UL tested system is available through any manufacturer, a drawing representing the manufacturer's engineering judgment, derived from similar UL system designs or other tests, shall be submitted to local authorities having jurisdiction for review and approval prior to installation. Engineer judgment drawings must follow current requirements set forth by the International Firestop Council.

E. Submittals:

1. Manufacturer's submittals shall include specifications and technical data for each type of material including its composition and limitations, documentation of UL firestop systems to be used and manufacturer's installation instructions to comply with Section 1300. The submittal shall also include material safety data sheets as well as any engineering judgement drawings previously approved by local authorities Installer Qualifications:

a. The firestop system installer must be certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary experience, staff, and training to install manufacturer's

products per specified requirements as previously stated in Quality Assurance.

2. Requirements:

   a. All holes, voids, miscellaneous openings, etc., made by penetrations in floor slabs (above grade) for systems provided under this section shall be completely sealed to insure watertight integrity. Installation of firestopping shall be scheduled after completion of penetrating item installation but prior to covering or concealing of openings.

   b. Provide firestopping utilizing components that are compatible with adjacent surfaces, the substrates forming openings, and the items penetrating the firestopping under conditions of service and application as demonstrated by the firestopping manufacturer, based on testing and field experience. Note that materials containing flammable solvents shall not be used.

3. Materials:

   a. Use only firestop products that have been UL 1479, ASTM E-814, or UL 2079 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each specific application.

   b. For penetrations by combustible items (penetrants consumed by high heat and flame) including insulated metal pipe that is PVC jacketed, flexible cable or cable bundles and plastic pipe (closed piping systems), an Intumescent material is required to maintain fire rating of the assembly penetrated.

   c. A firestop system with an "F" rating as determined by UL 1479, ASTM E814 or UL 2079, which is equal to the time rating of the construction being penetrated, must be utilized.

4. Preparation:

   a. Surfaces to which firestop materials will be applied shall be examined for detrimental conditions. They shall be free of any substances that may effect proper adhesion.

   b. Observe and comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

5. Installation:

a. Firestop materials shall be installed in accordance with published recommendations listed under the heading "Through-Penetration Firestop Systems" in the UL Fire Resistance Directory. In addition, the manufacturer's instructions for installation of through-penetration materials shall be strictly followed.

b. Consult with the engineer prior to installation of any UL firestop systems that might hamper the performance of fire dampers as they pertains to duct work.

6. Miscellaneous:

a. Sealed penetration areas shall be checked thoroughly to ensure proper installation before concealing or enclosing said areas.

19. CUTTING AND PATCHING

A. All cutting and/or drilling of walls, slabs, structural members, etc., required in conjunction with work under this section shall be performed as part of the work and shall be done under the supervision of the General Contractor. Work shall be neatly done, without unnecessary removal of material. Holes, openings, etc. shall be located where they will not weaken the structure. No beams, joists, etc., shall be cut without written authorization from the Architect.

B. Cutting of holes in masonry and/or concrete shall be performed with a core drill to minimize spalling, etc. Locations shall be accurately determined and checked, and the appropriate drill bit shall be used to minimize hole size.

C. Openings made in walls, partitions, etc., for pipe passage shall be carefully cut/drilled and accurately sized for the penetrating item.

D. Sleeves or thimbles for these holes as well as escutcheons and trim plates shall be provided as described in Item INSERTS AND SLEEVES. Installation shall permit free movement of pipe.

E. NOTE: Cutting of water lines, electric conduit or similar service lines in the course of work performed under this section shall be immediately repaired as part of the work of this section.

F. Patching and/or repairing of all work, including finished surfaces, necessitated by the performance and/or installation of work under this section shall be considered as part of this work. It shall, however, be performed by mechanics of the appropriate trade in order to achieve a workmanlike job. This shall include, but not be limited to, all items of concrete and masonry work, millwork, gypsum board and/or plaster work, painting, floor finishes and ceiling finishes as well as all other surface finishes.

G. When the need for such patching or repairs arises, immediate arrangements shall be made with the appropriate trade(s) or with the General Contractor to perform the necessary work at no additional cost to the Owner. The final responsibility for acceptance of such work by the Owner's representative shall reside with the contractor for this section of the project.

20. HOISTS, RIGGING, TRANSPORTATION AND SCAFFOLDING

A. Provide all necessary scaffolding, staging, cribbing, tackle, hoists and rigging to locate the material, equipment, etc., of this section in its proper place on the project. All such temporary work shall be removed from the premises when no longer required.

B. Pay all costs related to the transportation of materials and equipment to the job site. These costs shall be covered in the bid as no additional allowance will be made by the Owner.

C. Scaffolding and hoisting equipment shall comply with requirements of all pertinent Federal, State and Local Laws and Codes.

21. PIPE, PIPING AND COUPLINGS

A. Piping shall be designed, fabricated and installed in accordance with National Fire Protection Association regulations as contained in NFPA No. 13. Pipe and tube used in the sprinkler system(s) shall be designed to withstand a minimum working pressure of 175 psi. or greater where dictated by system requirements.

B. Piping Inside Building:

1. Pipe for sprinkler and standpipe systems shall be either steel or copper. Pipe for dry sprinkler or standpipe systems shall be galvanized steel.

2. Pipe shall be one of the following:

3. Thread-end steel pipe shall be minimum Schedule 40 weight conforming to ASTM A53. Where welding or roll-groove assembly is utilized, steel pipe shall be minimum Schedule 10 weight conforming to ASTM A135.

4. Copper piping shall be Type K, L or M, hard temper seamless copper tube conforming to ANSI H23.1 and ASTM B 88. Verify allowable working pressure of assembly as determined by tube wall thickness, tube size and joint type.

5. Schedule 5 weight steel pipe conforming to ASTM A135, A795 or A53 may be used for wet pipe systems. Pipe shall be assembled with press fit type couplings and fittings formed of precision cold drawn steel, as

manufactured by the Victaulic Corporation, with self-contained synthetic O-ring seals in the coupling/fitting ends. O-ring seals shall be molded of synthetic rubber: Grade "C" IIR butylene. Fittings shall be pressed onto the pipe using only an approved press fit assembly tool in accordance with the latest recommendations of the coupling manufacturer.

6. Fittings used to assemble thread-end pipe shall be malleable iron, minimum Class 300, or forged steel, Class 2000. Couplings for groove-end piping shall be standard, general purpose type or light-weight type but in all cases, shall provide for an allowable system working pressure of at least 300 psig or greater for system requirements in excess of this figure as determined by job conditions. They shall be UL listed and FMG approved. Coupling/fitting gaskets shall be as recommended by the manufacturer for the application and shall be made of molded synthetic elastomer with properties as designated by ASTM D 2000. Coupling bolts shall be oval neck track head type plated steel with hex head nuts, per ASTM A183. NOTE: Dry pipe systems shall utilize flush seal gaskets or Victaulic Firelock EZ style 009 couplings.

7. Transition couplings may be used to join grooved end IPS steel pipe, valves or fittings to grooved end AWWA ductile iron pipe, valves or fittings of the same nominal size. Couplings shall be supplied with a Flush Seal gasket specifically compounded to conform to ductile pipe surfaces. Such couplings shall be similar to Victaulic style 307.

8. Schedule 10 weight steel sprinkler pipe shall be assembled either by welding (in accordance with ANSI B31.10.10, B31.10a and B31.10b) or by mechanical couplings. These couplings shall be of the rolled-groove type.

9. Grooves shall be rolled only and shall be dimensionally compatible with the coupling.

10. Note that steel pipe shall have at least one identifying mark or legend per length. In addition, steel piping systems shall be galvanized where indicated on the drawings and/or where required by code considerations, insurance carrier guidelines, or when utilized for specific applications including parking garages, corrosive environments, etc.

22. PIPE FITTINGS

A. All fittings shall be of a type acceptable for use on sprinkler systems and shall conform to the general requirements outlined below.

1. Steel Pipe Systems:

a. Where permitted and/or unless otherwise specified, thread-end fittings on black steel pipe may be gray iron and cast iron. They shall

be manufactured according to ANSI B16.4 with material used conforming to ASTM A126, Class B and shall be threaded in accordance with ANSI B2.1 for tapered pipe threads. Where flanges and flanged fittings are required, unless otherwise specified, they may be cast iron conforming to ANSI B16.1.

b. Gray iron thread-end pipe fittings, flanges, etc. shall be Class 125 or 250 lb. as determined by size and service requirements. Note that fitting class shall be in accordance with NFPA standards.

c. Malleable iron and ductile iron thread-end fittings shall be used where specified and/or required by applicable codes. They shall be manufactured according to ANSI B16.3 with the material used conforming to ASTM A197 and shall be threaded as specified above. Fitting class shall be in accordance with NFPA standards.

d. Unless otherwise specified, welding fittings on black steel pipe shall be carbon steel butt-welding type made from ASTM A106 Grade B seamless pipe. Fittings shall correspond to ANSI B16.9 with standard bevel ends and shall be in accordance with the Verification and Identification program accepted by ASME.

e. Where branch outlet fittings are used (see Item MATERIALS AND WORKMANSHIP) they shall be tapered transition type units of forged steel construction. Strength ratings shall be equal to Schedule 40 seamless steel pipe and all such fittings shall be manufactured in accordance with applicable requirements of ANSI B16.9 and B16.11.

f. Manufactured fittings used with grooved-end pipe shall be standard full flow or short radius type made with grooves or shoulders designed to accept gasket and coupling. They shall be ductile iron or wrought steel - seamless for wet pipe systems and galvanized for use in dry pipe systems. Allowable working pressure shall at least equal coupling working pressure or 300 psi, whichever is greater.

g. In lieu of the above, segment welded fittings may be used. All segment steel fittings are to be fabricated from carbon steel pipe per ASTM A53B. Fittings through 6" shall be fabricated from schedule 40 pipe. Fittings 8" through 12"in size shall be fabricated from minimum schedule 30 black steel pipe. All segment welded grooved end fittings are to be considered a hydraulic and dimensional equal to Victaulic full flow cast grooved end fittings.

h. Pipe grooving and assembly shall be in accordance with manufacturer's specifications regarding pipe and preparation, lubrication of gaskets, assembly of couplings, fittings and flanges.

i. Gaskets and couplings shall be as described in Item PIPE, PIPING AND COUPLINGS.

j. Where making a branch connection to an existing 3" or larger steel pipe, a mechanical tee bolted branch outlet fitting may be used in conjunction with hole-cutting the existing pipe. Mechanical branch outlets are available grooved, or female threaded and must be installed with centerlines at a true 90° angle and with locating collar engaging into hole.

k. Where flanged connections occur, such as at valves and equipment, the use of screwed companion flanges will be allowed in lieu of flanged welding fittings.

l. Cast iron flanges shall conform to the requirements specified above. Where ductile iron flanges are used, they shall be cast to the requirements of ANSI B16.1 and threaded in accordance with ANSI B2.1. Steel flanges shall be carbon steel, ASTM A 105 and shall conform to ANSI B16.5. They shall be 150 lb. or 300 lb. class as determined by service requirements.

m. Bolting shall utilize only cadmium plated carbon steel machine bolts and bolt studs, threaded in accordance with ANSI B1.1, coarse thread series. Bolt stud length to allow no more than one thread extension.

n. Gaskets shall be full face, 1/8" thick and made from red sheet rubber.

2. Copper Pipe Systems:

a. Solder-joint wrot copper, cast copper alloy and cast bronze pressure fittings shall be used on copper tube piping. Wrot copper fittings shall be in accordance with ANSI B16.22 and shall be made from commercially pure copper and red bronze mill products per ASTM B75 Alloys 120 and 122. Cast copper fittings shall be in accordance with ANSI B16.18 and shall be made from Copper Alloy C84400 per ASTM B584

b. Cast bronze fittings shall be manufactured according to ANSI B16.18 with material composition conforming to ASTM B584. Flanges shall be cast copper alloy pipe flanges, minimum Class 150 and shall comply with ASME B16.24.

23. SUPPORTS, HANGERS AND BRACKETS

A. The hangers, brackets, etc. for supporting pipe and apparatus included under this section of the work shall be furnished and installed under this section of the work. Pipe hanger support spacing shall be in accordance with requirements of NFPA and ANSI B31.1.0. Piping shall be installed in such a manner that movement due to expansion and contraction can freely take place except at anchor points. Pipe supports shall be capable of vertical adjustment after erection of pipe. Pipe rings or rolls shall be carried by threaded rods of a size determined by the hanger used, but in no case less than the size called for in the carrying capacity table for threaded rods listed in the ASME code for pressure piping. Supports and parts shall conform to the latest requirements of ANSI B31.1.0. and MSS Standard Practice SP58, except as supplemented and/or modified herein.

B. Ceiling grid systems shall not be supported from piping, etc., and vice versa. The utilities and mechanical services shall be separate installations from the ceiling grid system and shall be independently supported from the building structure. Where interferences occur, trapeze hangers or supports shall be employed. Care shall be taken to avoid blocking access to air terminal boxes, fire dampers, valves, etc.

24. VALVES (MAIN SYSTEM)

A. Valves of each type shall be of one make and each valve shall have a manufacturer's name and trademark as well as size indicated on the valve body. Except where noted otherwise, valves shall be designed and rated 175 lb. WWP.

B. Isolation valves shall be as follows:

1. Gate valves 2-1/2" and over shall be bronze mounted with iron body, OS & Y, parallel seats and double disc. Ends shall be either flanged, groove, hub or mechanical joint as required. Flanged ends shall have Class 125 flanges to ANSI B16.1 and mechanical joint ends shall be standard type complying with AWWA C111 and ANSI A21.11. Gate valves 2" and below shall have bronze body, union bonnet and thread ends.

2. For service above grade, butterfly valves may be used in lieu of gate valves for systems rated at 300 psig working pressure. Body shall be ductile iron, full lug design - 2-1/2" and larger -to accommodate Class 125 ANSI standard flat or raised face flanges or grooved end design and shall be rated 300 lb. WWP. Disc shall be bronze, bronze alloy, stainless steel, nickel plated iron or EPDM encapsulated iron and stems shall be stainless steel with corrosion resistant bearings. When installed in grooved end piping systems, valves shall have end connections designed to accommodate the couplings and gaskets specified for these systems and shall be the same manufacturer as the grooved coupling. Ball valves for 1" through 2" may be grooved or threaded.

C. Check valves shall be as follows:

1. Check valves 2-1/2" and over shall be iron body with bronze trim, with flanged or grooved ends. They shall be of the gravity operated, swing check design. Body marking shall indicate direction of flow.

2. In lieu of the swing check design, valves 4" and over may be wafer style with iron body and spring-loaded bronze clapper, for installation between standard Class 125 flanges. They shall have a stainless steel spring and pin and resilient seat.

D. Manufacturer:

1. Valves, as described above, shall be as manufactured by Central, Globe, Grinnell, Kennedy, Keystone, Mueller, Nibco, Victaulic or Viking. Indicator posts shall be as manufactured by Grinnell, Mueller, Nibco, Kennedy, Stockham or Victaulic.

25. SERVICE VALVES AND FITTINGS

A. Service valves and fittings of each type shall be of one make and each item shall have the manufacturer's name and trademark indicated thereon. Unless otherwise indicated, valves, fittings and specialty items subjected to internal pressure shall be rated to handle pressures to 300 psig.

B. Service valves shall be of standard, cast brass construction with female connections having tapered iron pipe threads. Valves having a male outlet shall have hose threads required to conform to standards of the fire department having jurisdiction.

C. Miscellaneous fittings, assemblies, etc. for fire department service tie-in shall be of cast brass. Type, size and finish shall be as indicated on the drawings. Threaded connections shall be as required to conform to standards of the fire department having jurisdiction.

D. The above described equipment shall be as manufactured by Potter-Roemer, Croker Standard, Elkhart Brass, Powhatan or Guardian.

26. SYSTEM DRAINS AND TEST PIPES

A. Provide a minimum 2" combination standpipe and sprinkler system drainpipe, running parallel to each combination sprinkler and standpipe riser, which shall be piped to the outside. When volume of trapped pipe sections is 5 gallons or less, the auxiliary drain line shall consist of a 1" nipple and cap or brass plug. When such volume is over 5 gallons, the auxiliary drain shall incorporate a 1" gate valve with fixed piping to an approved drain point.

B. Test Pipe:

1. Test pipes, not less than 1" diameter, shall be installed in the system in accordance with requirements of NFPA 13.

2. A test pipe shall also be installed on each floor and/or for each alarm zone.

3. Test pipe(s) shall be run to an auxiliary drain location or as directed by the inspector.

27. SPRINKLERS

A. Sprinklers and accessories shall be of one manufacturer as specified herein or as indicated on the drawings. Acceptable manufacturers are Viking, Reliable, Gem, Star, Central or Victaulic.

B. Sprinklers located in finished ceiling areas shall be chrome plated pendent type with chrome plated two piece escutcheons to match existing. Upright heads with natural brass finish shall be provided in all exposed structure areas.

C. Existing sprinklers and escutcheons shall be removed, all escutcheons shall be replaced with new, in existing and/or revised locations after installation of new ceilings. Any additional sprinklers and escutcheons which may be required shall match existing. See Architectural drawings for areas that will have new ceilings.

D. Furnish a sprinkler cabinet with a minimum of six (6) spare sprinklers (or as required by NFPA) including all types and temperature ratings. In addition, furnish any special wrenches required.

E. Provide three (3) pairs of wedges for shutting off activated sprinklers.

F. Sprinklers which are so located as to be subject to mechanical damage shall be protected with approved guards.

28. DEMONSTRATION, CODE COMPLIANCE AND TESTING

A. Test/operate all systems, equipment and/or apparatus installed under this section as necessary and, where required, in the presence of the inspecting agency having jurisdiction. Notify the Engineer at least 72 hours in advance of any demonstration or test.

B. The system(s) shall be hydrostatically tested for a minimum of two hours at not less than 200 psi or at 50 psi in excess of maximum system static pressure when normal system pressure is in excess of 150 psig. All testing shall be done in accordance with applicable requirements of NFPA 13, 14 and local fire department. The repairing or replacing of defective work that has been discovered shall be done promptly.

29. PAINTING

A. See Division 1, General Requirements, for additional requirements.

B. In addition to any painting specified elsewhere, the following painting shall be accomplished as part of the work under this section:

1. Metal parts not factory coated which will remain exposed to view within the building (including work in unfinished areas, storage rooms, equipment rooms, etc.) shall be cleaned, spot primed and given one coat of red enamel paint. This shall include steel equipment supports, pipe hangers and rods, bolts, nuts, steel equipment bases, bare steel pipe and fittings and incidental metal items.

2. Equipment which has been factory painted and on which the finish has deteriorated or been damaged shall be cleaned and repainted to equivalent factory condition.

3. All sprinkler equipment systems, etc., that will be concealed shall have a prime coat only (Painting does not apply to aluminum, galvanized steel or stainless steel material, or other material that would not normally receive paint). The above will be spot primed as required after installation.

30. PIPE MARKING

A. Provide and install color banding at approximately 25 ft. intervals on main feeders and risers only and at valves, flow detectors and other control/monitoring devices. Consult Owner concerning appropriate colors.

B. In addition, piping in these areas shall be identified by stencil formed painted markers consisting of 1" high letters and flow arrows per NFPA standards.

C. Banding and identification shall be done after the final coat of paint has been applied.

31. CONCEALED EQUIPMENT-ACCESS AND MARKING

A. Where equipment, valves, etc., are located in inaccessible furred spaces and/or chases or above plaster or other type fixed (non-accessible) ceilings, access panels shall be provided.

B. Reach-in access panels for valves, unions, etc., shall be 8" X 12" minimum and crawl-in access panels shall be 18" X 24" minimum or as required for access.

C. Panels, except as noted below, shall be aluminum with extruded aluminum frame. The panel shall have a continuous hinge and flush latch. Units shall have a brush satin aluminum finish and shall be of a model suitable for the type of construction in which they are installed.

D. Access panels in fire rated walls and plastered or gypsum board ceilings utilized as fire protection for the structure shall be Milcor Fire Rated or equal as manufactured by Elmdor or Zurn. They shall meet NFPA requirements and shall carry the UL 1-1/2 hour "B" label. Construction shall incorporate a minimum 20 ga. steel insulated panel door, self-latching lock and continuous hinge. The assembly shall be treated with a rust inhibitor and given a baked-on enamel primer.

E. Access panels for other plastered surfaces shall be Milcor Style K or L with 16 ga. steel frame and 14 ga. steel panel or equal as manufactured by Elmdor or Zurn. A 22 ga. casing bead shall surround the frame. The unit shall be treated with a rust inhibitor and given a baked-on enamel primer.

F. Where valves, equipment, flanged fittings, etc., are located above suspended (accessible) tile ceilings, furnish and install plexiglass panels below their locations.

32. VALVE IDENTIFICATION

A. All valves shall be identified with proper signage as required by the local fire department, the Ohio Basic Building Code, the National Fire Protection Association and Factory Mutual requirements.

B. A valve diagram or chart of each system shall be furnished to the Owner. It shall be carefully drawn and typewritten, describing location completely and shall be placed under glass and framed. A copy shall be bound in a hard fiber binder and turned over to the Owner.

C. Valves shall also be identified by means of carefully numbered brass or aluminum tags attached to the valve handwheels. Tags shall be secured by adequately sized, non-rusting "S" hooks. Each tag shall have a sequential number and service designation.

D. In the case of an addition or remodeling work where a valve identification system exists, numbering shall start in sequence after the highest existing number.

E. Numbers and locations shall be accurately marked on the record set(s) of contract drawings. See Item RECORD DRAWINGS.

F. Provide typed valve directories, framed under glass, identifying each valve as to size, type service and location. This shall also be incorporated into the Operating Instruction Brochures as specified in Item INSTRUCTIONS.

33. INSTRUCTIONS

A. Typewritten or printed operating instructions for each separate system shall be prepared in duplicate. They shall be placed under glass and framed prior to submitting to the Owner.

B. Provide four (4) complete brochures in hard backed binders, each containing operating, servicing, and maintenance information as well as parts lists for equipment installed under this contract. Where diagrams are too large for the binder, arrange manila pockets with reinforced holes to hold folded drawings.

C. Arrange for technical instruction of Owner's maintenance personnel for such time as is reasonably required to acquaint them with their duties. In addition, deliver to the Owner all special tools or equipment required for making normal adjustments on any equipment or apparatus furnished under this section.

* * * END OF SECTION * * *

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PLUMBING

SECTION 15400

INDEX

1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Requirements and Division 1 - Specification Sections, apply to work specified in this section.

2. SCOPE

A. The work included in this contract shall consist of the furnishing of all labor, material, equipment and incidentals which may be necessary for the installation, test, adjustment and guarantee of the plumbing work as shown on the drawings and as specified hereinafter. All work shall be done in strict accordance with all applicable Local, State and Federal codes and regulations including the recommendations of the NFPA and the requirements of the NEC. In no case shall work be installed contrary to or below the minimum legal standards or in violation of applicable codes.

3. DESCRIPTION OF WORK

A. Below is a listing of the principal categories of work under this section. Note, however, that this listing is for general information only and work will not necessarily be limited to these categories. The detailed drawings and the following specifications cover the full extent of the work.

1. Modifications to sanitary drainage and vent system.

2. Modifications to domestic water system.

3. New domestic water heating equipment.

4. Modifications to fuel gas piping.

5. Condensate waste piping.

6. Rough-in and final connections for plumbing fixtures and equipment and other apparatus furnished by others.

4. SITE INVESTIGATION

A. Prior to bidding, it is recommended that the contractor visit the job site and investigate all details which may have any effect on the installation, progress or completion of the project.

B. When a bid is received, it will be assumed that the contractor has made the job site visit(s) and is familiar with the conditions as they exist and any adjustments and/or

modifications that may be necessary in order to perform and complete the work as specified.

C. At project start-up, certain areas will be designated for the storage of materials and equipment and cooperation with the Owner in minimizing interference with existing operations will be mandatory.

D. All plumbing fixtures, trimmings, etc.

E. All labor, material, tools, scaffolding and transportation which may be required to complete the work and carry it to a successful conclusion ready for operation when turned over to the Owner.

F. Test and guarantee of all work installed under this contract.

5. WORK DONE BY OTHERS

A. Each bidder shall become familiar with the entire project specification in order to properly delineate the areas of responsibility between trades.

B. Work to be done by others in connection with the work of this section shall include the following:

1. Painting of exposed pipes, equipment, insulated items, etc. will be done by others, except where specifically noted in the following items of this specification.

2. Water and/or fuel gas lines shall be terminated with a valve adjacent to any and all equipment requiring same. Final connections to the equipment shall be done by others.

3. Current to any externally wired apparatus in this contract will be provided under the electrical section. Unless otherwise mentioned, furnish the Electrical Contractor with the required starters, controls and any other miscellaneous electrical apparatus pertaining to the plumbing equipment and the Electrical Contractor will make all electrical connections to same. Starters that are part of a motor control center as well as all fractional horsepower manual starters, however, will be furnished by the Electrical Contractor unless otherwise indicated. See Item MOTORS AND STARTERS.

4. The required magnetic starters for the plumbing equipment, except as stated above or unless specifically mentioned otherwise, shall be furnished under this section of the work. Refer to the motor schedule and/or the motor control diagram on the contract drawings as a check to verify the specific electrical characteristics of all motors and starters under this section.

5. Plumbing fixtures and equipment furnished by others shall be roughed-in and, where indicated, connected as part of the work under this section.

6. INTERLOCK AND CONTROL WIRING

A. Unless otherwise indicated on the drawings or elsewhere in the specifications, all required and/or referenced interlock and control wiring involving equipment and systems installed under this section of the work shall be provided (furnished, installed, wired, etc.) by this contractor.

B. Low voltage wiring in concealed areas shall be run in conduit or with plenum rated cable. Exposed wiring shall be run in conduit. In mechanical/boiler rooms conduit shall be rigid, galvanized steel. Control wiring in conduit must be color coded and all conductors shall be tagged or otherwise identified. Unless specifically called for by the equipment manufacturer, all such wiring shall be minimum 20-gauge, 150 volt, type TW or rubber insulated jacketed type.

C. Line voltage wiring shall be in accordance with applicable requirements of the National Electric Code. As specified above for low voltage applications, all wiring must be color coded with all conductors tagged and all installations within mechanical/boiler rooms shall incorporate rigid, galvanized steel conduit.

7. BIDDING

A. All bids shall be based upon furnishing and installing the make of materials and apparatus specified herein WITHOUT SUBSTITUTION, in order that all bids may be properly compared.

B. Other materials, equipment or systems that the bidder may desire to use as a substitute for that specified will be considered IF PROPOSED AT THE TIME OF BIDDING and shown on the substitution sheet of the proposal. Such alternate items shall be of equally high quality with all safeguards, design features and operational requirements as shown on the drawings and/or as specified herein.

C. It is understood that proposals to use such substitutes shall be made in addition to and separate from the base bid in order to receive consideration and the addition to or deduction from base bid, if any, shall be duly noted on the bid form.

D. Regarding substitutes, note that any deviations from the following specifications or any special equipment requirements (ambient conditions, utilities, power conditioning, etc.) necessary for full time operation shall be clearly stated and completely itemized. Failure to meet these stipulations could result in additional expense that would be assigned to this section of the work and not considered as an extra.

E. If no proposals for substitutes are listed on the bid form, no such proposals will be permitted for later consideration unless delivery schedules or other factors beyond the Contractor's control justify same.

F. If more than one make of material or equipment is specified, the proposed manufacturer, brand, type, etc. shall be identified. If this provision is not complied with, the Owner may then make this selection without change in contract price.

G. Note that in the following specifications, where more than one manufacturer is listed for a particular item of operating equipment, the design will be based on the first named. If equipment by the other named manufacturer(s) or a proposed substitute requires redesign work, revised/modified services, or specific additional field work by other trade(s), the price submitted for providing this equipment must include the required additional amount to cover such work.

8. TEMPORARY WATER SERVICE

A. Provide and maintain water service to the building at all times for construction services.

B. Provide hose bibbs at locations convenient to the General Contractor as needed for construction operations. The General Contractor shall pay for additional temporary piping needed. The Owner shall pay for the water used by the Contractors.

9. DRAWINGS

A. The drawings prepared for this project are an outline to show where pipes, apparatus, equipment, etc. should be located in order to fit within the confines of available space and minimize conflicts with other trades. All work must be installed in accordance with the drawings insofar as possible. All drawings shall be carefully checked during the course of bidding and construction. If any discrepancies, errors or omissions or overlaps with other trades are discovered prior to or during the construction phase, notify the Engineer immediately for interpretation or correction. Note that an overlap with another trade does not relieve the contractor from the obligation of performing the work indicated on the drawings for this section of the project unless written notification stating such is obtained from the Engineer.

B. Take all necessary measurements and be responsible for same, including clearances for all materials and equipment that will be furnished. The Architect/Engineer shall reserve the right to make minor location changes of piping and/or equipment where such adjustments are deemed desirable from an appearance or operational standpoint. Such changes will normally be anticipated sufficiently in advance to avoid extra work or unduly delaying progress on the project.

C. The general building drawings shall be used to obtain dimensions and exact locations and as a check with other contractors to avoid interference with their

work. Prior to making any layout drawings refer to applicable drawings on all branches of the work where other trades are involved on the project. Also, be involved with the other trades in producing coordination drawings so that added fieldwork and/or job delays resulting from conflicts between crafts can be avoided. Piping that has been prefabricated before coordinating with the other trades will have to be re-done at no additional cost to the Owner if conflicts are encountered.

D. Note that the piping shown on the drawings shall be considered as diagrammatic for clearness in indicating the general run, connections required, etc. and may not in all cases be shown in its true position. The piping and equipment may have to be offset, lowered or raised as required or as directed at the site in order to accommodate field conditions.

10. SPECIFICATIONS

A. Specifications shall be interpreted in conjunction with the drawings hereinbefore described and if anything is shown on the drawings and not mentioned in the specifications or vice versa, it is to be included in the work the same as though clearly set forth by both.

B. Furthermore, all materials or labor obviously required to fully complete the work shall be included in the bid, even though each item necessarily involved is not specifically mentioned or shown. Such work and/or material shall be furnished and shall be of the same grade or quality as the parts actually specified and shown. Should there be a conflict between the plans and specifications, the greater quantity or better quality shall be furnished.

C. Should an overlap of work between the various trades become evident, the Engineer shall be notified. Such an event shall not relieve any trade of the responsibility for the work called for under his branch of the specifications until a written clarification or directive is issued concerning the matter.

1. When selecting equipment to be used on this project, refer to Item EQUIPMENT CLEARANCES AND REQUIREMENTS in these specifications.

2. All references made to codes, standards, etc. in these specifications or on the drawings shall be taken to mean the latest edition, amendment and/or revision of such reference in effect as of the date indicated on the Bid Documents.

11. SHOP DRAWINGS

A. Prepare or obtain from the manufacturer, certified shop or erection drawings of all items of equipment to be furnished under this section and submit copies of same as required for review. This shall be done as soon as possible, well prior to proceeding with installation or construction and in the proper sequence to avoid delays in the

work, the work of the Owner or other contractors. Unless otherwise indicated, a minimum of six (6) hard copy sets OR one (1) electronic set shall be submitted. These drawings shall be complete in every respect, showing pertinent details of size, capacities, arrangement, fittings, piping, kinds and thickness of materials, weight, loading required, clearances for service, maintenance, etc. Departures or deviations, if any, from the specifications, listed performance data, etc., shall be called out on the submittals. **NOTE:** Where departures or deviations from the specifications do occur, the contractor shall additionally itemize same on the cover sheet that accompanies the submittals. Failure to do so will risk subsequent delay or rejection at the job site (With regard to voluntary substitutions, refer also to Item BIDDING in this specification).

B. By submitting such drawings, the Contractor represents that he has selected and verified conformance of the proposed materials and equipment to the specifications, has verified the adequacy of the space available and/or taken necessary field measurements, and has noted field construction criteria, etc. related thereto, or will do so. In addition, it will be assumed that the Contractor has checked and coordinated the information contained within such submittals with the requirements of the Work and the Contract Documents as noted in the previous paragraph.

C. Material and equipment to be furnished for this project shall be of current production by manufacturers regularly engaged in the manufacture of such items. When two or more similar units are required, they shall be the product of one manufacturer.

D. The review of shop drawings shall not be construed as a complete check but will indicate only that the capacity, general method of construction and/or detailing is satisfactory. It does not involve determining the accuracy or completeness of such particulars as dimensions or quantities or indicating full and complete compliance with the specifications. In addition, it does not deal with the means, methods or procedures of fabrication, construction and/or installation. The Contractor shall carefully check and verify dimensions for installation and service requirements before ordering equipment for the project.

E. The Contractor is advised to request submittals from all other trades before proceeding with any piping connections, etc. on equipment furnished by them.

F. Submittals shall be itemized on a standardized shop drawing submittal form stating the name of the project, specification section, paragraph and/or drawing numbers applicable to the submittal and shall bear the contractor's review stamp as evidence that the items have already been checked for compliance with Contract Documents as stated above.

G. After review, shop drawings will be returned five (5) hard copy sets OR one (1) electronic set, marked in one of the following ways:

1. "NO EXCEPTIONS NOTED" - Copies may be distributed as required for construction, shipment, etc. to proceed.

2. "EXCEPTIONS NOTED" - Contractor may proceed with and/or authorize construction, shipment, etc. taking into account the necessary corrections.

3. "EXCEPTIONS NOTED - REVISE AND RESUBMIT" - Contractor will be required to resubmit shop drawings in their entirety. No fabrication, erection or installation shall be authorized or initiated until shop drawings so marked have been completely revised, resubmitted and subsequently marked in accordance with either of the two preceding sub-paragraphs. Only shop drawings officially marked "NO EXCEPTIONS NOTED" or "EXCEPTIONS NOTED" will be permitted on the job site.

H. Upon return of submittals take appropriate action as specified above. Note that any shop drawing hard copies received beyond the number required will be destroyed (not returned).

I. Where resubmittal is required, four (4) hard-copies OR one (1) electronic copy will be so noted by the reviewer, of which two (2) hard-copies OR one (1) electronic copy will be returned for corrections (one (1) hard-copy for the contractor and one (1) hard-copy for the supplier/subcontractor).

J. The following is a list, where applicable, of items requiring submittals. See Item INSTRUCTIONS AND MANUALS.

1. Valves
2. Drains
3. Thermometers
4. Gauges
5. Plumbing Fixtures and Equipment
6. Water Heater

K. Performance curves shall be furnished for each pump. Curves shall show discharge pressure (feet of water), horsepower and efficiency versus GPM for a series of impellers. Performance curve shall slope up to shut-off. Pump shall be selected to operate near point of maximum efficiency and/or to meet efficiency indicated on the drawings.

L. Shop drawings will be provided by the Owner for any Owner furnished equipment requiring connections under this section.

M. Fixtures and equipment requiring color selection shall have shop drawings accompanied by color sheets or finish selection. The Architect shall be made aware of the finishes and colors available.

N. Submittals and Shop Drawings for manufactured items shall be manufacturer's printed literature. Equipment selection shall be within manufacturer's printed recommended ratings.

O. A complete set of shop drawings, officially marked in the prescribed manner noted previously, shall be filed on the job site. Such drawings shall be kept together, maintained in good condition, and shall be readily available for reference.

12. PERMITS, FEES, INSPECTIONS, LAWS & REGULATIONS

A. Obtain and pay for all permits required in connection with this section of the work. In addition, pay all necessary inspection fees or similar charges. Laws, codes and regulations which bear upon or affect this work shall be complied with and are hereby made a part of this specification. All work which such laws require to be inspected shall be shown to the proper public officials for their inspection. In no case shall work be installed contrary to or below the minimum legal standards or in violation of applicable code requirements.

B. At completion of the project furnish to the Owner, at no additional charge, a certificate(s) of inspection issued by the authorized agency (or agencies) having jurisdiction over this portion of the project, verifying that all work executed under this section complies with applicable code requirements.

C. Note that the General Building Permit will be obtained and paid for by the successful General Contract Bidder. Contractors bidding on this section of the work shall make a sufficient allowance in their bid to reimburse the General Contractor for their proportionate share of the permit cost.

D. Additional fees, charges, etc. imposed by other contractors and/or tradesmen, professional consultants, etc., for services rendered in connection with performing any portion of the work under this section shall be included as part of the work. This shall include surveys, profiles and/or other miscellaneous drawings, etc. that may be mandated by the governing authorities in addition to the requirements of the contract documents.

13. WARRANTIES

A. Provide warranties to the Owner that all materials and equipment furnished are new, unless otherwise specified, and that all work is of good quality, free from faults and defects and in conformance with the Contract Documents.

B. Warranties on all work and equipment shall commence on the date of substantial completion of the work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. These warranties and all related documents shall be submitted, in accordance with the front part of the specifications, prior to the issuance of any certificates. Warranties shall include equipment manufacturers' written certificates warranting the equipment furnished

complies with all requirements of the drawings and specifications including any extended warranties as well as the contractors's warranty statement for the project. This documentation shall be submitted in an appropriately marked, 3-ring hard cover binder.

C. If, within one year after the date of substantial completion of the work or within one year after acceptance by the Owner or within such longer period of time as may be prescribed by the terms of any applicable special warranty specified for a particular item, any work is found to be defective or not in accordance with the Contract Documents, it shall be promptly corrected upon receipt of official notification to do so. In addition, latent defects in material, equipment, or workmanship that are not discovered until sometime during the second year following acceptance shall remain the contractor's responsibility to correct. This obligation shall survive termination of the contract.

14. EQUIPMENT CLEARANCES AND REQUIREMENTS

A. This contractor shall be responsible for verifying compliance with the specifications for all equipment provided under this section of the work. In addition, all such equipment shall be installed in strict accordance with the manufacturer's recommendations, instructions, installation drawings, etc. The recommended clearances for service and maintenance, as well as for proper operation, shall be provided in all cases.

B. For many items of equipment described in these specifications several manufacturers may be listed. The first named in each instance is the make on which the design was based and on which performance, space requirements, service access, electrical and plumbing characteristics, etc. have been checked.

C. Due to the possibility of restrictions imposed by space limitations, the responsibility for resolving conflicts resulting from the use of equipment other than first named or of alternate equipment shall rest with the equipment supplier and the contractor. Submittals for this equipment will be considered as a statement that clearances for installation, access, service, maintenance, etc. have been checked and found adequate.

D. Alternate equipment or the equipment of additional manufacturers named in these documents shall meet all base bid specifications. In the event such equipment, or any equipment which the bidder proposes to furnish, deviates from the requirements of equipment first named regarding electric service, power wiring, control wiring, plumbing and/or piping, sound attenuation, vibration dampening, etc., it shall be the responsibility of the bidder to include in his price a sufficient sum to cover all additional costs or charges resulting therefrom.

E. Note that in all cases the contractor is responsible for checking the entrance access/clearance requirements for all equipment being furnished under this section and making the necessary provisions to accommodate the moving of such

equipment to its final location. This may be of particular importance where an existing structure is involved and could include such activities as partial equipment disassembly, window removal, making temporary openings, etc.

F. With regard to running pipe, the Contractor is cautioned that the installation of piping in elevator equipment rooms or run directly above electrical switch gear or similar equipment shall be avoided. Where this situation is determined to be unavoidable, liquid tight sheet metal troughs shall be provided under the piping to afford the necessary protection. Additional protection, sensors, alarms, drain piping from the troughs, etc., shall be provided where and as required by local authorities.

15. PROTECTION

A. Provide proper protection of the building during the execution of all work involved under this contract heading.

B. This protection shall include covering all apparatus, building surfaces and/or other materials to protect same from dirt; adequate temporary connections to protect apparatus from damage of any sort; and required shielding to protect finished parts of the building. The following shall apply where applicable:

1. Protect finished floors from chips and cutting oil by the use of metal chip receiving pans and oilproof floor covers.

2. Protect equipment and finished surfaces from welding and cutting spatters with baffles and spatter blankets.

3. Protect equipment and finished surfaces from paint droppings, insulation adhesive and sizing droppings, etc., by use of drop cloths.

C. All pumps, motors and other rotating/reciprocating equipment stored for this project shall be adequately protected with openings, connections, bearings, etc., covered to exclude dust and moisture. All stockpiled pipe, valves, fittings, etc. shall be placed on dunnage and protected from weather and from entry of foreign material.

D. A 50 lb. CO_2 extinguisher on wheels shall be provided at all times in the immediate vicinity of any welding or similar operations. Additional Federal, State and/or local regulations shall be complied with as required.

E. Provide protection from damage for plumbing fixtures before, during and after their installation. Plumbing fixtures shall not be used for the storage of tools or materials nor as a support or platform. Every precaution shall be taken to avoid damage to fixtures and fittings.

F. During installation and until final connections are made, all piping shall be protected against entry of foreign matter. Equipment connections shall be tightly sealed until system tie-in.

16. TESTING AND INSPECTION

A. Test all systems, equipment or apparatus installed under this contract as required, in the presence of the certified plumbing inspector for the jurisdiction involved. Witnessing and approval in writing (sign-off) shall be required on all of these tests. Representatives of manufacturers who furnished major items of equipment for the project shall be present at the time their apparatus is being tested. Repairing or replacing defective work shall be done immediately. Give prior notification of all tests to the Engineer. Where notification is not received, the Engineer reserves the right to have the test(s) repeated. The required inspection tags furnished by the plumbing inspector shall be recorded and subsequently turned over to the Owner.

B. The apparatus provided under this contract heading which fails to deliver its full rated capacity, or which is defective or unacceptable in other ways, shall be promptly replaced or made good. Performance of equipment shall be witnessed and validated by the manufacturer's representative in the presence of the Owner's duly authorized agent.

C. Test drainage system(s) in accordance with the instructions of the plumbing inspector, using air, water or smoke as required.

D. Hydrostatically test water supply system(s) at 150 psig in accordance with stipulated AWWA procedures and leave said system in perfect working order after satisfactory completion of the test.

E. Compressed air piping shall be tested at a minimum 125 psig or one- and one-half times working pressure, whichever is greater. The test duration shall be not less than 30 minutes for each 500 cubic feet of pipe volume or fraction thereof, except that when testing a system having a volume of less than 10 cubic feet, the test duration may be reduced to 15 minutes.

F. The fuel gas piping system shall be tested, using air, in accordance with procedures outlined herein. The test duration shall be not less than 30 minutes for each 500 cubic feet of pipe volume or fraction thereof. A soap test shall be made, at operating pressure, of all exposed fittings in service or house lines which were not included in the pressure drop test. Piping shall be tested at the following pressures:

1. Steel Pipe: Piping to operate at less than 1 psig shall be given a pressure test of not less than 5 psig without showing any drop in pressure. Piping to operate at a pressure of at least 1 psig, but not more than 40 psig shall be given a pressure test of not less than 50 psig or 150 percent of maximum operating pressure, whichever is greater, without showing any drop in pressure.

2. Plastic Pipe: Piping shall be given a pressure test of not less than 50 psig or 150 percent of maximum operating pressure, whichever is greater, without showing any drop in pressure. However, the maximum test pressure may not be more than three times the design pressure of the pipe and the temperature of the pipe must not be more than 100°F. during the test.

G. All systems, in addition, shall be tested as required by governing Federal, State and/or local authorities. Note that the testing of piping systems shall be performed prior to the application of any specified insulation or backfilling. Where applicable, certificates of approval shall be furnished to the Owner as noted in Item PERMITS, FEES, INSPECTION, LAWS AND REGULATIONS.

H. Calibrated instruments, meters, equipment, facilities, and labor required to properly conduct tests shall be provided as required. Tests shall be repeated, if failures occur, until satisfactory performance is established.

17. INSTRUCTIONS AND MANUALS

A. Provide the Owner with four (4) complete equipment brochures in hard backed binders. These assembled manuals shall contain all operating, servicing, and maintenance information as well as parts lists for all systems and/or equipment installed under this contract. Where diagrams are too large for the binder, arrange manila pockets with reinforced holes to hold folded drawings.

B. Arrange for technical instruction of the Owner's maintenance personnel for such time as would be reasonably required to acquaint them with their duties. In addition, deliver to the Owner all special tools or equipment required for making normal adjustments to any equipment or apparatus furnished under this contract heading.

C. The spare parts listed below, where applicable, shall be turned over to the Owner at the completion of the project.

1. Technical instructions involving installed equipment shall include a demonstration of the operating system with a description of system operation explained to the Owner's representatives. This demonstration shall take place after all testing and balancing has been completed and the written reports of such work have been submitted as required. The time at which the satisfactory completion of this technical instruction and demonstration occurs will establish the date of final acceptance of the system unless otherwise stipulated.

2. Note that the specifications may indicate certain items of equipment be provided with a demonstration of operation (See Item SHOP DRAWINGS). This demonstration shall include technical instructions covering the proper start-up procedure and normal maintenance routines recommended by the manufacturer.

18. RECORD DRAWINGS

A. At the commencement of the work, the Plumbing Contractor shall set aside two complete white print sets of the Plumbing drawings for recording changes, modifications, etc. All variations and deviations from the work (plans, details, schedules) that occurred under this Section, including those required by Change Orders, if any, shall be recorded in a neat and legible manner with colored ink or colored pencil at the end of each working day on these drawings. These prints shall be available at all times for the Owner's and Architect's and/or Engineer's inspection.

B. Prior to examining the Contractor's requisition for Final Payment or making any response thereto, the Contractor shall submit one complete set of white prints to the Architect, marked as stated above, indicating the final and accurately represented installation of the work included under this contract. In addition, all piping system drains shall be accurately located on these prints. The Architect will forward the prints to the Consulting Engineer for review and comment. After review, they will be utilized by the Engineer in preparing an updated electronic file.

C. Note that providing these marked-up prints showing all changes to the original contract drawings is a requirement for project close-out.

19. CLEAN UP

A. Rubbish resulting from the work herein specified shall be removed from the premises by the trade which produced it as fast as it accumulates.

B. Upon completion of the work, remove from the project site all tools, equipment, surplus materials and rubbish pertaining to the work under this contract heading. Responsibility for this shall include paying all costs for removal and disposition including hauling, dumping, etc.

20. MATERIALS AND WORKMANSHIP

A. Materials used in this contract shall be those specified herein unless proposals for the use of alternate materials have been submitted and accepted, in writing, as provided hereinbefore. Materials shall be strictly first grade of their kind and shall be new and in first class condition when installed. Materials damaged in transit or otherwise will be rejected and must be replaced by proper and acceptable materials. Materials shall be similar and in accordance with the provisions of this specification.

B. No materials or equipment may be installed under this contract heading which does not meet the approval of the authorities having jurisdiction. Specific materials may have certain restrictions or exclusions as to their usage, including where they may or may not be located. All such regulations shall be adhered to where applicable.

C. Workmanship throughout shall conform to the standards of best practice and labor employed must be competent to do the work required. Tool marks WILL NOT be permitted on any exposed material, fixture or fitting. Work that is determined to be below normal industry standards for best practice shall be redone and/or replaced at the contractor's expense. Note: Refer to specification item WARRANTIES.

D. Exact locations of electric outlets, piped equipment, piping, lighting fixtures, ducts, etc., shall be coordinated as described in Item DRAWINGS, so there will be no interference at installation between the various trades. For work not shown on the drawings or where changes are required to harmonize with the work of other trades, consult the Superintendent for instructions.

E. All piped equipment shall be flange or union connected.

F. Where the use of grooved end pipe and grooved pipe mechanical couplings is specified (see Item PIPE), the requirements with respect to installation include strictly following manufacturer's recommendations regarding pipe, pipe preparation, hanging of pipe, lubrication of gaskets, and the method of joining with couplings, fittings, etc.

G. Valves and specialties shall be placed so as to permit easy operation and access, and valves shall be regulated, packed and adjusted as required at the completion of work before final acceptance. Gate and globe valves should be installed with their stems in the vertical (up) position if possible. These valves shall not be installed with their stems below the horizontal position. Control valves and other miscellaneous equipment requiring adjustment shall be adjusted to setting indicated or as directed.

H. Exposed screw pipe in the finished parts of the building shall be put together so as to conceal the threads and at completion must be left clean. Tool marks will not be permitted on any exposed metal, fixture or fitting.

I. Lubricate all rotating and/or reciprocating equipment according to manufacturer's directions before operation and as required at the completion of work. Where lubricating points are not easily accessible, provide extensions as required for such maintenance. Belts shall be checked for defects and tightened to proper tension.

J. All apparatus installed on this project shall operate within the normal sound range for similar equipment and without vibration transmission to the structure. Equipment furnished must meet acceptable sound levels for the particular installation involved while operating under normal conditions. Request certification of compliance to OSHA standards from all equipment suppliers. Maximum sound levels shall not exceed the permissible noise exposure listed by OSHA for a continuous 8-hour period. In case of excessive noise and/or vibration, the Contractor shall make the necessary modifications to correct the conditions or

shall replace the objectionable equipment. The Architect shall be the sole judge as to the severity of the condition and his decision on acceptance shall be final.

K. Accepted engineering practice: Where a standard or other publication is referred to in Chapter 4101:2-69-01 of the Administrative Code relative to "accepted engineering practice," conformity to the applicable technical provisions, requirements, recommendations, and determinations in the standard or other publication is prima-facie evidence of conformity with accepted engineering practice.

21. CUTTING AND PATCHING

A. All cutting and/or drilling of walls, slabs, structural members, etc., required in conjunction with work under this section shall be performed as part of the work and shall be done under the supervision of the General Contractor. Work shall be neatly done, without unnecessary removal of material. Holes, openings, etc. shall be located where they will not weaken the structure. No beams, joists, etc., shall be cut without written authorization from the Architect.

B. Cutting of holes in masonry and/or concrete shall be performed with a core drill to minimize spalling, etc. Locations shall be accurately determined and checked, and the appropriate drill bit shall be used to minimize hole size.

C. Openings made in walls, partitions, etc., for pipe passage shall be carefully cut/drilled and accurately sized for the penetrating item.

D. Sleeves or thimbles for these holes as well as escutcheons and trim plates shall be provided as described in Item INSERTS AND SLEEVES. Installation shall permit free movement of pipe.

E. NOTE: Cutting of water lines, electric conduit or similar service lines in the course of work performed under this section shall be immediately repaired as part of the work of this section.

F. Patching and/or repairing of all work, including finished surfaces, necessitated by the performance and/or installation of work under this section shall be considered as part of this work. It shall, however, be performed by mechanics of the appropriate trade in order to achieve a workmanlike job. This shall include, but not be limited to, all items of concrete and masonry work, millwork, gypsum board and/or plaster work, painting, floor finishes and ceiling finishes as well as all other surface finishes.

G. When the need for such patching or repairs arises, immediate arrangements shall be made with the appropriate trade(s) or with the General Contractor to perform the necessary work at no additional cost to the Owner. The final responsibility for acceptance of such work by the Owner's representative shall reside with the contractor for this section of the project.

22. INSERTS AND SLEEVES

A. Fabricated steel inserts shall be furnished and set wherever piping, equipment, etc., is to be hung from poured-in-place concrete beams, slabs or walls. These inserts shall be equal to Unistrut 1-5/8" channel width series and be selected based on the load carrying recommendation of the manufacturer. Where not provided, furnish and install acceptable types of supports as appropriate for the application. (See Item SUPPORTS, HANGERS AND BRACKETS). Inserts for precast concrete members shall be approved by the precast unit manufacturer.

B. Sleeves shall be furnished for all pipeline penetrations of poured concrete and masonry work throughout. Material and installation shall be in accordance with the following:

1. Floor Slabs Above Grade:

   a. Exposed Areas (normally accessible areas) Sch. 40 steel pipe - sleeve to extend 2" above finish floor.

   b. Concealed Areas (pipe chases, shafts, etc.) - Min. 20 gage galvanized sheet metal.

2. Walls - General:

   a. Poured Concrete, Masonry - Sch. 40 PVC pipe or Sch. 40 steel pipe - sleeve ends to be flush with face of wall. All sleeves shall be machine cut to have squared, finished ends. In exterior walls, steel pipe sleeves shall be galvanized. Note that sleeves are not required for drilled holes in poured concrete.

   b. Stud/Gypsum Board - Min. 20 gage galvanized sheet metal sleeves or thimbles shall be provided at pipe penetrations. They shall have flanged ends set flush with face of wall.

3. Walls - Fire Rated:

   a. Fire rated walls shall be sleeved as described above except that non-metallic sleeve material is prohibited. The annular space between the sleeve or thimble and the penetrating item must be fire stopped as subsequently described.

   b. Note: Steel pipe sleeves in exterior walls shall be galvanized. All sleeves of steel pipe or PVC pipe shall be machine cut to provide finished ends. Sleeves for insulated lines shall be large enough to accommodate the insulation. Metal sleeves shall be lined where the possibility exists for contact with a dissimilar metal.

c. In all cases where pipes, tubes, conduits, etc., pass thru floors, walls, and/or fire rated partitions, the spaces between the structure or sleeve and the penetrating member shall be provided with an approved firestop sealant to produce a fire, smoke and water barrier. Sealant material and installation shall be as described in Item FIRESTOPPING.

4. Pipe penetrations of walls, floors, etc. in exposed areas shall be provided with escutcheons. They shall have concealed hinge and set screw and shall be securely attached to the pipe. In finished areas, escutcheons shall be polished brass or chrome plated steel. In mechanical or service areas, escutcheons shall be galvanized cast iron. Floor penetrations shall be provided with deep pattern floor plates set flush with the floor and designed to cover the entire sleeve projection. Note: Where required by code considerations, non-metallic sleeves shall be covered by escutcheons.

5. Penetrations through the roof structure shall be carefully made (see Item CUTTING AND PATCHING) and located in designated areas only. All penetrations shall be sealed on the weather side to provide a watertight installation (See Item FLASHING).

6. Unused sleeves in floors and walls are to be plugged and finished to match the adjoining surface.

7. All sleeves shall be large enough to permit free movement of pipe. The pipe shall be centered in the sleeve and insulated from it. No wood wedges or other similar devices will be permitted for centering the pipe in the sleeve. All ferrous sleeves penetrating exterior walls shall be coated with bitumastic paint.

23. FIRESTOPPING

A. Furnish and install the required firestopping as referenced in the item of the specifications covering inserts and sleeves. Materials, installation, etc., shall be as described below. Products shall be as manufactured by Hilti, Inc., Specified Technologies Inc. or United States Gypsum Co.

B. Definition:

1. Firestopping is defined as the material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, water and hot gases through penetrations in fire rated wall and floor assemblies.

C. Application:

1. Tested firestop systems shall be used for all penetrations for the passage of ductwork and piping through floors, fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

D. Quality Assurance:

1. A manufacturer's direct representative (not distributor or agent) shall be on site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

2. Firestop system installations must meet requirements of ASTM E-814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated. In addition, proposed firestop materials and methods shall conform to applicable governing codes having jurisdiction.

3. For those firestop applications that occur for which no UL tested system is available through any manufacturer, a drawing representing the manufacturer's engineering judgment, derived from similar UL system designs or other tests, shall be submitted to local authorities having jurisdiction for review and approval prior to installation. Engineer judgment drawings must follow current requirements set forth by the International Firestop Council.

E. Submittals:

1. Manufacturer's submittals shall include specifications and technical data for each type of material including its composition and limitations, documentation of UL firestop systems to be used and manufacturer's installation instructions to comply with Section 1300. The submittal shall also include material safety data sheets as well as any engineering judgement drawings previously approved by local authorities.

2. Installer Qualifications:

a. The firestop system installer must be certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary experience, staff, and training to install manufacturer's products per specified requirements as previously stated in Quality Assurance.

3. Requirements:

a. All holes, voids, miscellaneous openings, etc., made by penetrations in floor slabs (above grade) for systems provided under this section

shall be completely sealed to ensure watertight integrity. Installation of firestopping shall be scheduled after completion of penetrating item installation but prior to covering or concealing of openings.

b. Provide firestopping utilizing components that are compatible with adjacent surfaces, the substrates forming openings, and the items penetrating the firestopping under conditions of service and application as demonstrated by the firestopping manufacturer, based on testing and field experience. Note that materials containing flammable solvents shall not be used.

4. Materials:

a. Use only firestop products that have been UL 1479, ASTM E-814, or UL 2079 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each specific application.

b. For penetrations by combustible items (penetrants consumed by high heat and flame) including insulated metal pipe that is PVC jacketed, flexible cable or cable bundles and plastic pipe (closed piping systems), an Intumescent material is required to maintain fire rating of the assembly penetrated.

c. A firestop system with an "F" rating as determined by UL 1479, ASTM E814 or UL 2079, which is equal to the time rating of the construction being penetrated, must be utilized.

5. Preparation:

a. Surfaces to which firestop materials will be applied shall be examined for detrimental conditions. They shall be free of any substances that may affect proper adhesion.

b. Observe and comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

c. Installation:

1. Firestop materials shall be installed in accordance with published recommendations listed under the heading "Through-Penetration Firestop Systems" in the UL Fire Resistance Directory. In addition, the manufacturer's instructions for installation of through-penetration materials shall be strictly followed.

2. Consult with the engineer prior to installation of any UL firestop systems that might hamper the performance of fire dampers as they pertain to duct work.

d. Miscellaneous:

1. Sealed penetration areas shall be checked thoroughly to ensure proper installation before concealing or enclosing said areas.

24. EXCAVATION AND BACKFILL

A. Provide all required excavation, backfilling, replacement of paving and sodded areas for items to be installed under this contract heading. The excavation shall be carried to the proper depth and grade and shall form a firm base as required. All piping shall be laid on a minimum 6" deep bed of clean sand. Note that prior to performing any excavation at the project site, the Ohio Utilities Protection Services (1-800-362-2764) shall be contacted by the Plumbing Contractor in order that all buried lines in the vicinity of this work can be properly located and marked or otherwise identified.

1. Where roots of live trees are encountered in excavation, they shall be carefully protected during construction.

2. Where rock is encountered, excavation and removal shall involve using appropriate and approved methods.

3. Provide and operate pumping equipment as necessary to keep trenches and other excavations free of water.

4. Provide plastic warning tape at all excavations. Install tape 8" to 12" above top of pipe. Tape shall be 6" wide with black letters identifying the piping service. Tape shall be as manufactured by Seton Nameplate Company or Emed Company, Inc.

B. Shoring, bracing, sheathing, etc., shall be provided as necessary to ensure the safety of all personnel in accordance with OSHA requirements.

C. After installation has been completed, approved where required by inspecting agencies and accepted by the Architect/Engineer, the excavation shall be backfilled to required subgrade level as determined by location and the specification covering site preparation and grading.

D. In all areas, unless designated otherwise, backfill shall consist of clean sand to 12" above top of pipe, the remainder of the excavation shall be backfilled with select

material. In no case will the use of organic material, large rocks or debris be permitted.

E. Backfill shall be accomplished by placing material in 6" layers and tamping. Backfill around pipes with hand tools to a point 18" above pipe. Beyond this point use small mechanical tampers. Compact all backfill to the following minimum densities:

1. Under sod and planted areas.....85%
2. Under walks, slabs, parking areas.....90%
3. Under structural footings, etc, and top 2 feet under roadways.....95%

NOTE: These figures are expressed as percentages of max. dry density as determined by AASHO T99 or other approved method.

F. Remove and legally dispose of all surplus excavation and backfill material.

G. Repair and re-establish grades where required before the guarantee period of the project has expired.

H. Where excavation is necessary in existing pavements, the Contractor for whose work the excavation is required shall pay all fees and costs of opening street or pavement and all costs of filling and repaving in accordance with requirements of and to the satisfaction of the Municipality, Utility or other entity having jurisdiction.

I. Where excavation has occurred in sodded areas, replace sod to match existing turf. In these areas, the top 6" of backfill shall be with topsoil. Topsoil shall be fertile, friable, natural loam surface soil, reasonably free of subsoil clay lumps, brush, weeds and other litter and shall not contain roots, stumps, stones larger than 2" in any dimension and other extraneous or toxic matter harmful to plant growth.

25. PIPE MARKING

A. Properly identify all piping in mechanical equipment rooms, exposed piping at basement ceilings and all piping above accessible ceilings. Identification banding shall occur at approximately 25' intervals, at both sides of a main valve or fitting, at shaft openings, and at access doors (Identification of medical gas piping shall be per NFPA standards). Pipe markers shall be in accordance with OSHA requirements and shall comply to ANSI A13.1. They shall be pressure sensitive vinyl pipe markers, Seton OPTI-CODE or equal.

B. Banding and identification shall be done after the final surface finish is applied. Additional locations for identification markers may be required because of job site conditions.

26. CLEANING AND PAINTING

A. Clean all fixtures, removing all labels and remove stains with whiting and alcohol. All metal shall be clean and free from rust, scale and grease and sanded before applying primer or finish coats. Colors will be selected by the Owner.

B. Exterior and Interior Iron and Steel Work: Apply one (1) coat of primer and two (2) coats of alkyd enamel paint carefully sanded between each coat.

C. Incidental Sheet Metal Work: All exposed metal work except copper, stainless steel or aluminum shall receive one (1) coat of galvanized iron primer and two (2) coats of alkyd enamel paint.

D. Plumbing Pipes: Exposed piping shall receive one (1) coat of Sonneborn S.R.P. #75 or equal and one (1) coat of Sonneborn #377 or equal rust preventative paint.

E. Pipe and Equipment Covering: Exposed covering and insulation shall receive one (1) prime coat and two (2) finish coats of alkyd enamel paint.

F. Equipment which has been factory painted and on which the finish has deteriorated or been damaged shall be cleaned and repainted to equivalent factory condition.

G. Paints, enamels, etc., shall be DuPont, Colorizer, Glidden or an approved equal and shall be delivered to the job site in original containers. All paints, etc., shall be evenly spread and shall be free from runs, sags or other defects. All adjacent work and materials shall be protected with suitable covers during the progress of the work.

27. EQUIPMENT LABELING AND IDENTIFICATION

A. Where an item of equipment or appliance is specified to meet the requirements of a referenced agency, conformance shall be evidenced by attachment of the agency seal, label or stamp to such item. The seal, label or stamp of Underwriter's Laboratories, Factory Mutual Laboratories, AGA, ASME, or other suitable, nationally recognized testing laboratory listed by NFPA will be accepted as evidence that the item furnished conforms to the standards.

B. Before completion, each major system component such as water heaters, softener, storage tank, pumps, etc. shall be identified by means of 2" high stencil-painted lettering and by a permanent tag with stamped marking fastened to the unit. Tags shall bear the unit designation indicated on the drawings and the rooms and/or areas being served.

28. CONCEALED EQUIPMENT - ACCESS AND MARKING

A. Where equipment, valves, etc., are located in inaccessible furred spaces and/or chases or above plaster or other type fixed (non-accessible) ceiling, access panels or doors shall be provided.

B. Reach-in access panels for valves, unions, etc., shall be 8" X 12" minimum and crawl-in access panels or doors shall be 18" X 24" minimum or as required for access.

C. Panels or doors, except as noted below, shall be aluminum with extruded aluminum frame. Doors shall have a continuous hinge and flush latch. Units shall have a brush satin aluminum finish and shall be of a model suitable for the type of construction in which they are installed.

D. Access doors in fire walls and plastered or gypsum board ceilings utilized as fire protection for the structure shall be Elmdor Fire Rated, Milcor Fire Rated, Zurn Fire Rated, or equal. They shall meet NFPA requirements and shall carry the UL 1½ hour "B" label. Construction shall incorporate a minimum 20 ga. steel insulated panel door, self-latching, key operated lock and continuous hinge. The assembly shall be treated with a rust inhibitor and given a baked on enamel primer. All locks shall work with a common key.

E. Access doors for other plastered surfaces shall be Milcor Style K or L with 16 ga. steel frame and 14 ga. steel panel or equal as manufactured by Elmdor or Zurn. A 22 ga. casing bead shall surround the frame and unit shall be treated with a rust inhibitor and given a baked on enamel primer.

F. Where valves, equipment, flanged fittings, etc., are located above suspended tile ceilings, furnish and install tile face markers below their locations. They shall be large flat head chrome or s/s screws or approved metal discs which are readily visible.

29. MOTORS AND STARTERS

A. Unless otherwise specified, furnish and install all electric motors for equipment under this contract heading. Electrical power wiring and connections will be under the electrical section. However, control and/or interlock wiring shall be under this section of the work.

B. Consult the motor schedule on the contract drawings as a cross check of electrical characteristics for all motors and starters to be furnished under this contract heading. Minimum starter size shall be size 1.

30. HOUSEKEEPING PADS AND BASES

A. Provide concrete housekeeping pads for all floor mounted equipment furnished under this contract heading. Unless otherwise detailed, pads shall be nominally 4" high with edges chamfered 1". Concrete shall be min. 2500 psi test and all surfaces

shall be free of voids and rubbed smooth. Provide at least 2 dowel rods into floor for anchorage. Pad top shall be dead level and shall have a steel trowel finish.

B. Equipment anchor bolts shall be installed in accordance with manufacturer's recommendations. Equipment bases, bed plates, sole plates, etc., shall be exactly aligned, shimmed and leveled. Finally, a commercially available non-shrink grout shall be carefully placed under the entire contact area.

31. HOISTS, RIGGING, TRANSPORTATION AND SCAFFOLDING

A. Provide all necessary scaffolding, staging, cribbing, tackle, hoists and rigging to locate the material, equipment, etc., of this section in its proper place on the project. All such temporary work shall be removed from the premises when no longer required.

B. Pay all costs related to the transportation of materials and equipment to the job site. These costs shall be covered in the bid as no additional allowance will be made by the Owner.

C. Scaffolding and hoisting equipment shall comply with requirements of all pertinent Federal, State and Local Laws and Codes.

32. PIPE STERILIZATION

A. Sterilize the entire domestic water distribution system prior to completion of the project. Sterilization shall be by means of chlorine solution injection into the system in an approved manner, at/or near the source. Outlets throughout the system shall be tested to prove presence of minimum requirements. The sterilizing solution shall remain in the system for a period of 24 at least hours. Sterilization procedure shall be witnessed by the Architect/Engineer or other qualified representative of the Owner.

B. The sterilizing solution shall contain not less than 50 parts per million of chlorine. Chlorinating material shall be either liquid chlorine conforming to U.S. Army Specifications 4 - 1, or a sodium hypochlorite solution conforming to Federal Spec. O.B. 441a, Grade D.

C. After the sterilization procedure has been completed, the system shall be flushed with clean water until the chlorine content is not greater than 0.2 parts per million, or until approved by the State Health Department.

D. The system shall then be tested for quality. Samples shall be collected at an assortment of outlets within the system and sent to an approved laboratory for testing. Test report shall be forwarded to the design team. If report shows bacteriologic contamination the process shall be repeated until test reports it removed.

E. Unless the Contractor can establish proof of expertise to the Owner's satisfaction for handling the above described operation, the Contractor shall hire, at his own expense, a company specializing in this procedure to perform the work.

33. FLASHING

A. Vent pipes extending through the roof shall be flashed and counter flashed. Flashing shall consist of a minimum 18" X 18", 4 lb. per square foot sheet lead. The lead shall extend to the top and bend inside vent pipe and be properly burned at joints by an experienced lead burner. Approved prefabricated seamless lead flashing systems similar to Stoneman Model S1300-4 are acceptable.

B. In all cases where pipes, tubes, conduits, etc. penetrate the roof structure they shall be flashed, and counter flashed on the weather side and otherwise sealed so as to provide a watertight installation (per SMACNA Standards).

C. Flashing for roof drains shall be 36" X 36" Nobleflex, consisting of non-plasticized chlorinated polyethylene waterproofing membrane (min. 0.040" thick) laminated to 30# asphalt saturated roofing felt. The flashing shall be drawn into the clamping section of the drain and clamped securely. Flashing for roof drains may consist of minimum 48" X 48", 4 lb. per square foot sheet lead in lieu of the Nobleflex.

D. Floor drain flashing shall be a 36" X 36" sheet of "Chloraloy 240" non-plasticized chlorinated polyethylene waterproofing membrane (min. thickness of 0.040"). The flashing shall be drawn into the clamping section of the drain and clamped securely.

E. The Chloraloy or Nobleflex as manufactured by the Noble Company shall be installed per manufacturer's recommendations.

34. PIPING

A. Piping shall be designed, fabricated and installed in accordance with applicable portions of ANSI Codes for Pressure Piping, the Ohio Plumbing Code and the state piping and welding codes.

B. Piping systems shall be installed with approved hangers and supports (see item SUPPORTS, HANGERS AND BRACKETS) in a manner that will prevent sagging, warping, sway or vibration. Hangers, supports, etc., shall be properly located to allow for expansion and contraction and to accommodate concentrations of weight such as from heavy equipment and/or large valves.

C. Pipe shall run straight between fittings and in straight horizontal and vertical lines, and parallel to building lines wherever possible. Ream ends of pipes to remove fins, burrs, etc., to full inside diameter and see that insides of pipes are clean before being placed in position. Open ends of pipelines or equipment shall be properly capped or plugged until final connection to keep dirt or other foreign material out of the system.

D. Changes in direction and intersections of pipelines shall be made with standard, specification type fittings as required and as called for hereinafter. Mitering of pipe to form elbows, notching straight runs to form tees or any similar procedure will not be permitted unless specifically mentioned in these specifications.

E. Butt or socket weld fittings shall be used on black steel piping 2" and over. In lieu of welding tees, however, branch connections for standard weight piping may be made using forged branch outlet fittings provided the nominal diameter of the branch line does not exceed 2" or 1/4 the diameter of the run, whichever is less. Branch outlet fittings shall be weld type, flared where attached to the run and shall conform to ANSI B31.1 requirements. Thread-end fittings shall normally be used on black steel piping 1-1/2" and under. Install screw joints with a thin coat of graphite and oil or Teflon tape on male threads only. All fittings shall be standard weight or extra strong as required for matching pipe wall thickness.

F. Solder-joint wrot copper pressure fittings shall be used on copper tube piping and pipe shall be made up with sweat or brazed joints. Filler metal, brazing material, etc., shall be as described in Item PIPE JOINTS. Note: All products used in the potable water system shall be “lead-free’ and comply with NSF 61-G.

G. Consideration of and provisions for expansion and contraction in pipelines throughout the system shall be part of this section of the work. Expansion loops, offsets, etc. which will properly care for the expansion may be used.

H. Piping shall be concealed in pipe shafts, pipe spaces, and furring, where possible. Prior to installation, determine that the proper space has been provided for pipes and exercise care in locating same in accordance with the requirements of the finish of various rooms. No pipes, etc., shall be placed where they will block access doors or in any way interfere with the swing of other doors or the operation and normal maintenance of equipment. In addition, the installation of piping in elevator equipment rooms or directly over switchgear or similar equipment shall be avoided.

I. Where piping is run exposed through floors, walls, partitions or ceilings, furnish chromed escutcheons to cover the openings and provide a finished appearance. Escutcheons shall be securely fastened with set screws or other satisfactory means that will positively hold them in place against wall, floor or ceiling.

J. On installations incorporating steel pipe, groove end pipe with UL listed mechanical couplings may be used. Roll grooving and assembly to accommodate these couplings shall be in accordance with the manufacturer's specifications regarding pipe and preparation, lubrication of gaskets and assembly of couplings, fittings, etc. Grooving shall be within specified tolerances. This method of joining pipe is acceptable for hot and cold water service as well as interior storm lines above grade. Couplings shall incorporate 2-part ductile iron housings with track head type plated steel retaining bolts per ASTM A183 and allowable design working pressure, thru 12" size, shall be at least 750 psig.

K. Locate and install piping so 1/2" minimum clearance is maintained after insulation is applied.

L. Unless otherwise indicated, galvanized lines 6" and over in size shall be flanged and all lines 5" and below may be threaded.

M. Connection to plumbing fixtures shall be made using the proper method to eliminate strain due to expansion.

N. All water risers shall have accessible drain valves with hose thread connections at the base of the risers. Piping shall be pitched conveniently so all systems will completely evacuate by gravity to drain valves.

O. Pipe shall be tested as described in Item TESTING AND INSPECTION before connecting to equipment. Said equipment and piping shall then be connected as described in Item PIPE JOINTS.

P. Bullhead connections in any piping system are expressly prohibited.

Q. Reductions in pipe sizes shall be made with reducing fittings and not with bushings.

R. Provide small piping required in connection with instruments, gauges, reducing valves, and other mechanical items not specifically shown on the drawings. Sensing lines shall be of intermediate alloy seamless steel tubing ASTM A335, Grade PF. Provide drains, shut-off valves and cocks, syphons, pulsation dampers, etc.

S. All buried or submerged ferrous metal pressure piping and/or conduit installations shall be installed with a cathodic protection system in accordance with the ANSI B31 GUIDE (Corrosion Control).

T. All piping materials used on this project shall be those approved for use by the authorities having jurisdiction. Specific materials may have certain restrictions or exclusions as to their usage, including where they may or may not be located. All such regulations shall be adhered to where applicable.

U. Specific piping materials shall be called out under sections covering each specific service and/or system.

35. PIPE FITTINGS

A. Fittings for work throughout the project shall be of the type designed for the pipe on which they are to be used and shall conform to the general specifications outlined below. Cast iron and malleable iron fittings, flanges, etc. shall be minimum Class 125 or as determined by service requirements.

B. Connections at valves, unions, etc. on steel pipe shall be screwed or flanged as determined by size and/or service. Where flanged connections occur, the use of screwed companion flanges will be allowed in lieu of flanged welding fittings. Class of flanges shall be determined by service requirements.

C. Dielectric unions or couplings shall be used where dissimilar metals are joined and shall be located in accessible areas and/or where indicated on the plans.

D. Where groove end piping is utilized, fittings shall be standard full flow type with grooves and shoulders designed to accept gasket and coupling. They shall be of ductile iron and with a dip-coated alkyd enamel finish. Fittings shall have a rated working pressure of at least 450 psig through 8" size. Coupling/fitting gaskets shall be as recommended by the manufacturer for the application and shall be made of molded synthetic elastomer with properties as designated by ASTM-D-2000.

E. Where a manufactured malleable fitting pattern is not available, groove fittings may be fabricated from standard weight seamless steel pipe or standard wall seamless welding fittings.

F. On all steel piping systems, other than steam, with a maximum operating pressure and/or relief valve setting below 100 psig, thread end fittings shall be minimum Class 125. On all piping systems other than steam with a maximum operating pressure and/or relief valve setting between 100 psig and 200 psig, thread end fittings shall be minimum Class 250.

G. Copper Piping:

1. Solder-joint wrot copper and cast bronze pressure fittings shall be used on copper tube piping. Wrot copper fittings shall be in accordance with ANSI B16.22 and shall be made from commercially pure copper and red bronze mill products per ASTM B75, Alloys 120 and 122.

2. Cast bronze fittings shall be made to the requirements of ANSI B16.18, material composition shall be in accordance with ASTM Specification B584 and comply with NSF 61-G. Flanges shall be minimum Class 150 and shall meet ANSI Standard B16.24 dimensions.

3. In lieu of wrot copper tees for copper tube piping at size reduction branch lines, mechanically formed tee connections may be utilized. The mechanically extracted collars for joining must be formed in one continuous operation. This shall consist of drilling a pilot hole and drawing out the tube surface to form a collar with a height of at least three times the thickness of the tube wall. The collaring device shall be fully adjustable to insure proper tolerance and complete joint uniformity.

H. The joining branch lines shall be notched and dimpled in a single process with two dimple/depth stops. The first depth stop insures proper penetration into the collar

for brazing and the second dimple, 1/4" above the first, serves as a visual inspection point. Dimple/depth stops shall be in line with the run of the tube. All such joints shall then be brazed (Soldered joints will not be permitted).

I. All mechanically formed branch collars shall meet the requirements of applicable sections of ANSI/ASME B31 and their use shall be approved by the local and/or state inspecting agencies having jurisdiction.

J. Machine crimp press fittings, where referenced in Item PIPE JOINTS, shall be engineered press fittings that meet the material requirements of ASME B16.18 or ASME B16.22. The O-ring seal shall be of EPDM. The joining method shall be recognized by the ICC International Plumbing Code and BOCA National Plumbing Code as well as state and local codes. The fittings shall be designed for use with K, L and M hard copper tubing and shall be rated for service to 300 psi.

K. Roll groove piping with gasketed couplings may be used on sizes 2-1/2" and above. System shall consist of couplings, gaskets, flanged connections and designed for bolted assembly. Coupling and fittings shall conform to ASTM A-536 (Grade 65-45-12) with an alkyd enamel coating. Gaskets shall be molded of synthetic rubber having properties as designated in ASTM D-2000 Flanged connections shall have a flange adapter, engaging directly into roll grooved copper tube and fittings and bolting directly to ANSI Class 125 cast iron and Class 150 steel flanged components. Fittings through 4" shall be full flow copper fittings per ASTM B-75 alloy C12200, 5" - 6" fittings shall be bronze sand castings per ASTM B584-87 copper alloy CDA 844 (81-3-7-9). The piping shall be installed and supported per manufacturers guidelines including the requirements of MSS-SP-69.

L. Specific fitting types and materials shall be called out under sections covering each specific service and/or system. Unless noted otherwise, all fittings shall be of the same weight and shall conform to the same standards as the pipe on which they are used.

36. PIPE JOINTS

A. Installation of pipe joints shall be in accordance with accepted engineering practice and in conformance with all applicable standards.

B. The full wall thickness of any pipe or tube shall be maintained when joining or making joints between two sections of pipe or between pipe and fittings except for the cutting of threads or when the reduction of thickness of the wall is permitted by an approved standard.

C. Cast iron bell and spigot soil pipe shall be installed with bell ends upstream and joints shall be made using one of the following methods:

1. Compression type joints for cast iron bell and spigot soil pipe shall be made with a preformed molded ring or collar used with pipe or fittings for which

such ring or collar is designed and secured by pulling the pipe together in such a way as to compress the molded ring to provide a gas and watertight joint.

2. Caulked joints shall be firmly packed with oakum or hemp and filled with molten lead not less than one inch deep, caulked tight, and the surface of the lead of the completed joint shall be flush with top of hub.

3. Joints in cast iron no-hub soil pipe shall be made with neoprene gasket and either a cast iron clamp or stainless steel band fastened with stainless steel bolts. Stainless steel couplings shall be heavy duty type 304 stainless steel with minimum shield thickness of .016". Coupling shall be either 4 band for 1-1/2" through 4" pipe and 6 band for 5" through 10" pipe designed to be tightened to a minimum of 80 inch pounds of torque or 2 band for 1-1/2" through 4" pipe and 4 band for 5" through 10" pipe designed to be tightened to a minimum of 125 inch pounds of torque.

4. In lieu of the above, joints in cast iron no-hub soil pipe 1-1/2" through 6" in size subjected to a static head of less than 40 feet may be made with neoprene gasket and either a cast iron clamp or stainless steel band fastened with stainless steel bolts conforming to CISPI-310 and ASTM C1277 standards.

D. Joints in above ground copper sanitary waste, soil, vent and condensate drainage piping shall be made up using an ASTM listed, 50/50 solder. Soldering shall be in accordance with the Copper Development Association Copper Tube Handbook.

E. Joints in copper tube domestic water piping and other copper pressure piping installations shall be made using tin-silver solder (Fed. Spec. #QQ-S-571E, Class SN96) for smaller sizes thru 1-1/4"and solder with high elongation properties and a liquidus rating in excess of 600° F with a wide plastic range for piping sizes 1-1/2" and 2". Note, however, that all copper piping joints 2-1/2" and over shall be brazed. Brazing operations shall be in accordance with the Copper Development Association Copper Tube Handbook recommendations using an ANSI/AWS listed nonferrous brazing alloy (BAg or BCuP series filler metal) containing at least 5% silver, having a melting range (solidus) of approximately 1,200° F and listed for the specific application. In addition, the brazing process must be performed utilizing a secondary pressurized gas in order to insure having a sufficient flame temperature to achieve a satisfactory joint.

F. In lieu of the joining method using standard fittings with solder joints for domestic water lines, copper piping installations 2" and below may be installed using a machine crimp press fitting system utilizing engineered copper fittings and bronze unions. On lines 2 ½" thru 4", a similar system utilizing engineered bronze fittings may be used in lieu of standard fittings with brazed joints. The press fittings, which shall incorporate a fitting bead and an elastomeric O-ring seal, shall have a listed temperature range of 0°F to 250°F at 200 psi and may be used with system

pressures rated to 200 psi. Installation shall be in strict accordance with manufacturer's recommendations.

G. Black steel piping 2" and over in size, except where connected to valves, equipment or otherwise shown or specified, shall be fusion welded. Welding shall be done by a qualified welder certified per procedure suggested by published AWS Specifications and required by enforcing bodies. Welding and all procedures shall be in conformance with Section IX of the ASME Boiler and Pressure Vessel Code and ANSI B31.1. Steel pipe below 2" may be assembled with thread-end couplings, fittings, etc. in lieu of welding unless otherwise specified.

H. Welding of beveled end steel pipe and/or butt weld fittings on systems with a safety/relief valve setting in excess of 100 psig, shall be accomplished using welding rings. Rings shall be groove type with knock-off spacer pins.

I. Joints in PVC drainage piping shall be solvent cemented in accordance with ASTM D2855. A primer conforming to ASTM F656 shall be applied and solvent cement conforming to ASTM D2564 shall be applied to all joint surfaces.

J. Joints in ABS plastic DWV pipe shall be solvent cemented in accordance with ASTM D2235, ASTM D2661 or ASTM F628 using solvent cement that conforms to ASTM D2235 standards.

K. For underground plastic pipe installations, the plastic piping may be installed using solvent cement or mechanical joints. With solvent cement use only primers, cleaners and cements specified for the materials being used.

L. Transitions from one approved plastics material to another approved plastics material are permitted only through the use of acceptable fittings designed for this purpose.

37. SUPPORTS, HANGERS AND BRACKETS

A. The hangers, brackets, etc. for supporting pipe and apparatus included in this contract shall be furnished and installed as required. Pipe support spacing shall be in accordance with ANSI B31.1.0. Piping shall be installed in such a manner that movement due to expansion and contraction can freely take place except at anchor points. Pipe supports shall be capable of vertical adjustment after erection of pipe. Pipe rings or rolls shall be carried by threaded rods of a size determined by the hanger used, but in no case less than the size called for in the carrying capacity table for threaded rods listed in the ASME code for pressure piping. Supports in contact with copper pipe shall be copper plated. All supports and parts shall conform to the latest requirements of ANSI B31.1.0. and MSS Standard Practice SP58, except as supplemented and/or modified herein. Supports, hangers, brackets and accessories shall be as manufactured by Anvil, PHD Manufacturing, Inc. or Michigan Hanger.

B. Where required hanger spacing does not correspond with structural joist and/or rib spacing, or where the placement/location of suitable structural members will not accommodate this required spacing or hanger location, attach supporting steel members to the structure in order to properly carry the lines.

C. Where three or more lines are installed in parallel, trapeze hangers may be used. The horizontal support shall be formed channel members with the appropriate pipe supports and accessories as listed below.

D. Soil pipe stacks shall be supported at each floor and at each 5' increment, joint, and elsewhere as required. Other vertical piping shall be guided or supported at the midpoint of riser and not over 15 ft. on centers with riser clamp lugs and shall be supported at base elbow or where shown, with pipe stand.

E. Suspended cold lines with compressible insulation as well as all non-insulated lines shall be supported by clevis hangers, Anvil Fig. 300, with standard additional components as required. All pipe supports for cold lines shall have formed galvanized steel insulation protection shields.

F. All suspended steam, steam condensate and hot water piping (above 140°F) 2-1/2" and over shall be supported with Anvil Fig. 181 adjustable swivel pipe rolls with protection saddles spot welded to pipe and standard additional components as required. Saddles shall be made from carbon steel plate. On all hot lines 2" and below, however, adjustable clevis hangers, Grinnell Fig. 300 or equal, may be used. Note that where copper lines are involved, calcium silicate segments shall be employed at the support points.

G. Wall brackets or floor supports for hot lines 3" and over shall utilize adjustable rollers with base plate, Grinnell Fig. 175 or equal. In lieu of rollers, lines may be supported by weld type T-cradle guides with bonded graphite bearing surfaces. Securely fasten base plate to bracket or floor slab after alignment. Furnish with insulation protection saddles or shield as required.

H. Pipe support loops, U-straps, rings, rollers, etc. shall be of the proper size to fully accommodate the pipe and, for insulated lines, the pipe with insulation.

I. All manufactured support items such as brackets, clamps, hangers, etc. shall comply with the Manufacturers Standardization Society specifications as well as applicable federal specifications. The imposed loads shall not exceed the manufacturer's published maximum recommended load listings.

J. Supporting and/or framing members, racks, etc. shall consist of cold-formed structural steel channel sections, fittings, bolt and nut assemblies, etc. as required by job conditions. Double channel combinations shall be spot welded. Beam loading, etc. shall not exceed manufacturer's allowances. All members shall be bonderized and material shall be as manufactured by Unistrut, Anvilstrut, Hilti or Van Huffel Tube.

K. Ceiling grid systems shall not be supported from ductwork, piping, etc., and vice versa. The utilities and mechanical services shall be separate installations from the ceiling grid system and shall be independently supported from the building structure. Where interferences occur, trapeze hangers or supports shall be employed. Care shall be taken to avoid blocking access to air terminal boxes and other items of mechanical equipment, fire dampers, valves, etc.

38. EXPANSION, ANCHORS AND GUIDES

A. All piping shall be installed with due regard for expansion to prevent damage to the building, equipment and piping. Provide anchors and expansion loops, offsets or approved type expansion joints where indicated or required for the accurate control of movement.

B. Branch connections from mains to domestic hot water risers shall be made with a minimum of two 90° elbows.

C. Bullhead connections in any piping service are expressly prohibited.

D. All expansion joints and compensators shall be supplemented with adequate guides as close to the units as possible and additionally at recommended intervals from joints to preserve alignment and pitch. Guides shall be rigidly secured to the structure and shall permit axial movement only.

E. Unless otherwise noted, expansion joints shall be packless type with stainless steel bellows and external equalizing or reinforcing rings. Where pressure/temperature ratings permit, joints 2½" and smaller may be internally guided, seamless bellows type expansion compensators. On copper lines, units shall be of all-bronze construction.

F. Expansion loops shall be the flexible type, sized as noted on the drawings and designed so that no pressure thrust load is imparted to the connecting pipe. They shall consist of three flexible sections of bronze or stainless steel hose and braid with connecting fittings. The hose and fitting material shall correspond to adjacent pipe and end connections shall be in accordance with specification item PIPE FITTINGS. Loops shall be as manufactured by Flex-Hose.

G. All expansion units shall be line pipe size and shall be installed in strict accordance with manufacturer's recommendations.

H. Expansion joints and/or loops 2-1/2" and over in size shall have standard ANSI flanged end connections; expansion joints and/or loops 2" and under, as well as all expansion compensators, shall have thread-end or sweat-end connections unless otherwise indicated.

I. Each expansion unit shall be selected for minimum traverse of 1½ times the possible expansion that can occur in the particular section (Assume that the piping is installed at 40°F. outdoor air temperature with no cold springing).

J. Expansion joints shall be as manufactured by Zallea, Tube Turns, Flexonics or approved equal and shall be designed for a minimum 125 psi working pressure or higher as determined by system requirements.

K. Pipe guides shall be the spider and sleeve type as manufactured by ADSCO, Flexonics, Elcen or equal. On pipelines subject to sweating, guides shall be sized to accommodate an insulating thermal barrier.

L. Thermal barriers shall consist of split, waterproof thermal units, ADSCO "ITB" or equal, which shall be installed in accordance with manufacturer's instructions.

M. Pipe anchors shall be furnished and installed where required to secure the pipe and totally eliminate movement. They shall be fabricated from structural steel shapes and shall be securely attached to both pipe and structure as required.

N. Where the structure is of steel, the means of attachment shall be welding, and where the structure is concrete, the means of attachment shall be anchor bolts and heavy-duty sleeves.

O. All welding shall be performed in accordance with applicable provisions of the AWS Code. Structural steel anchors shall be fabricated and installed using fillet welds. Allowable weld stress shall be 3,000 lbs. per lineal inch parallel to the longitudinal axis and 1,500 lbs. per lineal inch normal to this axis.

P. Bolts used for anchor attachment shall be minimum 5/8" diameter high-strength carbon steel bolts. A minimum of 3 bolts shall be utilized at each other attachment.

Q. Note that where pipeline expansion joints are involved, the method of attachment, length of weld, size and number of bolts, etc. shall be subject to approval.

39. CAST IRON DRAINS

A. Furnish and install drains as shown on the drawings and specified herein. The drains specified are based on a manufacturer whose catalog numbers have been used as criteria for type and description unless otherwise noted. The drains of the other manufacturers of equal quality and similar design shall be given the same consideration as those listed. Acceptable manufacturers are J.R. Smith, Zurn, Watts, Wade or Josam.

B. All drains shall have cast iron bodies, drainage flanges and weepholes, unless noted otherwise. Furnish a flashing collar on all roof drains and all floor drains not installed directly on grade or fill. Additional features and requirements will be found in the drain schedule located on the drawings.

C. Floor drains shall be installed flush with the finished floor. Verify floor pitch to drains with General Contractor. Rim of drain shall not be higher than surrounding floor area.

D. Neoprene compression gaskets may be used in lieu of lead caulking for connecting drains to piping.

E. Install flashing on all roof drains and all floor drains not installed directly on grade or fill. For acceptable methods of flashing, see description under item FLASHING.

40. CLEANOUTS

A. Cleanouts, caulked into proper branches, shall be provided where indicated or where required by local and/or state codes. Cleanouts shall be as manufactured by J. R. Smith, Zurn, Watts, Wade or Josam. Cleanouts shall be located for convenience and easy accessibility.

B. Cleanouts shall be provided as listed below:

1. Floor Cleanouts: Cast iron cleanout with adjustable housing, ferrule with "speedi-set" outlet and plug with neoprene seal. Furnish with flashing flange and clamping device for floors with membrane seals. Tops of cleanouts located in finished areas shall be secured and scoriated nickel bronze. Cleanouts shall be equal to the following J. R. Smith styles:

a. Finished Areas - 4111
b. Carpet Areas - 4031-Y/4031-X*
c. Concrete Areas - 4237

*As selected by Architect

C. Wall Cleanout: J. R. Smith #4532, cleanout tee with countersunk tapped brass plug and round stainless steel cover screw.

D. Other Pipe: J. R. Smith #4710, round s/s cover with screw.

E. Horizontal drains within buildings shall be provided with cleanouts not more than 100 ft. apart. Where more than one change of direction occurs in a run of piping, only one cleanout shall be required for each 40 feet of developed length.

F. Outside cleanouts shall be standard type furnished with J. R. Smith #4237-U or equal cast iron cover and frame set in concrete flush with grade so no hazard will exist.

41. SANITARY DRAINAGE SYSTEM

A. The sanitary drainage system shall consist of a complete properly vented piping system from the outlets of fixtures to a point indicated on the drawings.

B. Sanitary piping below grade within the building and to five (5) feet outside the building shall be one of the following:

1. Coated cast iron hubless soil pipe and fittings conforming to CISPI 301 and ASTM A888 standards.

2. PVC plastic DWV pipe and fittings conforming to ASTM D2665 or ASTM D2949 standards, installed per ASTM D2321 standards.

3. ABS plastic DWV pipe and fittings conforming to ASTM D2661 standards.

C. Sanitary and vent piping above grade shall be one of the following:

1. Coated cast iron hubless soil pipe and fittings conforming to CISPI 301 and ASTM A888 standards.

2. Copper DWV tubing conforming to ANSI B306 standards and wrought copper drainage fittings conforming to ANSI B16.29 standards.

3. All cast iron soil, waste and vent pipe and fittings shall be made in the USA and marked with the CISPI mark, C.I. All pipe and fittings shall be of one manufacturer.

4. Soil and waste piping shall be graded at not less than 1/4" per ft.

5. Furnish and install J.R. Smith #1748 or approved equal, cast iron vent caps with vandal proof head on all vents extending through roof.

D. For acceptable methods of joining pipe and fittings, see description under Item PIPE JOINTS.

42. DOMESTIC WATER SUPPLY SYSTEM

A. Furnish and install modifications to the domestic water supply system as shown on the drawings and indicated in these specifications.

B. Water piping located above grade shall be as follows:

1. On lines thru 4"...Type L hard temper seamless copper water tubing conforming to ASTM B88 standards with wrought copper fittings conforming to ANSI B16.22 standards.

2. Hot water shall be provided through a hot water supply and return piping system originating from the point of connection to the hot water supply source and extending to all points of use as required and as indicated on the drawings.

3. The hot water return system shall be carried to the end and top of each hot water main and connected in such a manner as to ensure continuous circulation.

C. Piping shall be as previously specified.

D. No water lines shall be installed in exterior building walls unless it is absolutely unavoidable. If this situation does occur, the piping shall be installed in such a way that all building wall insulation is on the outdoor side of the water line and only the room wall surface is between the line and the conditioned space.

E. Connections between copper and steel or iron pipe shall be made with an approved type dielectric coupling.

F. The water distribution system shall be installed in such a manner as to allow total evacuation of the system.

G. Piping shall be run to fixtures and equipment as required.

H. Wherever the possibility of cross-connection or contamination exists, furnish and install a backflow preventer as approved by the E.P.A., state and local authorities.

I. For acceptable methods of joining pipe and fittings, see description under Item PIPE JOINTS.

43. CONDENSATE DRAINAGE SYSTEM

A. The condensate drainage system shall consist of piping from the drain connections of all air conditioning units to drain locations as indicated on the drawings. Unions shall be used at all condensate drain connections.

B. Condensate drainage piping shall be Type L or M hard temper copper tubing conforming to ASTM B-88 standards and made up with solder joint fittings. On lines 1" and below use wrought copper pressure fittings conforming to ANSI B16.22 standards and meeting the requirements of MSS SP-104 or cast copper alloy pressure fittings meeting the requirements of ANSI B16.18. On lines 1-1/4" and above use DWV drainage fittings. Wrought drainage fittings to be in accordance with ANSI B16.29 and cast copper alloy drainage fittings to be in accordance with ANSI B16.23. Note that where pressure fittings are involved, 45° Y fittings in tandem with 45° ells must be used in lieu of dead head tees.

C. For acceptable methods of joining pipe and fittings, refer to specification Item PIPE JOINTS.

44. FUEL GAS PIPING SYSTEM

A. Furnish and install fuel gas piping as indicated on the drawings and in these specifications. The work shall consist of new fuel gas piping from the point of connection to the gas supply main and extending to all points of use as required. All piping to be in accordance with applicable portions of ANSI B31.2.

B. The fuel gas piping installation shall be in accordance with the latest rules and regulations of the Department of Transportation Pipe Line Safety Law, Section 191 and 192, Title 49 of the Code of Federal Regulations and all local requirements.

C. All branch lines shall be taken off of the top of the main and dirt legs shall be provided on all pipe drops to equipment.

D. Fuel gas piping below grade shall be, at the Contractor's option:

1. Schedule 40 electric resistance welded or seamless carbon steel pipe conforming to ASTM A53, type E or type S standards with factory beveled ends. Fittings shall be standard weight carbon steel of the butt-welding type made from ASTM A106, Grade B seamless pipe conforming to ANSI B16.9 standards with a standard bevel.

E. Fuel gas piping above grade shall be:

1. Piping 2" and under shall be Schedule 40, welded or seamless black carbon steel pipe conforming to ASTM A53, type E or type S standards with threaded ends. Fittings shall be gray iron minimum Class 125 or malleable iron minimum Class 150 threaded in accordance with ASME B1.20.1 Standard for tapered pipe threads.

2. Piping 2-1/2" and above shall be Schedule 40, welded or seamless black carbon steel pipe conforming to ASTM A53, type E or type S standards with factory beveled ends. Fittings shall be standard weight carbon steel, butt-welding type, made from ASTM A106, Grade B seamless pipe conforming to ANSI B16.9 standards with a standard bevel.

3. Apply joint compound sparingly, and only to male threads, when making pipe connections. Use only joint compound that is resistant to action of liquefied petroleum gases as specified by local and/or national codes. The use of Teflon coated tape is prohibited.

4. All Schedule 40 piping shall be assembled by fusion welding. Where threaded joints are necessary or permitted by code, pipe shall be Schedule 80 weight. Note: Threaded joints will not be permitted on any underground

piping, crawl space piping or piping run within ceiling and/or attic spaces being utilized as return air plenums. Threaded pipe joints will be permitted in areas with return air ductwork unless otherwise prohibited by codes and/or local inspection agencies.

F. Flanged fittings where required shall be made of forged carbon steel of the welding neck style, 150 lb. class. Fittings shall conform to ANSI B 16.5 and ASTM A105. Bolting for flanged fittings shall utilize only carbon steel machine bolts and studs, threaded in accordance with ANSI B1.1, coarse thread series. Bolt stud length to allow no more than one thread extension.

G. Furnish and install insulating fittings where indicated on the drawings or where otherwise required. Insulating fittings shall be one of the following types:

1. Insulating Flanges: Flanges shall be as previously specified, except that installation shall be made using an insulating gasket. Insulating gasket sets shall be Type E with O-ring seal as manufactured by Pacific Seal, Inc. or approved equal by F.H. Maloney or Central Plastics Company (The washers should be installed on the unprotected side of the flange to provide cathodic protection for the studs and nuts).

2. Insulating Coupling: Dresser Style 39 insulating coupling follows the same basic design as the regular coupling, except that the insulating gaskets extend under the follower rings and a plastic insulator extends over the pipe ends. Installation shall be per manufacturer's recommendations.

3. Insulating Union: Threaded insulating unions may be used on interior or above grade piping of 2" size or smaller. Insulated unions shall be composed of ground joint, precision machined black malleable iron castings with molded nylon insulation rated at 175 psi WOG as manufactured by Central Plastics Company or approved equal.

45. DOMESTIC WATER HEATER

A. Furnish and install, where shown on the plans, a gas fired, tank-type, commercial water heater with input, recovery rate, storage capacity, etc., as called for on the drawings.

B. The water heater shall have the AGA seal of certification and shall be provided an AGA rated temperature and pressure relief valve. The tank shall have a tube bundle which incorporates a double coating of high temperature porcelain enamel and shall be supplied with mounting legs, a hand-hole cleanout and magnesium anode rods. The water heater shall meet or exceed the thermal efficiency and standby loss limit requirements of current ASHRAE Standard 90.1b when tested in accordance with ANSI test procedures. The tank shall have a working pressure rating of at least 150 psi and shall be constructed in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section IV Part HLW.

C. The water heater shall be completely factory assembled with a natural draft gas burner, intake and combustion air connections, brass drain valve, controls including fully adjustable thermostat, 120/24 volt transformer, spark-to-pilot ignition system and high limit temperature cut-out. A fully piped and mounted gas valve train shall include a combination gas valve and main gas pressure regulation. The burner shall be made from high chrome stainless steel and shall be easily accessible for inspection.

D. The above described unit shall be manufactured by Rheem, A. O. Smith or Lochinvar and shall carry a three year warranty against tank leaks.

46. INSULATION

A. General Requirements:

1. All insulating materials, tapes, etc., for piping and equipment shall have composite fire and smoke hazard ratings, as tested by procedure ASTM E-84, NFPA 255, NFPA 258 and UL 723, not exceeding flame spread 25 and smoke developed 50 unless otherwise noted. Specific items of equipment that are factory insulated are not governed by this item of the specifications. Note that pipe insulation and coverings on pipe located in plenums and/or shafts serving to directly convey supply, return or exhaust air shall have a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50. However, pipe insulation and coverings installed in sealed chases and shafts or other similar concealed spaces, and in mechanical equipment rooms, shall have a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 150 (See Note at the end of this Item).

2. Insulation Index - Equipment and Piping shall be covered with the classification and thickness of insulation noted in the Insulation Index listed in this item of the specifications.

3. Surface Finish - All field applied surface finish reinforcing mesh, as listed in the index, shall be equal to Childers Chil-Glas #10 glass fiber open weave reinforcing mesh (referred to as glass cloth). When tested according to ASTM method D-579, the mesh material shall indicate a tensile strength warp of 75 lbs/sq. in. and fill of 75 lbs/sq. in. Material shall be applied in accordance with manufacturer's recommendations. Refer to Coverings at the end of this item for specific requirements regarding factory-applied jackets, field-applied metallic jackets, etc.

4. Equipment coverings and linings shall be interrupted as required by applicable provisions of NFPA 90A, and similarly, shall not conceal any service openings.

B. General Instructions:

1. Before insulation is applied, all piping and equipment shall have been tested in accordance with specifications - see Item TESTING AND INSPECTION. Tests shall be verified by the appropriate Inspection Agencies before proceeding with the work.

2. Before application of insulation or insulation adhesives, all surfaces to be covered shall be thoroughly cleaned of all dust, dirt, grease and moisture.

3. Where insulation is butted, laps and joints shall be sealed with adhesive. The use of staples is acceptable only as an installation aid and not as a substitute for adhesive. Where staples are used on pipe covering in exposed locations, care must be taken to locate the staple joints in such a way that they are not in direct view.

4. Where insulation is applied to flanges on heated lines, the pipeline insulation shall be stopped off a sufficient distance to allow removal of flange bolts without disturbing the insulation. Flanges shall be covered as specified. On lines subject to sweating, all surfaces shall be covered, and joints shall be sealed in a manner to prevent condensation.

5. Where valves are insulated, cover the valve bonnets to a point just below the stuffing box.

6. Where two layers of insulation are used, stagger all joints both ways and secure each layer independently.

7. Continue insulation through walls, partitions, floors and pipe sleeves unless otherwise indicated on drawings or prohibited by Code requirements.

8. Insulation manufacturer's names and product names that may appear in the specifications have been listed as a guide to manufacturer and/or a standard of quality. Products of equal quality and performance by other manufacturers will be considered on approval of the Engineer.

C. Adhesives, Coating and Vapor Barrier Materials:

1. All factory attached vapor barrier materials, and all adhesives, mastics, coatings and insulation materials applied as herein specified shall have a dry flame spread index not to exceed 25 when tested in accordance with applicable Federal Standards. In addition, materials shall be in accordance with applicable portions of MIL-A-336C, Classes 1 and 2 Grade A.

2. The toxicity of the solvents used on the premises must be such that the maximum allowable concentration (MAC) in parts per million (PPM) is 200

or higher according to the latest value published by the American Conference of Governmental Industrial Hygienists.

3. Prior to use, submit certification by the manufacturer for each of the above materials used with respect to the flame index and toxicity.

4. The lap-seal system described in the General Instructions shall only be installed when ambient conditions are within the range stipulated by the manufacturer.

D. Insulating Cements:

1. These materials shall be listed as mineral fiber, hydraulic settings, insulating and finishing cement.

E. Miscellaneous:

1. Exposed pipe risers, where subject to abrasion, shall have insulation covered with 0.016 ga. aluminum jacketing, J-M "Metal-On", "Metal-Lok", or equal.

F. Piping Insulation Index:

PIPING	CLASS	THICKNESS
Domestic Cold Water	C or G	1"
Hot Water	C or G	1-1/2”
Horizontal condensate waste and misc. piping subject to sweating thru 1-1/2" over 1-1/2"	C or G	3/4"

NOTE: Class "G" insulation may be used in cramped or otherwise inaccessible areas on cold lines such as domestic cold water, chilled water, condensate waste, etc.

G. Materials:

1. Class "C" Insulation

a. Nominal 4 pound density mineral fiber sectional pipe insulation wrapped with a factory applied ASJ jacket (similar to a Class "C" jacket) as manufactured by CertainTeed, Knauf, Manson, Johns Manville, Owens-Corning or Schuller. The "k" factor shall be 0.23 or less at 75F mean. Product shall conform to ASTM C 547, Class 1, the property requirements of HH-1-558D (Amendment 3),

Form D, Type III, Class 12 and shall meet UL 723 ratings. Published temperature range shall extend from 0ºF to 800ºF or greater. Longitudinal and circumferential (butt) joints shall be closed and sealed in accordance with manufacturer's instructions. The use of staples is permitted only in hot pipe insulation in concealed locations at contractor's option. Note that for exterior applications, the insulation shall have an all-weather (AWJ) jacket consisting of a factory-applied weather-resistant jacket reinforced with fiber glass fabric.

b. On insulated lines, all fittings, flanges, valves, etc. shall be covered with either premolded/mitered fiberglass insulating units or 4" wide x 1-1/2 " thick, minimum 3/4 lb. density, fiberglass wrap to the thickness of adjacent pipe insulation. The wrap insulation shall be installed under full compression and secured with vapor-barrier tape which shall cover the entire fitting. The tape shall overlap itself and the adjacent material in a neat, precise manner. On lines subject to sweating such as chilled water, etc., all of the above described work shall be given a flooding coat of vapor barrier mastic. Finally, all exposed fittings, valves and flanges shall be provided with preformed molded PVC jacket covers as manufactured by CertainTeed, Knauf or Johns Manville. Covers shall be white with gloss finish, shall be UL 25/50 rated and shall meet the requirements of ASTM D1784, Class 14253-C. Mechanical fasteners shall be of stainless steel.

c. Flanges and valves on specific hot lines (200° max. - 2-1/2" and below) need not be insulated unless otherwise called for or required for personal safety.

d. In general, all heated lines (above 140°F) 2-1/2" and larger will be supported by adjustable clevis pipe rolls or double rod trapeze type pipe rolls. Except as noted in the following paragraph, protection saddles for steel piping will be furnished with these supports by the piping contractor. Unless otherwise called for, heated lines 2" and smaller as well as all other lines will be supported by adjustable clevis hangers. Note that where copper piping is involved on heated lines, calcium silicate segments shall be employed at the support points. The above is described more fully under Item SUPPORTS, HANGERS AND BRACKETS.

e. Insulation at support points on cold lines 1-1/2" and larger shall incorporate water resistance treated calcium silicate segments, or pre-compressed and preformed sections of molded glass fiber. Inserts shall have sufficient compressive strength to support the pipe without deforming to a thickness less than the adjacent insulation. At support points on all such insulated lines, a formed, galvanized

steel protection shield will be provided with the support by the piping contractor - see Item SUPPORTS, HANGERS AND BRACKETS.

f. Removable heads shall be covered separately to permit access without disturbing body insulation of the equipment. Insulation shall have a 20 ga. galv. metal lagging. Covers shall be fabricated and installed in a manner that will prevent condensation at any point including the body insulation joint.

2. Class "G" Insulation:

a. Flexible, elastomeric cellular insulation (tubular or sheet) - as manufactured by Armstrong, IMCOA, Johns Manville or Rubatex. The "k" factor for this material shall be 0.27 or less at 75F mean and the published temperature range shall extend from -40°F or below to at least 210°F. On thicknesses through 1" the flame spread rating shall be 25 or less and the smoke developed rating shall be 50 or less based on ASTM E-84. Tubular material for piping shall conform to ASTM C534, Type II and be factory pre-slit longitudinally with mating surfaces adhesive coated and protected by release liners. In addition, all longitudinal joints shall be sealed with an approved tape. All other joints shall be butted and sealed with approved adhesive. Fabricate segments for valves and fittings and install according to manufacturer's recommendations. Outdoor piping insulation and lines that are exposed in mechanical rooms, etc. shall be given two coats of a white, semi-gloss latex enamel specifically formulated for this type of application. Note that adhesive shall not be field applied on or with any installation involving plastic pipe or tubing.

3. Coverings:

a. Standard (Indoor) Duty:

1. Class "C" - Jacket: All service type (ASJ) to be a white, embossed foil, vapor-barrier laminate. Water vapor perm rating not to exceed 0.02 perms (ASTM E96, Proc. A) Tensile strength to equal or exceed 75 lbs./in.

b. PVC Jacketing:

1. Where PVC jacketing is called for it shall be a 20 mil thick, high-impact, UV-resistant polyvinyl chloride covering designed for insulated pipe. It shall be 25/50 rated, white in color to match the insulated fitting covers and shall be similar and equal to Zeston 2000 jacketing.

c. Plastic Pipe Fire Resistant Covering:

1. Where non-metallic (PVC, CPVC, PB, PE, PP, PVDF and ABS) pipe is located in return air plenums it shall be covered with a fire resistant wrap, similar and equal to 3M Fire Barrier Plenum Wrap 5A. It shall be a refractory ceramic fiber blanket encapsulated with foil scrim, providing a flexible enclosure that is non-combustible as tested to UL 910.

2. The above described material shall be tested and rated in accordance with ASTM C411, ASTM C518, ASTM E84, ASTM E136 and the UL 910 flammability test. Note that the flame spread, and smoke developed ratings shall not exceed 5 when tested to ASTM E84.

3. This pipe wrap shall be installed in strict accordance with the manufacturer's written instructions.

4. Note: In view of the fact that one of the classes of insulation listed above (Class F) does not meet the smoke developed rating criteria of 50 or less, its use will not be permitted for this project unless letter(s) of approval from the inspection agencies involved accompany the insulation submittals. Letter(s) must state specifically where its use will be permitted.

47. VALVES

A. Valves of each type furnished on this project shall be of one make and each valve shall have manufacturer's name and trademark together with design working pressure (Class) clearly indicated on the body. Valves required to be Underwriters listed shall bear the U.L. label. Note that all valves shall be full line size unless specifically indicated otherwise.

B. All valves shall be compatible with the type of piping material installed in the system. In addition, valves intended to supply drinking water shall meet the requirements of NSF 61, Annex G and NSF 372.

C. Gate valves, globe valves, swing check valves and needle valves shall be in accordance with the following paragraphs where applicable. In addition, gate valves and globe valves 4" and over that are installed 8 feet or more above floor level shall be provided with babbit adjustable sprocket rim assemblies with non-corroding chains.

D. General:

1. Steel Piping Systems...Unless otherwise indicated, valves 2" and under shall be lead free bronze with thread ends and valves 2-1/2" and over shall be iron body, bronze mounted, with flanged ends or all steel with flanged or welding ends.

2. Copper Piping Systems...Unless otherwise indicated, valves 3" and under shall be lead free bronze with solder ends and valves 4" and over shall be iron body, bronze mounted, with flanged ends.

E. Materials:

1. Bronze castings shall meet NSF 61 and 372 specifications. Iron castings shall meet ASTM A-126, Class B specifications Steel castings shall conform to ASTM specification A-216, Grade WCB.

2. Packing for shut-off valves shall be of a non-asbestos type, suitable for its designated service.

3. Shut-off valves shall have stems designed for ample strength and machined to function easily. Bronze shut-off valves shall have malleable iron or aluminum alloy handwheels and stems with corrosive resistant properties per ASTM B-371.

F. End Connections:

1. Thread-end connections for bronze and/or iron valves shall conform to the requirements of ANSI B2.1 and solder-end connections for bronze valves shall conform to the requirements of ANSI B16.18.

2. End flanges of cast iron valves shall be faced and drilled to conform to requirements of ANSI B16.1.

3. End connections on steel valves shall conform to the applicable requirements of ANSI B16.5 and B16.10 for flanges, ANSI B1.20.1 for thread ends and ANSI B16.25 for butt weld ends.

4. Press-end connections shall conform to the testing requirements of ASTM B16.51 - “Copper and copper alloy press-connect pressure fittings”.

G. Standards Compliance:

1. The following additional standards shall apply to the valve types referenced above.

a. Cast Iron Gate Valves.....MSS SP-70
b. Cast Iron Globe Valves.....MSS SP-65

c. Bronze Gate and Globe Valves...MSS SP-80

H. Design:

1. Bronze gate valves shall have solid wedge disc, threaded bonnet and rising stem.

2. Bronze globe and angle valves shall have union bonnet, renewable composition disc and rising stem.

3. Bronze swing check valves shall have screwed bonnet or cap with renewable bronze disc and seat. Valve body shall display an arrow indicating direction of flow.

4. Cast iron gate valves shall be OS&Y design with rising stem, bolted bonnet, and solid wedge disc.

5. Cast iron globe and angle valves shall have bolted bonnet and renewable seat and composition disc.

6. Steel gate valves shall have straight-thru ports and shall be OS&Y design with rising stem, bolted bonnet and flexible disc. Valves may have bronze trim unless otherwise mentioned.

7. Other valves shall be as described under Miscellaneous.

I. Duty:

1. Pressure ratings for bronze valves shall be for cold working pressure (CWP); adjust pressure/temperature rating as required for solder end valves.

2. Pressure/temperature ratings for iron valves shall comply with the standard ratings for Class 125 and Class 250 valves.

3. Pressure/temperature ratings for steel valves shall comply with ANSI B16.5.

4. All piping systems with a maximum operating pressure and/or relief valve setting below 100 psig, valves shall be rated minimum 125 psig steam, 200 psig cold water, oil or gas. On all piping systems with a maximum operating pressure and/or relief valve setting between 100 psig and 250 psig, valves shall be rated minimum 250 psig at 450°F.

J. Manufacturer:

1. The above described valves shall be as manufactured by Crane, Hammond, Jenkins, Kitz, Milwaukee, Nibco, Powell or Watts.

K. Miscellaneous...

1. Butterfly Valves: Unless otherwise indicated, valves shall be water service type with stem seals, machined disc, full diameter stem and reinforced, resilient seat without the need of a downstream flange and designed for end of line service at full rated pressure. Valves shall be guaranteed bubble tight at design pressure. Body shall be full lug style ductile iron or cast iron and shall accommodate ANSI standard flat or raised face flanges. Lugs shall be tapped. Disc shall be bronze, bronze alloy or stainless steel and stems shall be stainless steel with corrosion resistant bearings. Seat material shall be EPDM. Handle assembly on valves through 6" size to have locking type handle for positive disc control. Valves 8" and over shall be gear operated. Valves shall be rated at a minimum 150 psig working pressure at temperatures between -20° and 250°F. Valves shall be as manufactured by Demco, Grinnell, Hammond, Keystone, Kennedy, Milwaukee, Mueller or Nibco.

2. Where butterfly valves are installed in grooved end piping systems they shall have end connections designed to accommodate the couplings and gaskets specified for these systems. Grooved end valves, conforming to applicable portions of the above specifications, shall be as manufactured by Victaulic, Anvil, Grinnell, or Nibco.

L. Ball Valves (Domestic Water System):

1. Valves shall be in accordance with the following and shall incorporate a stainless steel ball, multiple rings of Teflon impregnated packing and high tensile stem. Body shell/wall thickness to be in accordance with requirements of ANSI B16.34. Lever handle shall be of nickle plated or stainless steel with plastic grip. Quarter turn of handle shall rotate ball from full open to full closed position.

2. On lines 2" and under, valves shall be bronze with 316 stainless steel ball and blow-out proof stem. They shall be rated 600 psig WOG, cold non-shock. Body shall be two piece with threaded or solder ends and shall incorporate an adjustable packing gland and reinforced Teflon seat. Valves shall be in conformance with Federal specification WW-V-35C.

3. On lines 2-1/2" and over, valves shall be standard port with blow-out proof stem, adjustable packing gland, and minimum ANSI Class 150 carbon steel split body with ANSI B16.5 flanged ends, or 3-piece solder end bronze body rated 600 psig WOG, cold non-shock and 150 psig saturated steam. Stem shall be 316 stainless steel. Ball shall be 316 stainless steel through 8" and nickle plated carbon steel 10" and above. Bearing sleeve and seat shall be of reinforced Teflon. Manually operated valves 4" and over shall be provided with hand wheel type worm gear actuators.

4. Valves shall be as manufactured by Apollo, Flow-Tek, Grinnell, Hammond, Jamesbury, Kitz, Milwaukee, Nibco, Victaulic, Watts, W-K-M or Worcester. Install in accordance with manufacturer's recommendations including disassembly of sweat end valves. Note that valves for steam service shall be full port type and rated for 150 psig. saturated steam.

M. Balancing Valves:

1. Balancing valves for domestic hot water low flow return line applications (1/2 gpm) shall be globe style valves designed for precise regulation and control at flow rates below 1 gpm and rated 240 psi for bronze at 250° F. Valves 1/2" shall be constructed of dezincification resistant brass (DZR) or bronze alloy. Each valve shall have two metering/test ports with internal check valves and with attached protective caps. All valves must equipped with visual position readout and concealed memory stops for repeatable regulation and control. Valves shall be Nibco T or S1810LLF or approved equal globe style valve.

2. Balancing valves for domestic hot water return line applications shall be globe style valves for precise regulation and control and rated 175 psi for iron and 240 psi for bronze at 250° F. Valves 1/2" to 2" shall be constructed of dezincification resistant brass (DZR) or bronze alloy. Valves over 2-1/2" will be constructed of iron with ANSI Class 125/150 flanged or grooved ends. Each valve shall have two metering/test ports with internal check valves and protective caps. All valves must be equipped with visual position readout and concealed memory stops for repeatable regulation and control. Valves shall be Nibco T or S1810LF (1/2" - 2") or approved equal globe style valve.

N. Non-Slam Check Valves:

1. Unless otherwise indicated, valves shall be center-guided type with bronze or s/s trim, renewable or resilient seat and s/s spring. Disc holder shall be stainless steel with PTFE disk fully guided, top and bottom. Body shall have an open area equal to or greater than connected pipe. All parts to be field repairable or replaceable. Valves shall be Nibco lead free bronze ring check valve #T/S 480-Y-LF or as manufactured by Watts or Milwaukee.

2. Valves size 2" and under shall have bronze or semi-steel body with threaded or flanged ends and valves size 2-1/2" and over shall be wafer style with steel or cast iron body and flanged ends. Flanges shall conform to ANSI B16.1 for cast iron or ANSI B16.5 for steel.

O. Valves for specific service shall be as follows:

1. Fuel gas shut-off valves shall be constructed of materials compatible with the piping and comply with the standard applicable to the pressure and application in which the valve is used per the IFGC.

    a. Appliance shut-off valves used in applications with a pressure up to 1/2 psi shall have a forged brass body with a chrome plated brass ball, PTFE seat, lever handle and be CSA certified to ANSI Z21.15. The valve shall be a Nibco #GB10/GB1A or Engineer approved equal.

    b. Shut-off valves used in applications with a pressure up to 5 psi and size 2" and under shall be 2-piece, threaded, full port, forged brass with a chrome plated brass ball, PTFE seat, lever handle and comply with ASME B16.44 standards. The valve shall be a Watts #FBV-3C series or Engineer approved equal.

    c. Shut-off valves used in applications with a pressure up to 125 psi and in sizes 2-1/2" through 8" shall be carbon steel ASME class 150 flanged with a 316 stainless steel ball and stem, RPTFE seat, lever handle and comply with ASME B16.33 standards. The valve shall be an Apollo #88A-140 series or Engineer approved equal.

    d. Service entrance valves shall also be approved by the local utility company.

2. Lubricated plug valve: Wrench operated regular gland design with separate retainer and adjusting gland. Design shall incorporate pressure sealed lubrication with sealant fitting and well. Body shall be cast iron with flanged or threaded ends and shall be rated at 200 psig CWP. Valve shall be suitable for natural gas service and shall be as manufactured by Nordstrom, Powell or Walworth.

48. UNIONS

A. Unions shall be provided wherever necessary to facilitate connecting to apparatus and installing necessary fittings. In addition, unions shall be provided at the following locations:

    1. Adjacent to and downstream of all valves not flanged.

    2. At the connection to all items of equipment not flanged.

B. Except as noted in the following, thread-end unions shall be used for all steel piping 1-1/2" and under. They shall be Class 300 malleable iron unions with bronze-to-bronze seat ground to a ball and socket joint and shall conform to ASME B16.33. Note that on steam lines, however, unions shall be carbon steel with ball-to-cone

joint and rated Class 2000 or higher. Unions shall conform to MSS SP-83 and ends shall be threaded to ANSI B2.1.

C. Flange unions shall be used for steel piping 2" and over and shall be cast iron, minimum Class 125 or higher as required, conforming to ANSI B 16.1 or ductile iron, Class 150 or higher as required, conforming to B16.42. They shall be complete with suitable gasket and bolts. Use galvanized unions with cadmium plated bolts on galvanized steel piping.

D. Copper lines shall, in general, utilize sweat-end, copper alloy unions. They shall be cast pressure fittings manufactured in accordance with ANSI B16.18. On copper lines 4" and above, however, flange unions shall be used, with minimum Class 150 cast copper alloy flanges complying with MSS SP-106 and ASME B16.24.

E. Where dissimilar metals are involved, minimum Class 150 bronze flange dielectric piping connections incorporating non-metallic bolt sleeves and isolating washers shall be utilized. Note that gaskets, temperature and pressure ratings, etc., of these connections shall be comparable to the ratings specified for other components of the piping system.

F. Where a dielectric connection is installed on a closed loop piping system runout, provide a shut-off (ball) valve on the main side of and adjacent to the connection to permit isolation from the system for service.

49. STRAINERS

A. Furnish and install strainers where called for in the specifications and/or shown on the drawings.

B. Strainers shall have semi-steel bodies conforming to ASTM A278 Class 30 standards and 20-mesh stainless steel screen. Strainers 1½" and under shall have threaded ends; strainers 2" and over shall have ASA standard flange connections with blow-off covers. Design working pressure shall equal or exceed system pressure requirements. Strainers shall be as manufactured by McAlear, Mueller Steam Specialty, Nibco, or Sarco.

C. Install a valved blow-off pipe on all blow-off covers.

50. SHOCK ABSORBERS

A. Shock absorbers shall be installed where indicated on the drawings or required by good plumbing practice and shall be Sioux Chief "Hydra-rester", properly sized and installed in accordance with the Plumbing and Drainage Institute "Standard P.D.I. WH201" and ASSE 1010.

B. Units as manufactured by Oatey, Precision Plumbing Products, J.R. Smith, Zurn, Watts or Wade will be considered as equal.

51. THERMOMETERS

A. Thermometers shall be universal angle, bi-metal dial type with plexiglass window, and 5" diameter, hermetically sealed, stainless steel case and ring. Dial shall be of the anti-parallax type with jet black figures on a white background. The stem shall be 1/4" O.D. stainless steel with the sensitive portion of the stem having silicon surrounding bi-metal element to give faster heat transfer and damper element from vibration. Accuracy shall be within 1% through the entire range of the scale. Dial range shall be such that normal operating temperatures will read near the midpoint of the dial. Thermometers shall be furnished with combination Fahrenheit / Centigrade scales.

B. Thermometers for pipeline mounting shall have brass separable sockets.

C. All thermometers shall be installed so that dials can be read from a point 5'-6" above the floor.

D. Thermometers shall be Trerice Series B85600, Ashcroft Model 50EI60E or approved equal as manufactured by Marshalltown, Tel-Tru or Weiss.

52. PRESSURE GAUGES

A. Pressure gauges shall be 4½" size with black fiberglass reinforced polypropylene case and ring, solid front, blowout back, acrylic plastic window, white dial face with jet black embossed figures, micrometer adjustable pointer, stainless steel movement with bronze bushings, phosphor bronze bourdon tube, brass socket and glycerin filled. Accuracy shall be within ± 1% of scale range.

B. All gauges shall be selected for a midpoint scale reading at normal operating pressure and shall be furnished with a bar stock needle valve.

C. Gauges shall be Trerice No. 450LFB, Ashcroft Type 1279-ASL or approved equal as manufactured by U. S. Gauge, Marshalltown or Weiss.

53. GAUGE PLUG FITTINGS

A. Gauge plug fittings (for insertion of thermometer or pressure gauge probes) shall be as manufactured by Peterson Equipment Co. or equal. They shall be of the proper length as determined by piping insulation requirements.

B. Units shall be of all brass construction with two (2) valve cores of Nordel and shall be rated for operation to 275°F at 500 psig. Cores shall be sized to accept a 1/8" O.D. probe.

C. Fittings shall be furnished with color coded and marked caps with gasket seal.

54. VIBRATION ISOLATORS

A. General: Mechanical equipment as designated below shall be mounted on isolators to prevent transmission of vibration and mechanically transmitted sound to the building structure. Isolators shall be selected in accordance with equipment weight distribution in order to achieve reasonably uniform deflection. Vibration isolation equipment shall, in general, be of one make.

B. Use and Description:

1. Flexible pipe connections, where indicated at pumps, equipment, etc., shall be spherical type connectors molded of neoprene and nylon or other approved elastomer with self-aligning, galvanized or cadmium plated flanges. The flanges shall be full faced and flat, 125/150 lb. rated and conforming to ANSI B16.1. Joints shall be designed for a working pressure from 10Hg. vacuum to 150 psi at 250°F continuous and shall be furnished with control units as well as galvanized retaining rings. These joints shall be as manufactured by Metraflex, Mason, General Rubber or approved equal.

55. DOMESTIC HOT WATER RETURN PUMP

A. Furnish and install, where indicated on the drawings, a lead-free bronze hot water return pump. It shall be an in-line type wet rotor circulator designed specifically for quiet operation in potable water systems. The pump shall have flanged connections and be suitable for operation to 225° F and a 150 psig working pressure.

B. Pump capacity, motor characteristics, etc., shall be as noted on the drawings. The motor shall be non-overloading at any point on the pump curve and shall have built-in impedance protection.

C. Pump shall be UL listed and shall be as manufactured by Bell & Gossett, Grundfos, Armstrong or Taco.

D. Pump operation shall be controlled by immersion aquastat to be provided under this section. It shall be a single-stage, SPDT temperature controller utilizing a thermistor sensor and a temperature dial with manual adjustment. Controller shall be UL listed and set to switch the pump ON at 100°F and OFF at 105°F.

56. RELIEF VALVES

A. Furnish and install relief valves where indicated on the drawings and in these specifications, including all water heaters, hot water storage tanks and any other locations where they may be required. Installation shall be in strict accordance with all codes, ordinances and authorities having jurisdiction.

B. The relief valves shall be of the combination pressure and temperature relief type with automatic reseating, bronze body construction and a test lever. Design shall conform to ASNI Z21.22 standards and be A.S.M.E. listed and rated.

C. Relief valves shall be installed with full size discharge pipes run to a drain location.

57. CAULKING AND SEALANTS

A. Provide sealing materials to seal fixtures and/or equipment to floors, walls, countertops, etc. Sealing material shall be one-part mildew-resistant silicone sealant, Type S, Grade NS, Class 25; uses NT, G, A and as applicable to nonporous joint substrates indicated O; formulated with fungicide; intended for sealing interior joints with nonporous substrates and subject to in-service exposure to conditions of high humidity and temperature extremes. Consult Manufacturer's technical data regarding instructions for joint preparation and joint sealer application.

B. Sealants shall not be applied when ambient and substrate temperature conditions are outside the limits permitted by the manufacturer or below 40°F. or when joint substrates are wet.

C. Provide color of exposed joint sealers indicated and/or as selected by Architect from manufacturer's standard colors. Sealants shall be similar and equal to General Electric Sanitary 1700 Sealant or Dow Corning 786 Mildew Resistant Silicone Sealant.

58. PLUMBING FIXTURES

A. The plumbing fixtures as specified hereinafter are based upon the use of several manufacturers whose catalog numbers have been listed as criteria for type and description unless noted otherwise.

B. The plumbing fixtures shall be furnished with supports, control stops, trim etc., and complete in all respects. NOTE: The finish and colors for the fixtures outlined below shall be selected by the Architect.

C. Plumbing fixtures and equipment that are indicated (furnished by others) will require rough-in and final connection by the Plumbing Contractor. Those fixtures and equipment shall be set in place under the general contract unless noted otherwise.

D. Should there be a conflict between the model numbers listed and the item description, notify the Engineer immediately, otherwise, the Contractor is responsible for furnishing fixtures and equipment that meet the description and performance characteristics as indicated herein.

E. Supplies to equipment shall be protected against back siphonage by installing vacuum breakers or backflow preventers where required.

F. Seal fixtures and/or equipment to floors, walls, countertops, etc. see item CAULKING AND SEALANTS.

G. Refer to drawings for schedule of connections.

H. Each complete fixture as specified within fixture specification is comprised of one or more individual items. Each item is specified individually and may list several manufacturers. HOWEVER, ONLY THOSE MANUFACTURERS LISTED IMMEDIATELY BELOW WILL BE APPROVED FOR USE ON THIS PROJECT. All fixtures and/or trim of any one category shall be as supplied by a single equipment manufacturer.

1. Basic Fixture: (Vitreous China, Cast Iron, Enameled Steel)
   American Standard

2. Basic Fixture: (Stainless Steel)
   Elkay; Just

3. Carrier:
   Wade; Zurn; J. R. Smith; Watts; Josam

4. Seat:
   American Standard

5. Flush Valve:
   American Standard

6. Faucet:
   American Standard

7. Traps:
   McGuire; Dearborn; Brass Craft; Kohler; Zurn

8. Drains and Continuous Waste:
   American Standard; Eljer; Kohler; McGuire; Dearborn; Elkay; Just; Brass Craft; Zurn

9. Supplies:
   McGuire; Brass Craft; Zurn

I. The Architect reserves the right to disapprove any fixture deemed not equal to these specifications. The Contractor shall name the manufacturer and type he intends to use at the time of bidding, otherwise the Architect may choose any of the above specified makes.

J. A1 WATER CLOSET – FLOOR SET – TANK – ADA – 1.28 GALLON FLUSH

1. Vitreous china, white 16-1/2" high elongated bowl, close-coupled tank with left side trip lever and 1.28 gallon flush - American Standard "Cadet Pro Right Height" #215AA.104.

2. Seat - heavy duty solid plastic, white, elongated, closed front, cover, stainless steel posts, washers and nuts – American Standard #5321.110.

K. A2 WATER CLOSET – FLOOR SET – TANK – ADA – 1.28 GALLON FLUSH

1. Vitreous china, white 16-1/2" high elongated bowl, close-coupled tank with right side trip lever and 1.28 gallon flush - American Standard "Cadet Pro Right Height" #215AA.104.

2. Seat - heavy duty solid plastic, white, elongated, closed front, cover, stainless steel posts, washers and nuts – American Standard #5321.110.

L. A3 WATER CLOSET – FLOOR SET – ADA – MANUAL 1.6 GALLON FLUSH

1. Vitreous china, white 16-1/2" high elongated bowl, top spud, Flushometer, manual flush, left side trip - American Standard "Madera FloWise" #3461.001.020. Provide with #6063.101.002 flush valve.

2. Seat - heavy duty solid plastic, white, elongated, open front, stainless steel hinge posts, washers, and nuts – American Standard #5901.100.

M. A4 WATER CLOSET – FLOOR SET – ADA – MANUAL 1.28 GALLON FLUSH

1. Vitreous china, white 16-1/2" high elongated bowl, top spud, Flushometer, manual flush, right side trip - American Standard "Madera FloWise" #3461.001.020. Provide with #6063.101.002 flush valve.

2. Seat - heavy duty solid plastic, white, elongated, open front, stainless steel hinge posts, washers, and nuts – American Standard #5901.100.

N. B1 URINAL

1. Vitreous china, white elongated 14" rim, ¾" universal top spud - American Standard "Washbrook FloWise #6590.001.020. Mount at 24" and provide with manual flush valve American Standard #6045.101.002.

O. B2 URINAL - ADA

1. Vitreous china, white elongated 14" rim, ¾" universal top spud - American Standard "Washbrook FloWise #6590.001.020. Mount at 17" and provide with manual flush valve American Standard #6045.101.002.

P. C1 LAVATORY – WALL HUNG – DUAL CONTROL – GRID - ADA

1. Vitreous china, 20" X 18" front overflow, backsplash and faucet holes on 8" centers (for concealed arms support) - American Standard "Lucerne" #0356.015.

2. Faucet - dual control combination with compression type valves with renewable seats or ceramic disc valve cartridges, 4" spout, 8" centers, metal lever handles, - American Standard "Heritage" #7298-152.002.

3. Offset drain plug - cast brass body with integral open grid strainer, offset drain assembly, 1-1/4" tailpiece and chrome finish - American Standard #7723.018.

4. Trap - cast brass P-trap with 17-gauge tubing drain to wall, 1-1/4" inlet and 1-1/2" outlet, cleanout plug, escutcheon and chrome finish - Zurn #Z-8701-9; Kohler #K-8999-CP; McGuire #8902C.

5. Supplies - angle type with loose key stop, 3" nipple, 3/8" O.D. flexible tube riser, escutcheon and chrome finish - Zurn #Z-8800-LR-LK; McGuire #165LK.

6. Handicapped lavatory P-Trap, hot and cold angle stop assemblies shall be insulated with a fully molded vinyl cover. Abrasion exterior vinyl cover shall be smooth and have 1/8" minimum wall over cushion foam insert. Fasteners shall remain substantially out of sight. Zurn #Z-8946-3-NT; PLUMBEREX “Pro-Extreme” #X4444; Dearborn #ADA100.

7. Carrier - rectangular tube upright supports with steel plate base and concealed arms. Zurn #Z1231

Q. C2 SINK – STAINLESS STEEL – SINGLE COMPARTMENT – SWING SPOUT - BASKET

1. Self-rimming, 18-gauge, type 302 (18-8) nickel bearing stainless steel, 15" X 18" X 7 1/2" with sound deadening and three (3) faucet holes - Elkay "Lustertone" #LR 1517; Just "Stylist" #SL 1815 A GR.

2. Faucet - single lever handle with replaceable washerless cartridge, swing spout, 8" centers, aerator and chrome finish - American Standard "Reliant + " #4205.000.

3. Drain - stainless steel crumb cup strainer with removable basket, rubber seat stopper and 1 1/2" tailpiece - Dearborn #10T; Elkay #LK 99; Just #JB99; Engineered Brass Co. #SB8D; Zurn Z-8741.

4. Trap - Cast brass P-trap with 17-gauge tubing drain to wall, 1 1/2" inlet and outlet, cleanout plug, escutcheon and chrome finish - Brass Craft #0030; Crane #8 5260; Dearborn #510; Kohler #K 9000; McGuire #8912; Zurn #Z-8702-9.

5. Supplies - angle type with loose key stop, 3" nipple, 3/8" O.D. flexible tube riser, escutcheon and chrome finish - Brass Craft #SR1512AC; McGuire #165LK; Zurn #Z-8800-XL-LR-LK.

R. C3 – LAVATORY – COUNTERTOP – OVAL – SINGLE LEVER – ADA

1. White Vitreous China, 20” X 17” oval, self-rimming, front overflow, and faucet holes on 4” centers with extra left hand hole – American Standard “Aqualyn” #0475.035.

2. Faucet – single lever handle center set with replaceable washerless cartridge, 4” centers – American Standard “Reliant 3” #7385.053 with grid drain.

3. Supplies – angle type with loose key stop, 3” nipple, 3/8” O.D. flexible tube riser, escutcheon, and chrome finish – Brass Craft #SR1512AC; or McGuire #165LK.

4. Handicapped lavatory P-Trap, hot and cold angle stop assemblies shall be insulated with a fully molded vinyl cover. Abrasion exterior vinyl cover shall be smooth and have 1/8" minimum wall over cushion foam insert. Fasteners shall remain substantially out of sight. Zurn #Z-8946-3-NT; PLUMBEREX “Pro-Extreme” #X4444; Dearborn #ADA100.

5. Offset drain plug – cast brass body with integral open grid strainer, offset drain assembly, 1-1/4” tailpiece and chrome finish – American Standard #7723.018; Brass Craft #0702.

6. Soap dispenser – Bobrick #T9FB489397 or equal. 34 oz. Liquid and soap dispenser with 4” spout.

* * * END OF SECTION * * *

HVAC

SECTION 15500

INDEX

1. GENERAL

   A. The requirements of Conditions of the Contract and Division 1 of these specifications apply to all work under this section.

2. SCOPE

   A. The work included under this section shall consist of the furnishing of all material, equipment and labor required to install the heating, ventilating and air conditioning work indicated on the drawings and as specified hereinafter, including the balancing, testing, and adjustment of same.

3. DESCRIPTION OF WORK

   A. The following is a summary of the principal categories of work under this section. Note, however, that this listing is for general information only and work will not necessarily be limited to these categories. The detailed drawings and the following specifications cover the full extent of the work.

   B. The plans show the approximate location of the equipment, piping and ductwork systems, etc. involved under this section. All such work shall be performed and completed in the required manner in accordance with the contract documents.

   C. Demolition:

      1. Perform all demolition work as shown on the drawings and as specified herein or as may otherwise be required.

      2. Where items of equipment are to be removed, all incidental piping, fittings, ductwork, accessories, etc. shall be included (removed) where such items will no longer be operational.

      3. Where piping removal is indicated or required, the line shall be removed back to a main or a main branch whenever possible. At the termination point the remaining pipe shall be capped or plugged and insulated to match existing. Removal shall include associated hangers, supports, etc.

      4. Where ductwork is to be removed, all supports, hangers, etc. are to be included. The resulting ductwork openings shall be covered, sealed and insulated to match adjacent surfaces.

5. Piping and/or ductwork penetrating walls that are to be demolished shall be supported and shall have insulation patched as required. In cases where piping is running within the wall, such piping shall be removed and capped as described above.

6. Note that proper and legal disposal is considered to be part of the demolition/removal process referred to above.

D. Construction:

1. Demolition
2. Rigging
3. Sheetmetal and air devices
4. Modular Air Handling Unit
5. Gas fired rooftop packages
6. DX split systems
7. Unit and cabinet heaters
8. Exhaust fans
9. Underground ductwork
10. Underground chilled water lines
11. Chilled water piping and accessories
12. Hot water piping and accessories
13. Propylene glycol
14. Hot water boilers
15. Base mounted Pumps
16. VFDs
17. Chimney automation system
18. Terminal Air boxes
19. Fan powered mixing boxes
20. Zone dampers
21. Cutting and patching
22. Duct cleaning
23. Balancing
24. Insulation
25. Temperature controls and interlock wiring
26. Check, test, startup, and warranty

4. SITE INVESTIGATION

A. Prior to bidding, it is recommended that the contractor shall visit the job site and investigate all details which may have any effect on the installation, progress or completion of the project.

B. When a bid is received, it will be assumed that the contractor has made the job site visit(s) and is familiar with the conditions as they exist and any adjustments and/or modifications that may be necessary in order to perform and complete the work as specified.

C. At project start-up, certain areas will be designated for the storage of materials and equipment and cooperation with the Owner in minimizing interference with existing operations will be mandatory.

5. WORK DONE BY OTHERS

A. Each bidder shall become familiar with the entire project specification in order to properly delineate the areas of responsibility between trades.

B. Work to be done by others in connection with the work of this section shall include the following:

1. Painting of exposed pipes, equipment, insulated items, etc. will be done by others, except where specifically noted in the following items of this specification.

2. Domestic water and/or fuel gas lines will be terminated with a valve adjacent to the equipment or systems requiring same under the plumbing section. After determining that these services are suitable, adequate and located properly, make all final connections as required.

C. Current to any externally wired apparatus in this contract will be provided under the electrical section. Unless otherwise mentioned, furnish the Electrical Contractor with the required starters, VF drives, etc., as well as any other miscellaneous electrical apparatus pertaining to the HVAC equipment and the Electrical Contractor will make all electrical connections to same. Starters that are part of a motor control center as well as all fractional horsepower manual starters, however, will be furnished by the Electrical Contractor unless otherwise indicated. See Item MOTORS AND STARTERS. Exceptions to this may occur in the control portion of the specifications. See Item TEMPERATURE CONTROL.

D. The required magnetic starters for the HVAC equipment, except as stated above or unless specifically mentioned otherwise, shall be furnished under this section of the work. Refer to the motor schedule and/or the motor control diagram on the contract drawings as a check to verify the specific electrical characteristics of all motors and starters under this section.

6. INTERLOCK AND CONTROL WIRING

A. Unless otherwise indicated on the drawings or elsewhere in the specifications, all required and/or referenced interlock and control wiring involving equipment and systems installed under this section of the work shall be provided (furnished, installed, wired, etc.) by this contractor.

B. Low voltage wiring in concealed areas shall be run in metal conduit or with plenum rated cable. When exposed, all such wiring shall be in metal or liquid-tight conduit. In mechanical/boiler rooms metal conduit shall be rigid, galvanized steel. All wiring in conduit must be color coded and all conductors shall be tagged or otherwise identified. Unless specifically indicated to the contrary by the equipment manufacturer, wiring shall be minimum 20 gauge and 150 volt rated. Wiring in conduit shall be type TW or rubber insulated jacketed type.

C. Where cable is utilized, it shall be securely installed with the appropriate wire ties, hardware, supports, etc., for open wiring runs.

D. Line voltage wiring shall be in galvanized steel conduit and installed in accordance with applicable requirements of the National Electric Code. As specified above for low voltage applications, all wiring must be color coded with all conductors tagged and all installations within mechanical/boiler rooms shall incorporate rigid, galvanized steel conduit.

7. MAINTENANCE OF EXISTING FACILITIES

A. To the extent possible, maintenance of existing facilities for the present building(s) will be required. The actual length of time for any interruption shall be held to an absolute minimum. At least 72 hours in advance of the severance of any services or facilities due to modification of pipe, ductwork and/or equipment, submit the plan to the Engineer and the Owner, detailing the nature and estimated duration of the interruption and the method of procedure. Do not, under any circumstances, proceed with an interruption of service without the Owner's authorization.

B. Where alterations or additions to the existing building(s) are indicated, this work shall include all removal, rerouting, or replacement of all existing facilities located in pipe shaft spaces or walls being removed, as may be necessary to permit operation of a complete working system or systems where applicable to the trade jurisdictions involved in this section of the specifications.

C. Where an item of equipment is to be removed, all incidental piping, fittings, ductwork, accessories, etc., associated with the equipment shall also be included where it will no longer function as part of the operating system.

D. All piping, ductwork, etc. that has been re-routed or otherwise disturbed shall be insulated as required to match existing.

E. Where existing facilities are permanently abandoned, each outlet branch, etc. shall be removed completely (back to the main, when possible) and plugged or capped. All abandoned services shall be terminated well behind adjacent finished surfaces.

F. Unless otherwise mentioned, all material, equipment, etc. removed under this contract heading shall be disposed of in a proper and legal manner.

8. BIDDING

A. All bids shall be based upon furnishing and installing the make of materials and apparatus specified herein WITHOUT SUBSTITUTION, in order that all bids may be properly compared.

B. Other materials, equipment or systems that the bidder may desire to use as a substitute for that specified will be considered IF PROPOSED AT THE TIME OF BIDDING and shown on the substitution sheet of the proposal. Such alternate items shall be of equally high quality with all safeguards, design features and operational requirements as shown on the drawings and/or as specified herein.

C. It is understood that proposals to use such substitutes shall be made in addition to and separate from the base bid in order to receive consideration and the addition to or deduction from base bid, if any, shall be duly noted on the bid form.

D. Regarding substitutes, note that any deviations from the following specifications or any special equipment requirements (ambient conditions, utilities, power conditioning, etc.) necessary for full time operation shall be clearly stated and completely itemized. Failure to meet these stipulations could result in additional expense that would be assigned to this section of the work and not considered as an extra.

E. If no proposals for substitutes are listed on the bid form, no such proposals will be permitted for later consideration unless delivery schedules or other factors beyond the Contractor's control justify same.

F. If more than one make of material or equipment is specified, the proposed manufacturer, brand, type, etc. shall be identified. If this provision is not complied with, the Owner may then make this selection without change in contract price.

G. Note that in the following specifications, where more than one manufacturer is listed for a particular item of operating equipment, the design will be based on the first named. If equipment by the other named manufacturer(s) or a proposed substitute requires redesign work, revised/modified services, or specific additional field work by other trade(s), the price submitted for providing this equipment must include the required additional amount to cover such work.

9. DRAWINGS

A. The drawings prepared for this project are an outline to show where pipes, ducts, apparatus, equipment, etc., should generally be located in order to fit within the confines of available space and minimize conflicts with other trades. All work must be installed in accordance with the drawings insofar as possible. All drawings shall be carefully checked during the course of bidding and construction. If any discrepancies, errors or omissions or overlaps with other trades are discovered prior to or during the construction phase, notify the Engineer immediately for interpretation or correction. Note that an overlap with another trade does not relieve the contractor from the obligation of performing the work indicated on the drawings for this section of the project unless written notification stating such is obtained from the Engineer.

B. Take all necessary measurements and be responsible for same, including clearances for all materials and equipment that will be furnished. The Architect/Engineer shall reserve the right to make minor location changes of piping and/or equipment where such adjustments are deemed desirable from an appearance or operational standpoint. Such changes will normally be anticipated sufficiently in advance to avoid extra work or unduly delay progress on the project.

C. The general building drawings shall be used to obtain dimensions and exact locations and as a check with other disciplines to avoid interferences. Prior to making any layout drawings refer to applicable drawings on all branches of the work where other trades are involved on the project. Also, consult with the other trades in producing coordination/erection drawings so that added field work and/or job delays resulting from conflicts between crafts can be avoided. Piping that has been prefabricated before coordinating with the other trades will have to be re-done at no additional cost to the Owner if conflicts are encountered.

D. Note that the piping shown on the drawings shall be considered as diagrammatic for clearness in indicating the general run, connections required, etc. and may not in all cases be shown in its true position. The piping and equipment may have to be offset, lowered or raised as required or as directed at the site in order to properly accommodate field conditions.

10. SPECIFICATIONS

A. Specifications shall be interpreted in conjunction with the drawings hereinbefore described and if anything is shown on the drawings and not mentioned in the specifications or vice versa, it is to be included in the work the same as though clearly set forth by both.

B. Furthermore, all materials or labor obviously required to fully complete the work shall be included in the bid, even though each item necessarily involved is not specifically mentioned or shown. Such work and/or material shall be furnished and shall be of the same grade or quality as the parts actually specified and shown. Should there be a conflict between the plans and specifications, the greater quantity or better quality shall be furnished.

C. Should an overlap of work between the various trades become evident, the Engineer shall be notified. Such an event shall not relieve any trade of the responsibility for the work called for under his branch of the specifications until a written clarification or directive is issued concerning the matter.

D. When selecting equipment to be used on this project, refer to Item CLEARANCES AND INSTALLATION REQUIREMENTS in these specifications.

E. Note that all systems and items of equipment involved under this contract heading shall be furnished and installed in accordance with applicable requirements of federal, state and local codes including the ADA (Americans with Disabilities Act) and specifically referenced portions of NFPA Standard 90A and ASHRAE 90.1. This shall include adhering to the requirements governing mounting heights for occupant operable controls.

F. All references made to codes, standards, etc. in these specifications or on the drawings shall be taken to mean the latest edition, amendment and/or revision of such reference in effect as of the date indicated on the Bid Documents.

11. PERMITS, FEES, INSPECTIONS, LAWS & REGULATIONS

A. Obtain and pay for all permits required in connection with this section of the work. In addition, pay all necessary inspection fees or similar charges. Laws, codes and regulations which bear upon or affect this work shall be complied with and are hereby made a part of this specification. All work which such laws require to be inspected shall be shown to the proper public officials for their inspection. In no case shall work be installed contrary to or below the minimum legal standards or in violation of applicable code requirements.

B. At completion of the project furnish to the Owner, at no additional charge, a certificate(s) of inspection issued by the authorized agency (or agencies) having jurisdiction over this portion of the project, verifying that all work executed under this section complies with applicable code requirements.

C. Note that the General Building Permit will be obtained and paid for by the successful General Contract Bidder. Contractors bidding this section of the work shall make a sufficient allowance in their bid to reimburse the General Contractor for their proportionate share of the permit cost.

D. Additional fees, charges, etc. imposed by other contractors and/or tradesmen, professional consultants, etc., for services rendered in connection with performing any portion of the work under this section shall be included as part of the work. This shall include surveys, profiles and/or other miscellaneous drawings, etc. that may be mandated by the governing authorities in addition to the requirements of the contract documents.

12. SHOP DRAWINGS

A. Prepare or obtain from the manufacturer, certified shop or erection drawings of all items of equipment to be furnished under this section and submit copies of same as required for review. This shall be done as soon as possible, well prior to proceeding with installation or construction and in the proper sequence to avoid delays in the work, the work of the Owner or other contractors. Unless otherwise indicated, a minimum of six (6) hard-copy sets OR one (1) electronic set shall be submitted. These drawings shall be complete in every respect, showing pertinent details of size, capacities, arrangement, fittings, piping, kinds and thickness of materials, weight, loading required, clearances for service, maintenance, etc. Departures or deviations, if any, from the specifications, listed performance data, etc., shall be called out on the submittals. Note that in the following items of this specification, where more than one equipment manufacturer is listed, the first named has been used as the basis for design. All departures or deviations in material, performance, service requirements, size, construction, etc. from first named by the make submitted shall be noted on the shop drawings. NOTE: Where departures or deviations from the specifications do occur, the contractor shall additionally itemize same on the cover sheet that accompanies the submittals. Failure to do so will risk subsequent rejection at the job site. (With regard to voluntary substitutions, refer also to Item BIDDING in this specification.)

B. By submitting such drawings, the Contractor represents that he has selected and verified conformance of the proposed materials and equipment to the specifications, has verified the adequacy of the space available and/or taken necessary field measurements, and has noted field construction criteria, etc. related thereto, or will do so. In addition, it will be assumed that the Contractor has checked and coordinated the information contained within such submittals with the requirements of the Work and the Contract Documents as noted in the previous paragraph.

C. Materials and equipment to be furnished for this project shall be of current production by manufacturers regularly engaged in the manufacture of such items. When two or more similar items are required, they shall be the product of one manufacturer.

D. The review of shop drawings shall not be construed as a complete check but will indicate only that the capacity, general method of construction and/or detailing is satisfactory. It does not involve determining the accuracy or completeness of such particulars as dimensions or quantities or indicating full and complete compliance with the specifications. In addition, it does not deal with the means, methods or procedures of construction or installation. The Contractor shall carefully check and verify dimensions for installation and service requirements before ordering equipment for the project.

E. The Contractor is advised to request submittals from all other trades before proceeding with any piping connections, etc. on equipment furnished by them.

F. Submittals shall be itemized on a standardized shop drawing submittal form stating the name of the project, specification section, paragraph and/or drawing numbers applicable to submittal and shall bear the contractor's review stamp as evidence that the items have already been checked for compliance with Contract Documents as stated above.

G. After review, shop drawings will be returned five (5) hard-copy sets OR one (1) electronic set, marked in one of the following ways:

1. "NO EXCEPTIONS NOTED" - Copies may be distributed as required for construction, shipment, etc. to proceed.

2. "EXCEPTIONS NOTED" - Contractor may proceed with and/or authorize construction, shipment, etc. taking into account the necessary corrections.

3. "EXCEPTIONS NOTED - REVISE AND RESUBMIT" - Contractor will be required to resubmit shop drawings in their entirety. No fabrication, erection or installation shall be authorized or initiated until shop drawings so marked have been completely revised, resubmitted and subsequently marked in accordance with either of the two preceding subparagraphs. Only shop drawings officially marked "NO EXCEPTIONS NOTED" or "EXCEPTIONS NOTED" will be permitted on the jobsite.

H. Upon return of submittals take appropriate action as specified above. Note that any shop drawing copies received beyond the number required will be destroyed (not returned).

I. Where resubmittal is required, four (4) hard-copies OR one (1) electronic copy will be so noted by the reviewer, of which two (2) hard-copies OR one (1) electronic copy will be returned for corrections (one (l) hard-copy for the contractor and one (l) hard-copy for the supplier/subcontractor).

J. The following is a list, where applicable, of items requiring submittals. Items marked with an asterisk (*) must be provided with a basic demonstration of operation by factory authorized service personnel. See Item INSTRUCTIONS, MANUALS, ETC.

1. Access Doors
2. Air Conditioning Units
3. Air Cooled Condensing Units
4. Air Devices
5. Air Flow Monitoring Equipment
6. Air Handling Units
7. Air Vents
8. Boilers
9. Dampers
10. Expansion Joints/Pipe Guides
11. Expansion Tanks

12. Fans

13. Flow Measuring/Metering Equipment

14. Gauges and Thermometers

15. Hydronic Specialties (Air Separators, Etc.)

16. Insulation

17. Package Roof Top Air Conditioning Units

18. Pumps/Pumping Systems

19. Temperature Controls

20. Unit Heaters

21. Valves

22. Variable Frequency Drives

K. Submittals and Shop Drawings for manufactured items shall be manufacturer's printed listed literature. Equipment selections shall be within manufacturer's published recommended ratings.

L. Performance curves or charts shall be submitted for each air handling unit fan and for each separate centrifugal, axial and/or vane axial fan. They shall show static pressure (inches of water) and horsepower versus CFM for total RPM range of fan. Operating point shall be indicated on the performance curve at 100% and 125% of design static pressure for each air handling unit fan and at 100% for the other fans. Note that fan motors shall be selected/sized to be non-overloading at these listed maximum conditions.

M. Forward curved fans shall be selected to the right hand side of the peak pressure point on the fan curve. Backward inclined and/or airfoil fans shall normally be selected near point of maximum static efficiency. Vane axial fans shall be selected for optimum operating point/range.

N. Performance curves shall be furnished for each pump. Curves shall show discharge pressure (feet of water), horsepower and efficiency versus GPM for a series of impellers. Performance curve shall slope up to shut-off. Pump shall be selected to operate near point of maximum efficiency and/or to meet efficiency indicated on the drawings.

O. Shop drawings will be provided by the Owner for any Owner furnished equipment requiring connections under this section.

P. A complete set of shop drawings, officially marked in the prescribed manner noted previously, shall be filed on the job site. Such drawings shall be kept together, maintained in good condition, and shall be readily available for reference.

13. MATERIALS AND WORKMANSHIP

A. Materials used in this contract shall, in all cases, be those specified herein unless proposals for the use of alternate materials have been submitted and accepted in writing, as provided hereinbefore. All materials shall be strictly first grade of their kind and shall be new and in first class condition when installed. All materials damaged in transit or otherwise will be rejected and must be replaced by proper and acceptable materials. Materials shall, in all cases, be similar and in accordance with the provisions of this specification.

B. Workmanship throughout shall conform to the standards of best practice, and all labor employed must be competent to do the work required. Tool marks will not be permitted on any exposed materials, fixture or fitting. For work not shown on the drawings or where changes are required to harmonize with the work of other trades, consult the Engineer for instructions.

C. Exact locations of electric outlets, piped equipment, piping, lighting fixtures, ducts, etc., shall be coordinated as described in Item DRAWINGS, so there will be no interference at installation.

D. Locate and install piping and ductwork so that l/2" minimum clearance is maintained after insulation is applied.

E. Rigid metal ducts shall be installed with support systems as indicated in Tables 4-1 to 4-3 and Figures 4-1 to 4-8 of the SMACNA HVAC Duct Construction Standards. They shall be installed as required to maintain alignment. Upper attachment to structures shall have an allowable load not more than one-fourth of the failure load of the method utilized. Hangers shall be strips of galvanized steel or round, uncoated, hot-rolled steel rod. Note that in a humid and/or non-conditioned environment, hanger rods shall be electro-galvanized all-thread rods. Hanger spacing shall not exceed 10 foot intervals and shall be closer as required to avoid any sagging of the horizontal duct runs.

F. Piping systems shall be installed with approved hangers and supports (see Item SUPPORTS, HANGERS AND BRACKETS) in a manner that will prevent sagging, warping, sway or vibration. Hangers, supports, etc., shall be properly located to allow for expansion and contraction and to accommodate concentrations of weight such as from heavy equipment and/or valves, etc., when supporting large pipe.

G. All rigid pipe shall run straight between fittings and all work shall be run in straight horizontal and vertical lines which shall be parallel to the building lines wherever possible. Ream ends of all pipes to remove fins, burrs, etc., to full inside diameter and see that insides of pipes are clean before being installed. Open ends of pipelines or equipment shall be properly capped or plugged until final connection to keep dirt or other foreign material out of the system.

H. Where expansion joints or compensators are indicated, pipe alignment guides shall be provided as recommended by the manufacturer in order to avoid any non-axial pipe movement and resulting premature failure.

I. Valves and specialties shall be so placed as to permit ease of operation and access and all valves shall be regulated, packed and/or adjusted as required at the completion of the work before final acceptance. Also, with regard to valve sizing in piping runouts to coils, equipment, etc., note that valves shall be full line size unless specifically indicated otherwise.

J. Valves shall be installed in a horizontal or upright position only. Control valves and other miscellaneous regulating valves, equipment items, etc. shall be adjusted as necessary for the setting required by job conditions and/or as stipulated by the equipment manufacturer.

K. Flange joints shall be made with welding neck flanges, slip-on flanges, or threaded flanges where threaded connections are permitted, making a tight joint without peening. All flanges shall be faced perfectly true and joints shall be made with the proper gasket. RE:ItemGASKETS.

L. All welding shall be done by a qualified welder certified per procedure suggested by published AWSSpecifications and required by enforcing bodies. Welding and all procedures shall be in conformance with SectionIX of the ASMEBoiler and Pressure Vessel Code and ANSI B3l.l. Ends of pipe shall be properly beveled where assembled by butt welding. Welding of all beveled end steel pipe and/or butt welding fittings for systems with a safety/relief valve setting in excess of 100 psig shall be accomplished using groove type welding rings with knock-off spacer pins.

M. All piping intersections and changes in direction of rigid pipelines shall be made with standard, specification type fittings as required and as called for under Item FITTINGS. Mitering of pipe to form elbows, or any similar procedure will not be permitted.

N. Joint preparation for copper piping installations shall be in accordance with IAPMOInstallation StandardIS3. All solder joints shall conform to the requirements of ANSIB9.1. They shall be made using tin-silver solder (Fed. Spec.#QQ S 571E, Class SN96) for smaller sizes thru 1-1/4" and solder with high elongation properties and a liquidus rating in excess of 600F with a wide plastic range such as Harris Co. "Stay Safe Bridgit" for piping sizes 1-1/2" and over. Note, however, that all copper piping joints over 3" in size shall be brazed. Brazing operations shall be in accordance with the Copper Development Association Copper Tube Handbook using an AWS listed nonferrous brazing alloy (BAg 1 or a BCuP series brazing material) containing at least 15% silver, having a melting point in excess of 1,000°F and recommended for the specific application. In addition, the brazing process must be performed utilizing a secondary pressurized gas in order to insure having a sufficient flame temperature to achieve a satisfactory joint.

O. Where the use of pre-cleaned copper pipe and fittings is required, all joints shall be brazed, regardless of size. During the brazing operation, nitrogen shall be continuously bled through the lines to minimize oxidation formation.

P. Valves to be installed with a welding or brazing operation shall have all internals removed, prior to installation, where required to avoid the possibility of damage.

Q. The pressure rating requirements for fittings shall be as indicated under Item PIPE FITTINGS and the pressure rating requirements for valves shall be as listed under Item VALVES.

R. Miscellaneous piping items such as expansion joints, strainers, etc. shall be rated in accordance with applicable code requirements but in no case less than Class 125 or less than 50psi above the highest safety/relief valve setting or design operating pressure of the system, whichever is greater. Where higher pressure ratings are called for, then those requirements shall govern.

S. All piped equipment, coils, control valves, etc., shall be either flange or union connected, as determined by construction. Flanges or flanged fittings shall be used where indicated or specified.

T. Where piping of dissimilar metals is joined, insulating fittings or dielectric unions shall be provided.

U. Where the use of grooved end pipe and grooved mechanical couplings is specified (see Item PIPE AND PIPING), the requirements with respect to installation include strictly following manufacturer's recommendations regarding pipe and pipe preparation, lubrication of gaskets, and the assembly of couplings, fittings and flanges.

V. Piping and ductwork shall be concealed in shafts, furred spaces, etc., where possible. Take steps to insure that adequate space has been allowed for pipes and exercise care in locating same in accordance with the requirements of the finish of the various rooms. No pipes, ducts, etc., shall be placed where they will block access doors or in any way interfere with the swing of the other doors or the operation and normal maintenance of equipment.

W. Installation of piping directly over electrical switchgear and similar equipment shall be avoided. In elevator equipment rooms, only pipe specifically designated for heating and/or cooling equipment serving that room may be installed there. Such piping shall not be located over the hoist way or any electrical equipment.

X. Coils, control valves, heat exchangers, miscellaneous other piped equipment, etc., shall be installed with isolating valves and unions or flanges. For closed loop hydronics systems the return connections at coils and heat exchangers shall be installed with either balancing valves or flow-control units as indicated. Main and branch return lines of these systems shall also be installed with balancing valves. These valves shall be combination balancing and shut-off type as described in Item VALVES.

Y. Where pipes pass through floors, rated walls or partitions, provide an approved fire, smoke and water seal as required. Fire-stop material shall be tightly packed and shall completely fill the annular opening between pipe and sleeve. Re: Item INSERTS AND SLEEVES.

Z. On pump installations, furnish and install a pressure gauge assembly consisting of a single gauge with yoke piping connections through ball valves to pump suction and discharge tapings. In addition, install a union between each valve and the pressure gauge tee. Each base mounted packing gland type pump shall have a drain line extending from the tapped drain outlet on the base to the nearest floor drain.

AA. Base frame mounted pumps shall be carefully set, grouted and piped in such a manner that stress is not transferred to the impeller housing resulting in misalignment. After installation the impeller-shaft assembly shall rotate without binding.

BB. Lubricate all rotating and/or reciprocating equipment according to manufacturer's directions before operation, during the course of operation and as required at the completion of work or at the time of Owner acceptance, whichever occurs first. Where lubricating points are not easily accessible, provide extensions as required for such maintenance. Belts shall be checked for defects and adjusted to proper tension. See Item DRIVES AND GUARDS.

CC. Note that the piping contractor shall provide a pair of 3/4" valved and capped connections into each separate hydronics system to accommodate chemical feed requirements. Where not specifically shown, these connections shall be located as directed by the engineer.

DD. Take precautions when operating any air handling equipment to insure that approved filters are installed in place as designed. No equipment shall be operated at any time without these filters. When the job is completed and turned over to the Owner, all filters shall be new, clean, and in perfect operating condition. Note that at the time of Owner acceptance all filters on the project shall be rated UL Class 1 unless Class 2 is specifically mentioned elsewhere in the contract documents.

EE. All apparatus installed under the contract shall operate within the normal sound range for similar equipment and without vibration transmission to the structure. In case excessive noise and/or vibration occurs, make the necessary modifications, adjustments, etc. to correct the condition(s) or replace the objectionable equipment. The Engineer will judge the severity of the problem and make the final determination on acceptance. In situations where compliance is questionable, provide instrumentation, etc. as required for verification that equipment operation is within manufacturer's norm and/or in code compliance.

FF. Before equipment furnished under this contract heading is turned over to the owner it shall be demonstrated to meet acceptable sound power levels for the particular installation involved while operating under normal conditions. Certification of compliance to OSHA standards will be required from all equipment suppliers. In addition, actual sound levels for mechanical equipment or devices shall not exceed the maximum permissible noise levels listed by OSHA for a continuous 8hour period of exposure.

GG. A more specific description of materials and workmanship relating to ductwork as well as the insulation portion of the project is contained elsewhere in this section of the specifications under the heading of that particular item.

14. HAZARDOUS MATERIALS

A. This item of the specifications is designed to address the potential problem or problems occurring when hazardous materials (asbestos type insulations, etc.) are encountered on a project involving work in an existing structure and/or an existing system. Since the extent to which hazardous materials may have to be dealt with or whether, in fact, they will even be present on the site cannot always be determined prior to the actual demolition/construction phase of the project the Owner will have the responsibility for dealing with the situation, should it arise.

B. If, during the course of the project, it is suspected that hazardous materials have been encountered or are present, contact the Construction Manager/Architect/Engineer immediately and cease work in the area(s) of concern. After consultation with the parties involved, the Owner can elect to have verification testing performed by a duly authorized and licensed organization. If it is determined from these tests that hazardous materials are actually present, the Owner will deal with the situation in an appropriate manner before work in the affected area(s) resumes.

15. EXCAVATION AND BACKFILL

A. Provide all required excavation and backfill, unless otherwise indicated, for the work involved under this section. The excavation shall be carried to the proper depth and grade, and shall form a firm, and proper base as required. Note that prior to performing any excavation at the project site, the Ohio Utilities Protection Services (1-800-362-2764) shall be contacted by the HVAC Contractor in order that all buried lines in the vicinity of this work can be properly located and marked or otherwise identified.

1. Where roots of live trees are encountered in excavation, they shall be carefully protected during construction.

2. Where rock is encountered, excavation and removal shall involve using appropriate and approved methods.

3. Provide and operate pumping equipment as necessary to keep all excavations free of water.

B. Shoring, bracing, sheathing, etc., shall be provided as indicated and/or as necessary to ensure the stability of the surrounding area as well as the safety of all personnel in accordance with OSHA requirements.

C. After installation has been completed, tested and/or approved and accepted by the Owner's representative, the excavation shall be backfilled to required subgrade level as determined by location and/or other, detailed specification.

D. In all areas, unless designated otherwise, backfill for shallow excavations shall consist of clean sand. Backfill for piping excavations exceeding 30" in depth shall consist of sand to 12" above top of pipe and select material for the remainder. In no case shall large rocks, organic material or debris be used.

E. Backfill shall be accomplished by placing material in 8" layers and tamping and shall be done when moisture permits proper compaction. Carefully backfill around pipes with hand tools to a point 16" above the pipe. Beyond this point small mechanical tampers may be used. Compact all backfill to the following minimum densities:

1. Under sod and planted areas.....85%
2. Under walks, slabs, parking areas.....90%
3. Top 2 feet under roadways.....95%

F. NOTE: These figures are expressed as percentages of maximum dry density as determined by AASHO T99 or other approved method.

G. During backfill operation provide plastic warning tape in all pipe trenches. Tape shall be 6" wide with black letters identifying pipe service and shall be place 8” to 12" above top of pipe.

H. Remove and legally dispose of all surplus excavation and backfill material.

I. Repair and re-establish grades where required before the guarantee period of the project has expired.

J. Where excavation is to occur in existing street, drive or sidewalk areas, pay all required fees and costs involved as well as all costs of backfilling and repaving in accordance with requirements of and to the satisfaction of the Municipality, Utility or other entity having jurisdiction.

K. Where excavation is necessary in sodded areas, replace sod as required to match existing. In sodded or landscaped areas, the top 6" of compacted backfill shall be with topsoil reasonably free of clay, etc.

L. NOTE: Special backfill requirements as specified under item FUEL OIL STORAGE TANK, as recommended by the oil tank manufacturer and/or where stipulated by code considerations shall supersede any of the foregoing requirements.

16. CLEARANCES, INSTALLATION REQUIREMENTS, ETC.

A. The contractor shall be responsible for verifying compliance with the specifications for all materials and equipment provided under this section of the work. In addition, all materials and equipment shall be installed in strict accordance with applicable code requirements as well as the manufacturer's recommendations, instructions, installation/shop drawings, etc. The recommended clearances for service, maintenance, etc., as well as for proper operation, shall be observed and provided in all cases.

B. For certain items of operating equipment described in this section of the specifications several manufacturers may be listed. In these instances, the first named is the make on which the design was based with regard to performance, space requirements, service access, etc.

C. Due to the possibility of restrictions imposed by space limitations, the responsibility for resolving conflicts resulting from the use of equipment other than first named or of alternate equipment shall rest with the equipment supplier and the Contractor. Submittals for this equipment will be considered as a statement that clearances for installation, access, service, maintenance, etc. have been checked and found adequate.

D. Alternate equipment or the equipment of additional manufacturers named in these documents shall meet all base bid specifications. In the event such equipment, or any equipment which the bidder proposes to furnish, deviates from the requirements of equipment first named regarding electric service, power wiring, control wiring, plumbing and/or piping, sound attenuation, vibration damping, etc., it shall be the responsibility of the bidder to include in his price a sufficient sum to cover the additional costs or charges resulting therefrom.

E. Note that in all cases the contractor is responsible for checking the entrance access/clearance requirements for the equipment being furnished under this section and making the necessary provisions to accommodate the moving of such equipment to its final location. This is of particular importance when an existing structure is involved and, therefore, will probably involve either partial equipment disassembly, temporary openings, window removal, etc. as deemed appropriate under the circumstances.

F. With regard to running pipe, the Contractor is cautioned that such pipe may not be installed over, or run directly above, electrical switch gear. Where this situation is determined to be unavoidable, liquid tight sheet metal troughs shall be provided under the piping to afford the necessary protection. Additional protection, sensors, alarms, etc., shall be provided where and as required by local authorities.

17. PROTECTION

A. Provide proper protection to the building, equipment, etc., during the execution of all work involved under this contract heading.

B. This protection shall include the covering all apparatus, building surfaces and/or other materials to protect same from dirt; providing adequate temporary connections to protect apparatus from damage of any sort; and providing the required shielding to protect finished parts of the building. The following stipulations shall be adhered to:

1. Protection of finished floors from chips and cutting oil by the use of metal chip receiving pans and oilproof floor covers . . .

2. Protection of equipment and finished surfaces from welding and cutting spatters with baffles and spatter blankets . . .

3. Protection of equipment and finished surfaces from insulation adhesive, sizing droppings, etc., by the use of drop cloths . . .

C. All pumps, motors, fans and other rotating/reciprocating equipment stored for this project shall be adequately protected with openings, bearings, etc., covered to exclude dust and moisture. All stockpiled pipe, valves, fittings, ductwork, etc. shall be placed on dunnage and protected from weather and from entry of foreign material.

D. During installation and until final connections are made, all piping and ductwork shall be protected against entry of foreign matter. Equipment connections shall be carefully sealed until the actual time of system tie-in.

E. A 50 lb. CO2 extinguisher on wheels shall be provided at all times in the immediate vicinity of any welding or similar operations. Additional Federal, State and/or local regulations that are applicable shall be complied with as required.

18. PAINTING

A. Scope of Work: Provide all labor, tools, materials and equipment necessary to complete all painting as hereinafter described. All ferrous metal shall be clean and free from rust, scale and grease and sanded before applying primer or finish coats. Colors will be selected by the Owner. Cleaning methods shall comply with recommendations of the Steel Structures Painting Council.

B. Prior to proceeding with any painting, all shop applied prime coated surfaces shall be touched-up wherever damaged or bare. Touch-up to match existing.

C. Exterior and Interior Iron and Steel Work: Apply one (1) coat of synthetic, rust-inhibiting primer and two (2) coats of high gloss alkyd enamel, carefully sanded between each coat.

D. Sheet Metal Work: All exposed metal work, ductwork, etc., except copper, stainless steel or aluminum shall receive one (1) coat of galvanized iron primer and two (2) coats of high gloss alkyd enamel.

E. Ferrous Metal Plumbing and/or Heating Pipes: Apply one (1) coat of synthetic, rust-inhibiting primer and two (2) coats of high gloss alkyd enamel, carefully sanded between each coat. (Painting requirements apply to non-insulated lines only).

F. Paints, enamels, etc. shall be based on the use of Benjamin Moore products. Subject to compliance with requirements, provide "Moorecraft Professional Coatings". Materials shall be delivered to the job site in original containers. All paints, etc. shall be evenly spread and shall be free from runs, sags or other defects. All adjacent work and materials shall be adequately protected with suitable covers during all phases of the work.

19. PIPE MARKING

A. Properly identify all piping in mechanical equipment rooms, exposed piping at basement ceilings and all piping above accessible ceilings. Identification banding shall occur at approximately 25' intervals, at both sides of a main valve or fitting, at shaft openings, and at access doors. Pipe identification markers shall be in accordance with OSHA requirements and shall comply to ANSI A13.1. They shall be the pressure sensitive vinyl type.

B. Banding and identification shall be done after the final surface finish is applied. Surface shall be clean and dust free at application. Additional locations for identification markers may be required because of job site conditions.

20. EQUIPMENT LABELING AND IDENTIFICATION

A. Where an item of equipment or appliance is specified to meet the requirements of a referenced agency, conformance shall be evidenced by attachment of the agency seal, label or stamp of Underwriter's Laboratories, Factory Mutual Laboratories, AGA, ASME, or other suitable, nationally recognized testing laboratory listed by NFPA and will be accepted as evidence that the item furnished conforms to the standards.

B. Before completion, each major system component such as central station air handling units, exhaust fans, pumps, etc. shall be identified by means of an engraved nameplate with adhesive backing. Nameplates shall have 1-1/2" high subsurface black Helvetica letters and numbers on a white plexiglass or acrylic background.

C. Equipment identification shall be in agreement with the identification shown on the contract drawings and/or as directed by the Owner. In addition, all systems of identification shall meet the requirements of ASME A13.1.

21. CONCEALED EQUIPMENT – ACCESS AND MARKING

A. Where mechanical equipment, valves, control dampers, fire dampers, etc. are located in walls, shafts, inaccessible furred spaces and/or chases or above fixed (non-accessible) ceilings, adequately sized access doors of the appropriate type shall be provided.

B. Reach-in access doors for valves, unions, etc., shall be minimum 8" X 12" and crawl-in access doors shall be minimum l8" X 24" or larger as required for access.

C. General purpose access doors shall be flush mounted. They shall have a 16-gauge steel frame with 1" flange and a 14-gauge steel door with concealed continuous piano hinge. Doors shall have a stainless steel allen head cam latch unless otherwise indicated. The assembly shall be treated with a rust inhibitor and given a baked-on primer.

D. Access doors in rated walls and plastered or gypsum board ceilings utilized as fire protection for the structure shall be fire rated. They shall meet NFPA requirements and shall carry the UL l l/2 hour "B" label. Construction shall incorporate a 16-gauge steel mounting frame and minimum 20-gauge steel insulated panel door that is self-closing and self-latching with key operated lock and continuous concealed hinge. The assembly shall be treated with a rust inhibitor and given a baked on primer. All locks shall be fire rated and work with a common key.

E. Access door for other plastered surfaces shall be flush mounted with 16-gauge steel frame and l4-gauge steel panel door with continuous concealed hinge and stainless steel allen head cam latch. A 22-gauge plaster casing bead shall surround the frame. The unit shall be treated with a rust inhibitor and given a baked-on primer.

F. Access doors meeting the above specifications shall be as manufactured by Acudor, Cierra, Karp, Larsen=s or Milcor.

22. PREPARATION OF SYSTEMS

A. Boilers and/or building piping systems installed under this section shall be prepared for initial operation as described in the following paragraphs.

B. On initial boiler startup, all mill scale, oil and foreign matter shall be cleaned from the boiler(s) by "boiling out" in accordance with the manufacturer's published startup instructions. Furnish all required chemical compounds and prepare the boiler(s) for service as required (following the step-by-step procedure recommended). Finally, after performing the proper drain and flush procedure, fill for service with softened water (when available) and set into operation for demonstration purposes. Note that when filling steam boilers for service, treatment compound containing an oxygen scavenger shall be added at the prescribed rate.

C. The hydronics system(s) shall be initially flushed to remove loose dirt, mill scale, metal chips, weld beads, etc. Protect factory cleaned equipment, isolate pumps and pressure vessels, and remove any components which may be damaged. Open all valves, drains, vents, strainers, plugs, etc. to facilitate discharge of debris. Condensate return system(s) shall be treated in a similar manner.

D. After the initial flushing of closed loop piping systems, they shall be cleaned to remove adherent oil, hydrocarbons, flux, varnish, pipe joint compounds, etc. The cleaning agent shall be added to the system in strict accordance with the manufacturer's recommendations. Except as noted below, it shall be a polyphosphate, synthetic detergent or a combination of these.

E. The water temperature shall be raised to 100° and circulated for a minimum of 3 days with a temporary pump. The screening element in all strainers shall then be removed and cleaned. Following this, the lines shall be purged with fresh water until clean. Finally, strainer screens shall be installed again before final connections to the permanent pump are made. Temporary bypasses shall be provided for all system coils, pressure vessels, chillers, control valves, etc.

F. The final fill of hot water and chilled water systems shall incorporate a nitrite-borate corrosion inhibiter added at the rate required by local conditions but not exceeding the rate recommended by the manufacturer.

G. Glycol-water systems shall be cleaned using a heated tri-sodium phosphate solution prior to purging and the introduction of the glycol-water mixture. No water treatment shall be used with these systems.

H. At the completion of the job, all equipment involved in this contract shall be thoroughly cleaned, removing all traces of oil, grease, dust, dirt, etc. Re: Item PAINTING.

I. Supply air handling unit(s) shall not be operated for any purpose, temporary or otherwise, until the specified filters are in place, fan bearings are lubricated, and the equipment has been test run under observation. Note that unless otherwise specified, air handling units designed to incorporate two sets of filters need only be fitted with the upstream set until system component cleaning, as described below, is performed. Also note that if, during operation of any supply air system air handling equipment, the filters become loaded to the maximum recommended pressure drop as stated in the manufacturer's literature, they shall be replaced in order to avoid any possibility of downstream unloading.

J. Before final air system balancing is initiated, fan wheels and air handling unit housing interiors shall be vacuumed and wiped clean and all required filters shall be in place. Such filters shall be clean and installed properly. In addition, dust, dirt, debris, etc. shall be completely removed from the ductwork, plenums and other air distribution components. All ducts shall be clean and dust free when terminal devices or outlet faces are installed. Supply ducts serving finished areas shall be brush vacuumed and have a final cleaning with dampened rags. Note that where supply ductwork is to serve clean rooms, computer rooms, or similar areas, the final cleaning of the duct interiors shall be performed using clean rags dampened with an 80% ethyl alcohol solution.

23. BOILER EQUIPMENT CHECK-OUT AND START-UP

A. Control wiring connections involving the boiler interlock wiring between the boilers, circulating pumps/flow switches, etc., shall be done under the supervision of the boiler supplier's service personnel. With regard to any other items of operating equipment to be interlocked with the boilers, all such interlock and control wiring shall be certified by the boiler equipment supplier to be in accordance with the equipment manufacturer's instructions and/or recommendations.

B. After the power and fuel sources have been checked and the boilers have been piped, wired, inspected, and made ready for initial operation, they will be started up, checked and adjusted by the boiler supplier's service technician. When all controls have been determined to be performing as required, the Contractor shall perform the boil-out procedure in accordance with specification item PREPARATION OF SYSTEM.

C. After the boil-out procedure has been completed as specified, the boiler supplier's service technician will complete the boiler start-up routine, verify boiler capacity rating, confirm specified flue gas CO2 percentage at low and high fire, and determine stack temperature at high fire.

D. All pertinent data relating to boiler operation/performance will then be tabulated by the equipment supplier in a standardized boiler start-up and performance report. Copies of the completed report will be turned over to the Owner, the Engineer and the installing contractor by the boiler equipment supplier. This must be done prior to Owner acceptance.

24. TESTING

A. A complete test or tests of all work under this contract shall be conducted as soon after completion as practicable. Representatives of the manufacturers who furnished major items of equipment for the job shall be present at the time their apparatus is being tested. Prior notification of all tests shall be made to the Engineer.

B. Primary/major items of mechanical equipment shall be checked, started and test run in strict accordance with manufacturer's published start-up and testing procedures by factory authorized personnel. A complete operational report on each item of equipment shall be submitted on manufacturer's standard forms (in triplicate) to the engineer. Said reports shall be completed, signed and dated by the technician performing this work.

C. Apparatus furnished under this contract heading which fails to deliver its full rated capacity, or which is defective or unacceptable in other ways, shall be replaced or adjusted as required to comply with the intent of the specifications.

D. Unless otherwise mentioned, all hydronic piping systems involved under this contract heading shall be tested and made tight at a minimum 150 psi hydrostatic pressure or at a pressure 20% above system safety/relief valve setting or boiler pressure rating, whichever is greater. This shall be done before any equipment is connected and before any work is concealed. Finally, all hydronic system piping so tested shall be left under pressure of the domestic water system (or a min. 40 psig) for the balance of the construction period unless the risk of freezing exists. Note that the hydrostatic test pressure for heating boilers shall be 50% above the relief valve setting on the boiler.

E. Higher pressure (seal Class A) ductwork shall be leak tested in accordance with the recommendations and procedures outlined in the SMACNA High Pressure Duct Construction Standards manual. Note that the duct design operating pressure of a system shall be as listed in Item DUCTWORK unless shown otherwise in the drawings. Testing shall be performed and verified before such work is covered and/or concealed.

F. Ductwork that will normally operate at, or be subject to, design positive static pressures in excess of 3" w.g. will be identified on the drawings. Such ductwork shall be leak-tested according to industry-accepted test procedures. The actual duct leakage, as determined by the test, shall not exceed the value obtained when applying the formula listed in the current ANSI/ASHRAE Energy Standard under "Duct Leakage Tests".

G. All systems, in addition, shall be tested as required by governing Federal, State and/or local authorities. This includes meeting the requirements with regard to operational testing of any smoke and/or combination dampers. Note that the testing of piping and ductwork systems shall be performed prior to the application of any specified insulation. Where applicable, certificates of approval shall be furnished to the Owner as noted in Item PERMITS, FEES, INSPECTION, LAWS AND REGULATIONS.

H. Calibrated instruments, meters, equipment, facilities, and labor required to properly conduct tests shall be provided as required. If system testing results or equipment performance does not meet specifications or capacity requirements, the necessary corrective measures shall be taken and the testing shall be repeated until requirements are met.

25. BALANCING

A. The following described balance work shall be performed by a member of the Associated Air balance Council or the National Environmental Balance Bureau.

B. Balancing the hydronics system(s) shall be accomplished by measuring, adjusting and recording the flow at the balancing valve of each element, coil, etc. using the necessary instrumentation as specified by the valve manufacturer. Final adjustments shall be made as required to meet job conditions and performance specifications. Instrumentation required in conjunction with the work.

1. Where flow rates are not indicated, coil output shall be set by regulating the flow to achieve the required temperature drop and/or rise corrected for actual entering conditions.

C. All belt drive fan units shall be checked for alignment, belt tension, etc. and then adjusted to the speed required to meet the specified conditions of the system prior to balancing air delivery and air terminal settings to meet individual requirements. Any subsequent final balancing shall be done first by adjusting or changing fan drives and/or setting dampers where and as required.

D. Individual room balancing of the air systems shall be accomplished by determining the quantity of air flowing through each diffuser/register neck by means of velometer and pitot tube or other suitable means. Air discharge or exhaust at each device shall be as noted on the drawings or the schedule. Where possible, preliminary balancing shall be made at the branch ducts through a splitter, an air volume extractor, or at the branch take-off fitting damper. Final adjustment shall be made at the individual terminals. A performance log for all registers, grilles and diffusers shall be included in the balance report provided at the completion of this portion of the work.

E. Where an air device fails to perform at its rated or specified capacity, a traverse shall be made in the ductwork at field-selected points until the location of excessive pressure drop can be determined. The condition shall then be remedied so that specified performance can be achieved. All holes in ductwork shall be carefully plugged.

F. At the completion of the job or at such time as the various systems are completed and balanced, perform the following operations where applicable:

1. On all belt drive air handling equipment, a fan motor amperage draw reading and a fan wheel RPM reading shall be taken. Note ambient air temperatures when readings are taken.

2. Amperage draw readings shall be taken on all pump motors after final system balance.

G. All data shall be plotted against performance curves obtained from the manufacturer in order to establish actual system and equipment performance.

H. All balance data and equipment performance data shall be listed by category for this submittal. Each category of balance data shall be assembled in tubular form.

1. The actual flow through all hydronics system coils shall be indicated along with the specified flow requirements. All air devices shall be listed, either by room or by device number where such devices have individual numbers, and their actual performance shall be listed along with specified performance requirements.

I. Three complete reports containing all required information shall be submitted for review prior to or at the completion of the project. Such reports shall be typewritten, with cover sheet listing the job name, date, contractor, etc. and shall be looseleaf bound.

J. All instrumentation, meters and miscellaneous equipment required in performing the balancing operations specified above shall be furnished as part of this item. This shall include any special equipment, proprietary software, cables etc., that may be needed due to specific requirements that may be inherent within a particular specified vendor=s control system.

26. INSTRUCTIONS, MANUELS, SPARE PARTS, ETC.

A. Provide the Owner with four complete equipment brochures in hard-backed binders. These assembled manuals shall contain all operating, servicing, and maintenance information as well as parts lists for the equipment furnished and installed under this contract. Where diagrams are too large for the binder, arrange manila pockets with reinforced holes to hold folded drawings. Binders shall also contain complete valve charts.

B. Each fan or equipment room shall have all system automation and/or temperature control diagrams applicable to the equipment therein permanently sealed to durable transparent plastic and posted where directed.

C. Arrange for technical instruction of the Owner's maintenance personnel for such time as would be reasonably required to acquaint them with their duties. In addition, deliver to the Owner all special tools or equipment required for making normal adjustments on any equipment or apparatus furnished under this contract heading.

D. The spare parts and other items listed below, where applicable, shall be turned over to the Owner at the completion of the project.

1. One set of pump gaskets for each pump...

2. Pump packing or mechanical seal for each pump (except standby)...

3. Unless otherwise mentioned, one spare set of air filters for each filter bank and/or filter unit installation...

E. Technical instruction involving the mechanical systems installed under this section shall include a demonstration of the operating system with a description of same explained to the Owner's representatives, as well as all involved contractors, subcontractors, and major equipment manufacturers. The demonstration shall be held after installation of all work under this section has been essentially completed including all testing and balancing. In addition, all written reports of such work shall have been submitted as required. The time at which the satisfactory completion of the technical instructions and demonstration occurs will establish the date of final acceptance of the system unless otherwise stipulated.

F. Note that the specifications may indicate certain items of equipment be provided with a demonstration of operation. (See Item SHOP DRAWINGS.) This demonstration requirement applies to all major items of mechanical equipment and shall include technical instructions covering proper start-up procedure and normal maintenance routines recommended by the manufacturer.

27. RECORD DRAWINGS

A. At the commencement of the work, HVAC Contractor shall set aside two complete white print sets of the HVAC drawings for recording changes, modifications, etc. All variations and deviations from the work (plans, details, schedules) that occurred under this Section, including those required by Change Orders, if any, shall be recorded in a neat and legible manner with colored ink or colored pencil at the end of each working day on these drawings. These prints shall be available at all times for the Owner's and Architect's and/or Engineer's inspection.

B. Prior to examining the Contractor's requisition for Final Payment or making any response thereto, the Contractor shall submit one complete set of white prints to the Architect, marked as stated above, indicating the final and accurately represented installation of the work included under this contract. In addition, all piping system drains shall be accurately located on these prints. The Architect will forward the prints to the Consulting Engineer for review and comment. After review, they will be utilized by the Engineer in preparing an updated electronic file.

C. Note that providing these marked-up prints showing all changes to the original contract drawings is a requirement for project close-out.

28. CLEANUP

A. All rubbish resulting from the work herein specified shall be removed from the premises at the end of each working day.

B. Upon completion of the work, remove from the project site all tools, equipment, surplus materials and all remaining rubbish pertaining to the work under this contract heading. Responsibility for this shall include all related costs for such removal and disposition including hauling, dumping, etc.

C. By this time all extraneous labels, tags, etc., as well as other markings on equipment and ductwork not field insulated shall be removed.

29. WARRANTY

A. Provide warranties to the Owner that all materials and equipment furnished are new, unless otherwise specified, and that all work is of good quality, free from faults and defects and in conformance with the Contract Documents.

B. Warranties on all work and equipment shall commence on the date of substantial completion of the work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. These warranties and all related documents shall be submitted, in accordance with the front part of the specifications, prior to the issuance of any certificates of acceptance. Warranties shall include equipment manufacturers' written certificates warranting the equipment furnished complies with all requirements of the drawings and specifications including any extended warranties as well as the contractor's warranty statement for the project. This documentation shall be submitted in an appropriately marked, 3-ring hard cover binder.

C. If, within one year after the date of substantial completion of the work or within one year after acceptance by the Owner or within such longer period of time as may be prescribed by the terms of any applicable special warranty specified for a particular equipment item, any work is found to be defective or not in accordance with the Contract Documents, it shall be promptly corrected upon receipt of official notification to do so. In addition, latent defects in materials, equipment or workmanship that are not discovered until sometime during the second year following acceptance, shall remain the contractor's responsibility to correct. This obligation shall survive termination of the contract.

30. MOTORS AND STARTERS

A. Unless otherwise shown or specified, provide the required electric motors for equipment furnished under this contract heading All power wiring and associated electrical connections will be under the electrical section. However, control and/or interlock wiring shall be under this section of the work. See Item INTERLOCK AND CONTROL WIRING.

B. Motors:

1. All standard Motors shall conform to UL, CSA and NEMA MG1 and be nameplated and installed in accordance with NFPA National Electrical Code requirements.

2. Unless otherwise indicated, ac motors shall be industrial quality open drip-proof with grease lubricated ball bearings having a minimum L-10 bearing life of 80,000 hours when used with minimum pitch diameter sheaves as defined by NEMA Table 14-1. Motors shall be sized and rated for continuous duty at 40°C ambient temperature and shall have a minimum 1.15 service factor. Insulation shall be rated Class F and all motors shall be protected against current overload and excessive temperature with internal thermal overload protection. Windings and leads shall be 100% copper, 200 deg. C magnet wire rotors shall be solid cast aluminum. Motors frame shall be of aluminum alloy with steel bearing seats. The motor shall have a sealed conduit box and shielded ball bearings for all-position operation. Rotor shall be dynamically balanced to industry standards and shrunk fir to shaft. Where totally enclosed fan cooled motors are specified, such motors rated two horsepower and over shall have fans positively engaged and clamped to the motor shaft. Note that motor starting torque characteristics shall be suitable for the application.

3. Single phase motors 1/6 HP and above shall be either permanent split-capacitor or capacitor-start/capacitor-run type. Polyphase motors shall be general purpose squirrel cage induction type and, unless otherwise specified, shall be NEMA design B. Fractional horsepower motors in 42,48 and 56 frames may have permanently lubricated, double-shielded or sealed bearing. Integral horsepower open and totally enclosed motors in 143T through 449T frames shall have bearing systems capable of being re-lubricated without disassembly.

4. Polyphase motors shall be Premium Efficiency and tested in accordance with IEEE Standard 112, test method B, using accuracy improvement by segregated loss determination including stray loss improvement as specified in NEMA standard MG 1-12.53a. Minimum full – load efficiencies shall meet or exceed all published NEMA minimum efficiencies as listed in MG 1-12.54.2, table 12.6A. In addition, labeling of efficiency shall be in compliance with NEMA MG 1-12.54.2.

5. Polyphase motors shall be designed and built for across-the-line starting unless specifically indicated otherwise with a particular item of equipment and all motors shall exceed NEMA Torque standards.

6. Motors designated for service with invertor controls (IGBT – based variable speed drives) shall be built in accordance with NEMA standards as they apply to "Definite-Purpose Invertor-Fed Polyphase Motors" and shall carry a 3-year warranty from the manufacturer.

7. Note that in addition, such motors shall be provided with a factory installed shaft grounding ring (SGR) in order to prevent drive induced electoral damage to motor bearings. The ring, designed to continuously discharge VFD induced rotor shaft currents to the motor frame, shall incorporate conductive micro-fiber brush technology as the grounding means and have a projected operational life of at least 200,000 hours. It shall normally be installed with a rigid mounting plate at the drive end of the shaft.

8. Motors shall be as manufactured by G.E., Reliance, Allis-Chalmers, Gould, Lincoln, or U.S. Motor. Notes that where equipment is direct-driven, make of motor may be recommended and/or normally furnished as part of the package by the equipment manufacturer, but shall be in accordance with the requirements of these specifications.

C. Starters:

1. The Electrical Contractor will furnish fractional HP manual starters required for all manually operated single phase, single speed motors less than 1 HP unless otherwise mentioned in the following specifications or indicated on the drawings for a particular item of equipment. In addition, refer to Item WORK DONE BY OTHERS for additional starters that may be furnished under the electrical section. All other starts (motor controls), regardless of size, as well as variable speed drives for heating ventilating and/or air conditioning equipment shall be furnished under this section of the work either separately or as an integral part of the equipment supplied.

2. All separately mounted motor controls, with the exception of variable frequency drives, shall be magnetic starts mounted in a rated enclosure. Units shall be rated in accordance with NEMA Standards.

3. All Starters under this section, except those provided as an integral part of a specific item of equipment, shall be by the same manufacturer. These units shall be as manufactured by Cutler-Hammer, Allen Bradley, General Electric or Square D.

4. Unless otherwise indicated, the enclosure shall be NEMA type 1 (or NEMA 3R where exposed to the elements).

5. Required magnetic starters for motor driven equipment shall be across-the-line type and microprocessor based. Motor controls shall meet all applicable code references to underwriters Laboratories (UL) and National Electrical Manufacturers Association (NEMA) and shall have the following features:

   a. Contractors shall have NEMA size 1 through 6 ratings as required. They shall have replaceable fixed and movable contacts. Contractors shall be designed to accommodate two auxiliary contact blocks, each capable of a combination of up to 4 normally closed or 4 normally open auxiliary contacts. Auxiliary contact blocks to be of a design that is capable of fitting NEMA 1 through 6 contactors. Contacts to be color-coded, black designating NC and silver designation NO. Contacts to be rated 10 amperes continuous, make 7200 VA, break 720 VA for 120 though 600 volts AC and 69 VA Make and Break for 125 through 300 volts DC. Provide a minimum of one (1) spare NO contract and one (1) spare NC contact in addition to any auxiliary contacts called for on the drawings.

   b. Provide one current sensor located in each phase monitored by the microprocessor to furnish motor running overload protection that yields a time-current curve closely paralleling that of motor heating damage boundary, accurate to 2%. Running overload protection shall be DIP switch selectable for the specific motor full load amperes within the starter range. Provide DIP switches selectable overload trip class of 10, 20 and 30.

   c. Motor starters shall monitor current in each phase in order to provide phase loss and phase unbalance protection such that if the unbalance of any of two phases is greater than 30% of the DIP switch selected trip rating, a phase loss/unbalance trip occurs. Provide phase loss/unbalance protection which requires no time delay for reset.

   d. Motor starters shall be furnished with Class II ground fault protection. Ground fault protection shall be set at 20% of maximum continuous ampere rating and shall have a start delay of 20 seconds as well as a run delay of 1 second to prevent nuisance trip on starting.

6. Magnetic starts shall be similar to Cutler-Hammer Advantage Series type W 200 and shall incorporate the following features:

   a. They shall have a Hand-Off-Auto selector switch mounted in the face of the starter enclosure. The selector switch shall be wired

so that when it is in the Hand or Auto position, all safety controls are in series with the switch. All control devices shall be wired for operation in Auto position only.

b. They shall be provided with an encapsulated control circuit transformer. Primary and secondary fusing shall be provided. Unless otherwise specified, the secondary shall be 120 Vac.

c. They shall incorporate oiltight, flange mounted pilot devices, where specified, which shall be oiltight and mounted in the flange. LED type pilot lights, indicating motor operating status, shall be mounted in the face of the enclosure. Pilot device nameplates shall be engraved phenolic or aluminum.

D. Miscellaneous:

1. Starters for motors 5 HP and above shall be provided with three auxiliary terminals, installed between power contacts and overload devices, to facilitate field connection of power factor correction capacitors.

E. Deliver all starters up to size 3 to the Electrical Contractor's project site office or storage room and deliver all size 3 starters or larger to the room in which they are to be installed.

F. Consult the motor schedule on the contract drawings as a cross-check of electrical characteristics for all motors and starts to be furnished under this contract heading. Starters individually furnished shall be minimum size 1.

31. DRIVES AND GUARDS

A. Furnish drive sheaves as required for each item of belt driven equipment. Sheaves shall be statically and dynamically balanced and mechanically trued. They shall be made of pressed steel or of die cast or close grained cast iron free from sand holes or other defects.

B. Drive assemblies for motors 3/4 HP and over shall have at least two belts and all multiple belt sets shall be matched. Drive selection shall be based on a service factor of 1.5 as applied to the motor nameplate rating. Belt tension shall be set in strict accord with manufacturer's recommendations.

1. Fixed sheaves shall be used for all installations requiring more than 2 belts, for motors 30 HP and over and for installations incorporating a variable frequency drive to regulate motor speed. All other drive assemblies shall incorporate an adjustable pitch sheave selected so that final setting is at the approximate mid-point of adjustment range.

2. Belt speed shall be between 1,000 and 5,000 feet per minute. Center line distance shall be well within manufacturer's recommended limits. The angle of belt contact on the smaller sheave shall not be less than 120°.

3. Allow for sheave changes as necessary to meet the job requirements with each belt drive installation. On adjustable drive units, furnish and install fixed sheaves of same diameter as correct adjustment after air balance is complete. Leave adjustable sheave at motor location and secure to unit.

C. Belts, chains, pulleys, couplings, motor shafts, gears, etc., shall be fully guarded in accordance with OSHA 1910.219. Guards shall be cast iron, formed steel, expanded metal or wire mesh. They shall be rigid and suitably secured and shall be readily removable without disassembling the guarded unit.

D. Each belt drive guard shall have openings with covers at drive and driven sheave centers for taking tachometer readings. Guards for field erected air handling units shall also conform to applicable SMACNA standards.

E. For each direct drive item of equipment under this section which is not of extended shaft or close coupled design, furnish an approved type flexible coupling.

F. Furnish a typed index of belt drives, listing each separate item. Include data regarding belt size, bore size, keyway dimensions, etc., of each sheave, as well as the number of belts and manufacturer's replacement belt numbers. Bind this compiled data in the Operating Instruction Brochure described under Item INSTRUCTIONS, MANUALS, ETC. in this section of the Specifications.

32. ALIGNMENT OF ROTATING EQUIPMENT

A. All pumps or similar equipment directly connected to motors by means of flexible couplings must be perfectly aligned after installation by the use of a dial indicator. The alignment shall be performed by a mechanic skilled in this work. Make arrangements for and insure that the manufacturer of the equipment provides the services of a factory trained representative to supervise aligning and start-up and notify the Engineer when this has been accomplished.

B. Belted equipment shall be installed so that the grooves of the driver pulley are truly aligned with those of the driven sheave. In addition, the belts must be in the proper tension, free from flutter. In multi-belt drives, all belts must be operated in the same plane. Flutter in any one belt will be cause to reject the entire set, as the original installation of belts must be in matched sets as elsewhere specified. (See Items DRIVES AND GUARDS).

C. Before any rotating equipment is put in operation for testing purposes, it shall be properly lubricated with lubricants only as recommended by the equipment manufacturer. Additional lubrication shall be provided before equipment is turned over to the Owner. Prior to completion of the project, provide the Owner with a complete schedule of lubrication for all rotating equipment installed under this section.

33. CUTTING AND PATCHING

A. All cutting and/or drilling of walls, slabs, structural members, etc., required in conjunction with work under this section shall be performed as part of the work and shall be done under the supervision of the General Contractor. Work shall be neatly done, without unnecessary removal of material. Holes, openings, etc. shall be located where they will not weaken the structure. No beams, joists, etc., shall be cut without written authorization from the Architect.

B. Prior to the cutting of any slab-on-grade floors or similar type of demolition work, the contractor shall consult with the Owner, or individual(s) designated by the Owner, to determine whether buried utility lines may be in the vicinity and possibly at risk of being damaged or severed by the operation. Also, at this time, locations of appropriate isolation valves, disconnects, switches, etc. should be determined.

C. Cutting of round openings in concrete and/or masonry shall be performed with a core drill to minimize spalling, etc. Locations shall be accurately determined and checked, and the appropriate drill bit shall be used to minimize hole size. Required square or rectangular openings shall be cut neat with no over-cut. Remove any anchors used during the cutting operation and patch holes.

D. Openings made in walls, partitions, etc., shall be carefully cut/drilled and accurately sized for the penetrating item.

E. Sleeves or thimbles as well as escutcheons and trim plates for cut holes shall be provided as described in Item INSERTS AND SLEEVES. Installation shall permit free movement of pipe.

F. NOTE: Cutting of water lines, electric conduit or similar service lines in the course of work performed under this section shall be immediately repaired as part of the work of this section.

G. Patching and/or repairing of all work, including finished surfaces, necessitated by the demolition or installation of work under this section shall be considered as part of this work. It shall, however, be performed by mechanics of the appropriate trade in order to achieve a workmanlike job. This shall include, but not be limited to, all items of concrete and masonry work, millwork, gypsum board and/or plaster work, painting, floor finishes and ceiling finishes as well as all other surface finishes.

H. When the need for such patching or repairs arises, immediate arrangements shall be made with the appropriate trade(s) or with the General Contractor to perform the necessary work at no additional cost to the Owner. The final responsibility for acceptance of such work by the Owner's representative shall reside with the contractor for this section of the project.

34. INSERTS AND SLEEVES

A. Inserts (concrete expansion anchors) shall conform to applicable requirements of Federal Specification FF S 325. Embedment, anchor length and size shall be in accordance with manufacturer's recommendations. Anchors 3/8" through 3/4" shall be U.L. listed for pipe hangers.

B. In general, pipe sleeves through outside walls shall be of minimum 16 gauge galvanized steel or PVC pipe and shall be large enough to permit packing with picked oakum. The final 3" from the inside and outside faces of the wall shall be caulked with lead or waterproof plastic. Note that sleeves are not required for holes drilled in poured concrete walls.

C. Sleeves shall be provided for pipe and duct openings cut in masonry walls as well as for similar openings in non-masonry walls, partitions, etc. Sleeves shall be of galvanized sheet metal with flanged ends and shall be securely mounted in place. Voids between masonry and sleeve shall be filled with mortar. In rated walls, openings between pipes and/or ducts and structure, wall or sleeve shall be filled with firestop sealant to produce a fire, smoke, and water barrier as referenced below.

D. Provide thimbles wherever exposed pipes, tubing, conduit, etc., pass through interior non-masonry walls, partitions, etc. They shall be telescoping type, made from 22 ga. galvanized sheet metal and of minimum size. Thimble ends shall have cast, or stamped metal plates attached thereto. Floor penetrations shall be provided with sleeves extending at least 1/4" above the floor line.

E. Pipe, tubing, conduit and small round duct penetrations of walls, floors, etc. in exposed areas shall be provided with escutcheons. They shall have concealed hinge and set screw and shall be securely attached. In finished areas, escutcheons shall be polished brass or chrome plated steel. In mechanical or service areas, escutcheons shall be galvanized cast iron. Floor penetrations shall be provided with deep pattern floor plates set flush with the floor and designed to cover the entire sleeve projection. Note: Where required by code considerations, non-metallic sleeves shall be covered by escutcheons.

F. Openings cut through roof structures shall be carefully made (see Item CUTTING AND PATCHING) and located in designated areas only. Pitch pockets shall be utilized as required to eliminate any chance of moisture penetration. Pitch pocket liner shall be made from 16 oz. sheet copper (ASTM B 370, temper H00) and shall extend approximately 4" above the finished roof.

G. In all cases where ducts, pipes, etc., pass between floors, rated walls, and/or rated partitions, the spaces between the structure or sleeve and the penetrating member shall be provided with an approved firestop sealant to produce a fire, smoke, and water barrier. Sealant material and installation shall be as described in Item FIRESTOPPING.

35. FIRESTOPPING

A. Furnish and install the required firestopping as referenced in the item of the specifications covering inserts and sleeves. Materials, installation, etc., shall be as described below. Products shall be as manufactured by Hilti Inc., Specified Technologies Inc. or United States Gypsum Co.

B. Definition:

1. Firestopping is defined as the material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, water and hot gases through penetration in fire rated wall and floor assemblies.

C. Application:

1. Tested firestop systems shall be used for all penetrations for the passage of ductwork and piping through floors, fire-rated vertical barriers (wall and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

D. Quality Assurance:

1. A manufacturer's direct representative (not distributor or agent) shall be on site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

2. Firestop system installations must meet requirements of ASTME E-814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated. In addition, proposed firestop materials and methods shall conform to applicable governing codes having jurisdiction.

3. For those firestop applications that occur for which no UL tested system is available through any manufacturer, a drawing representing the manufacturer's engineering judgment, derived form similar UL system designs or other tests, shall be submitted to local authorities having jurisdiction for review and approval prior to installation. Engineer judgment drawings must follow current requirements set forth by the International Firestop Council.

E. Submittals:

1. Manufacturer's submittals shall include specifications and technical data for each type of material including its composition and limitations, documentation of UL firestop systems to be used and manufacturer's installation instructions to comply with Section 1300. The submittal shall also include material safety data sheets as well as any engineering judgment drawing previously approved by local authorities.

F. Installer Qualifications:

1. The firestop system installer must be certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary experience, staff, and training to install manufacturer's products per specified requirements as previously stated in Quality Assurance.

G. Requirements:

1. All holes, voids, miscellaneous openings, etc., made by penetrations in floor slabs (above grade) for systems provided under this section shall be completely sealed to insure watertight integrity. Installation of firestopping shall be scheduled after completion of penetrating item installation but prior to covering or concealing of openings.

2. Provide firestopping utilizing components that are compatible with adjacent surfaces, the substrates forming openings, and the items penetrating the firestopping under conditions of service and application as demonstrated by the firestopping manufacturer, based in testing and field experience. Note that materials containing flammable solvents shall not be used.

H. Materials:

1. Use only firestop products that have been UL 1479, ASTME E-814, or UL 2079 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each specific application.

2. Fore penetrations by combustible items (penetrants consumed by high heat and flame) including insulated metal pipe that is PVC jacketed, flexible cable or cable bundles and plastic pipe (closed piping systems), and Intumescent material is required to maintain fire rating of the assembly penetrated.

3. A firestop system with an "F" rating as determined by UL 1479, ASTM E814 or UL 2079, which is equal to the time rating of the construction being penetrated, must be utilized.

I. Preparation:

1. Surfaces to which firestop materials will be applied shall be examined for detrimental conditions. They shall be free of any substances that may effect proper adhesion.

2. Observe and comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

J. Installation:

1. Firestop materials shall be installed in accordance with published recommendations listed under the heading "Through-Penetration Firestop Systems" in the UL Fire Resistance Directory. In addition, the manufacturer's instructions for installation of through-penetration materials shall be strictly followed.

2. Consult with the engineer prior to installation of any UL firestop systems that might hamper the performance of fire dampers as they pertain to duct work.

K. Miscellaneous:

1. Sealed penetration areas shall be checked thoroughly to ensure proper installation before concealing or enclosing said areas.

36. SUPPORTS, HANGERS AND BRACKETS

A. All hangers, brackets, etc. for supporting material and equipment included under this section of the work shall be furnished and properly installed as required and as specified in the following. Material shall be as furnished by Anvil, Crane, Elcen, or Fee and Mason.

B. Pipe support spacing shall be in accordance with ANSI B3l.l.0. Piping shall be installed in such a manner that, where movement due to expansion and contraction could occur, it can freely take place except at anchor points. Supports shall be capable of vertical adjustment after erection of pipe. Pipe hangers, U-straps, clamps, pipe rolls, etc. shall be carried by threaded rods of a size determined by the support item locking device but in no case less than the size called for in the carrying capacity table for threaded rods listed in the ASME code for pressure piping. Supports and parts shall conform to the latest requirements of ANSI B3l.l.0 and MSS Standard Practice SP 58, except as supplemented and/or modified herein.

C. Where required hanger spacing does not correspond with structural joist and/or rib spacing, or where the placement/location of suitable structural members will not accommodate this required spacing or hanger location, attach supporting steel members to the structure in order to properly carry the lines.

D. Where three or more uninsulated lines are installed in parallel, trapeze hangers may be used. The horizontal support shall consist of formed steel channel members with the appropriate pipe supports, hanger rods and accessories as listed below. Hanger rod size, beam loading, etc., shall be in accordance with manufacturer's recommendations.

E. Vertical lines shall be guided or supported at the mid-point of riser and not over 12 ft. on centers with riser clamp lugs and shall be supported at base of riser on a securely mounted base elbow or, where shown, with pipe stand.

F. Wall brackets or floor supports for hot lines 3" and over shall utilize adjustable rollers with base plate. In lieu of rollers, lines may be supported by weld type T-cradle guides with bonded graphite bearing surfaces. Securely fasten base plate to bracket or floor slab after alignment. Install lines with insulation protection saddles or pre-compressed insulation segments and shields at the support points as required and as described in the following.

G. Suspended cold lines with compressible insulation as well as non-insulated lines shall be supported by adjustable clevis hangers with standard additional components as required. Suspension supports for insulated lines shall have galvanized steel insulation protection shields that are the recommended size per manufacturer's published data. The clevis shall be properly sized to accommodate the insulation with protection shield. Rigid preformed and pre-compressed insulation segments will be furnished by the insulating contractor as required for the support points. See Item INSULATION.

H. For steel piping installations, suspended hot lines 22" and over shall be supported with adjustable steel yoke pipe rolls with pipe covering protection saddles (pipe shoes) tack welded to pipe and with standard additional components as required. Saddles shall be made from curved carbon steel plate with steel stiffeners. On lines 2" and below, use adjustable clevis hangers with formed galvanized steel protection shields. For copper piping installations, all hot lines shall be suspended in a similar manner. However, for lines 2 2" and over, preformed and pre-compressed insulation segments shall be utilized at support points in lieu of pipe covering protection saddles.

I. Pipe support loops, U straps, rollers, etc. shall be of the proper size to fully accommodate the piping, including insulated lines with insulation installed.

J. On lines where supports come in direct contact with the piping, avoid the use of dissimilar metals at the area of contact...i.e. supports for copper lines shall be copper plated, etc.

K. All manufactured support items such as brackets, clamps, hangers, etc. shall comply with the ANSI code for Pressure Piping or Manufacturers Standardization Society Standard Practice SP-58 as well as other applicable federal specifications and the imposed loads shall not exceed the manufacturer's published maximum recommended load listings.

L. Supporting and/or framing members, racks, etc. shall consist of an arrangement of cold-formed structural steel channel sections, fittings, bolt and nut assemblies, etc. as required by job conditions. Double channel combinations shall be spot welded. Member sizing shall insure that beam loading, etc. does not exceed manufacturer's allowances. Nuts shall be made from steel bars and thoroughly case hardened after machining. All structural members and miscellaneous parts shall be bonderized or otherwise treated to resist corrosion. Provide plastic end caps or other, similar, colored "safety caps" for all structural elements where the possibility of injury to maintenance personnel exists. The above described materials shall be as manufactured by Unistrut, Anvilstrut, Hilti or Van Huffel Tube.

M. Where structural steel shapes such as beams or angles are indicated or required, they shall be supplied with a steel primer shop coat. In addition, they shall be spot primed as required at installation. Fabrication by welding shall be as described in Item MATERIALS AND WORKMANSHIP. Where bolting is used in fabrication or erection, they shall be A325 high strength steel bolts with size and number as required to fully develop the strength of the structural member.

N. Piping and duct work systems shall be supported independently from each other. In addition, the utilities and mechanical services shall be separate installations from the ceiling grid system and shall be independently supported from the building structure. Where interferences occur, trapeze hangers or supports shall be employed. Care shall be taken to avoid blocking access to terminal air boxes, fire dampers, valves, etc.

37. HOISTS, RIGGINGS, TRANSPORTATION AND SCAFFOLDING

A. Provide all necessary scaffolding, staging, cribbing, tackle, hoists and rigging to locate the material, equipment, etc. of this section in its proper place on the project. All such temporary work shall be removed from the premises when no longer required.

B. Pay all costs related to the transportation of materials and equipment to the job site. These costs shall be covered in the bid as no additional allowance will be made by the Owner.

C. Scaffolding and hoisting equipment shall fully comply with requirements of all pertinent Federal, State and Local Laws and Codes.

38. EXPANSION, ANCHORS AND GUIDES

A. All piping shall be installed with due regard for expansion to prevent damage to the building, equipment and piping. Provide anchors and loops, connectors and approved type expansion joints where indicated or required for the accommodation and/or control of movement.

B. Branch connections from horizontal mains to heating risers, radiation, etc. shall be made with a minimum of two 90° elbows.

C. Bullhead connections in any piping service are expressly prohibited.

D. All continuous radiation covers shall be attached through elongated holes or by other approved means to prevent buckling.

E. All expansion joint and/or expansion compensator installations shall be supplemented with adequate guides as close to the units as possible and additionally at recommended intervals in order to preserve alignment and pitch. Guides shall be rigidly secured to the structure and shall permit axial movement only.

F. Expansion loops or connectors shall be flexible type manufactured units, of the size and movement capability noted on the drawings, and designed so that no pressure thrust load is imparted to the connecting pipe. They shall consist of two or three flexible sections of bronze or stainless steel annular corrugated flexible hose and braid, with connecting fittings. The hose and fittings shall correspond to adjacent pipe size and end connections shall be sweat, threaded or flanged in accordance with specification item FITTINGS. Allowable working pressure shall be at least 150 psig at 250° F, or greater as required by design conditions. Loops shall be installed in strict accordance with manufacturer's recommendations.

1. All expansion joints and compensators shall be line pipe size and shall be installed in strict accordance with manufacturer's recommendations.

2. Expansion joints and/or loops 2-1/2" and over in size shall have standard ANSI flanged end connections; expansion joints and/or loops 2" and under, as well as all expansion compensators, shall have thread-end or sweat-end connections unless otherwise indicated.

3. Where joint data is not listed each expansion unit shall be selected for compression traverse at least 1-1/2 times the possible expansion that can occur in the particular sections being served (assume that the piping is installed at 40°F ambient air temperature with no cold springing).

G. Expansion joints and/or compensators shall be as manufactured by Adsco, Badger, Flexonics, Hyspan or Metraflex and shall be designed for an allowable working pressure of 150 psig or higher as determined by system requirements and an allowable operating temperature of 300° F or higher as determined by system requirements.

H. Pipe alignment guides shall be provided in accordance with the expansion absorbing device manufacturer's recommendations. They shall be the spider and sleeve type as manufactured by Adsco, Flexonics, Hyspan or Metraflex. They shall consist of a steel segmented spider, sized to the nominal O.D. of the pipe and free to move axially in a segmented steel cylinder. The sleeve or cylinder shall have an integral steel base designed for attachment to the structure. The spider shall have an appropriate liner, where required, to avoid pipe contact with a dissimilar metal.

1. On chilled water lines, or other pipe subject to sweating, the pipe guides shall be sized to accommodate insulating thermal barriers. The barriers shall consist of split, waterproof, thermal units which shall be installed in accordance with manufacturer's instructions.

I. Pipe anchors shall be furnished and installed where required to secure the pipe and totally eliminate movement. They shall be fabricated from structural steel shapes and shall be securely attached to both pipe and structure as required. Avoid direct anchor-to-pipe contact involving dissimilar metals. Note that where expansion joints are utilized in the piping system, the associated anchors must be of sufficient strength to withstand the pressure thrust as well as the force of joint compression and any alignment guide friction.

J. Where the structure is of steel, the means of attachment shall be welding, and where the structure is concrete, the means of attachment shall be anchor bolts and heavy-duty sleeves.

K. All welding shall be performed in accordance with applicable provisions of the AWS Code with finish welds clean, showing good fusion and 100% penetration. Structural steel anchors shall be fabricated and installed using minimum 1/4" fillet welds. Allowable weld stress shall be 3,000 lbs. per lineal inch parallel to the longitudinal axis and 1,500 lbs. per lineal inch normal to this axis.

L. Bolts used for anchor attachment shall be minimum 5/8" diameter high-strength carbon steel bolts. A minimum of 3 bolts shall be utilized at each anchor attachment.

M. Note that where main service pipeline expansion joints are involved, the method of attachment, length of weld, size and number of bolts, etc. utilized for the installation shall be submitted for review.

39. PIPE AND PIPING

A. Piping shall be designed, fabricated and installed in accordance with applicable portions of the ANSI Codes for Pressure Piping, as well as the requirements of the state piping and welding codes. Selection of pipe shall be in accordance with the following:

Service/System	Pipe/Tubing
Hot Water:	
Thru 3".....	Copper (Type "L")
4" and Over.....	Black Steel
Glycol-Water:	
Thru 3".....	Copper (Type "L")
4" and Over.....	Black Steel
Underground.....	HDPE

Piping so designated may be roll grooved and assembled with mechanical couplings.

B. Steel Piping:

1. All steel piping shall be made up using specified grade carbon steel pipe, either ASTM A-53 or A-106. Unless otherwise indicated, pipe shall be standard weight. For systems designed to operate beyond 50 psig (steam) or 60 psig (water), pipe shall be either A-53 Grade B, Class S or E or A-106 Grade B. Note, however, that pipe shall be used within the range of temperatures and allowable stresses listed within the ANSI Code. All steel pipe shall have at least one identifying mark or legend per length.

2. Black steel pipe 2" and over in size, except where connected to equipment or otherwise shown or specified, shall be assembled by welding. Black steel pipe under 2" may be assembled with thread-end couplings and fittings unless otherwise indicated. For requirements on welding, refer to Item MATERIALS AND WORKMANSHIP.

3. With the exception of glycol-water system piping, threaded connections shall be made using either PTFE tape or oil and graphite pipe joint compound on male threads only. On glycol-water piping, threaded connections are prohibited.

4. Note that on piping systems where all fittings are to be weld-end type, pipe lengths thru 1-1/2" size shall be assembled using socket weld couplings. On sizes 2" and above, pipe lengths shall be assembled by butt welding.

C. Copper Piping:

1. Non-ferrous (copper) piping shall consist of hard temper seamless copper tube conforming to ASTM B 88. Piping shall be made up with sweat and/or brazed joints as described in Item MATERIALS AND WORKMANSHIP.

2. Miscellaneous drain lines within mechanical rooms shall be Type "K" hard copper.

D. Grooved End Piping Installations:

1. On piping systems where mechanical couplings are permitted, the assembly shall incorporate grooved end pipe and UL listed mechanical couplings with resilient elastomeric gaskets as the means of fabrication. Couplings for steel pipe shall be standard, general purpose type with resilient gasket, 2 part ductile or malleable iron housing and trackhead type zinc electroplated carbon steel retaining bolts with hex nuts, per ASTM A 183. Allowable design working pressure, shall be at least 750 psig. Couplings for copper tubing shall be sized specifically for this application and shall have an alkyd enamel coating. Maximum design system temperature may not exceed 210□F for this type of installation.

2. Ends of pipe for systems utilizing mechanical couplings shall be hydraulically roll grooved. All grooving shall be accurately done in accordance with the coupling manufacturer's current listed standards and groove dimensions shall be within specified tolerances. (See Item MATERIALS AND WORKMANSHIP).

3. Coupling gaskets shall be the type recommended by the manufacturer for the application and shall be made of molded synthetic elastomer with properties as designated by ASTM D 2000. Unless otherwise indicated, gaskets shall have a listed temperature range of 20° to 230°F or greater and shall be recommended by the manufacturer for water service within these limits.

E. Miscellaneous Installation Requirements:

1. Special connections are required at locations where steel and copper piping are joined. These connections shall be as described in Item UNIONS. They shall be placed in accessible locations and each installation on closed loop systems shall incorporate a system isolation valve at the connection. The necessary precautions shall be taken when employing welding operations, brazing operations, etc. to protect fitting components from heat damage.

2. All hydronic system lines shall be sufficiently pitched so they will completely evacuate by gravity to valved drains. On multi-floor installations, drains shall be provided for each level. In addition, risers serving three or more floors shall be provided with a valved drain at the base. Drains shall be 3/4" in size and shall incorporate a ball valve and a hose-end connection...Cooling coil condensate drain piping shall pitch not less than one inch in 40 feet.

F. Testing and Final Connections:

1. Piping system(s) shall be tested as described in Item TESTING before connecting to equipment. Said equipment and piping shall then be connected as described under Item MATERIALS AND WORKMANSHIP.

2. Provide all small piping required in connection with the installation of instruments, gauges, reducing valves, traps, etc. involved under this section of the work. Sensing lines on steel pipe systems shall be of intermediate alloy seamless steel tubing ASTM A 335, Grade PF and on copper pipe systems shall be of Type "K" hard copper. Provide necessary drains, shut-off valves and cocks, syphons, pulsation dampers, etc.

40. HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS (UNDERGROUND CHILLED WATER PIPING)

Part 1: General

A. Section Description:

1. This specification includes but is not limited to high-density polyethylene (PE 3408) (ductile iron pipe size O.D) pressure pipe intended for the transportation of chilled water buried underground.

B. References:

1. AWWA C901 Polyethylene (PE) pressure Pipe & Tubing, 1/2 inch through 3 inch for water

2. AWWA C906 Polyethylene (PE) pressure Pipe & Fittings, 4 inch through 63 inch for water

3. ASTM D3035 Standard Spec for PE Pipe (DR-PR) Based on Controlled Outside Diameter

4. ASTM D3261 Butt Heat Fusion PE Fittings for PE Pipe & Tubing

5. ASTM D3350 Standard Specification for PE Pipe & Fittings Materials

6. ASTM D1238 Melt Flow Index

7. ASTM D1505 Density of Plastics

8. ASTM D2837 Hydrostatic Design Basis

9. NSF Std.#14 Plastic Piping Components & Related Materials

10. TR-33/2005 Generic Butt Fusion Joining Procedure for Field Joining of PE Pipe

C. General:

1. High Density Polyethylene (HDPE) pipes/fittings shall be used for underground chilled water pressure pipe.

D. Documentation:

1. Documentation from the resin's manufacturer showing results of the following tests for resin identification:

   Melt Flow Index ASTM D1238

   Density ASTM D1505

E. Manufacturer:

1. All HDPE pipe and fittings shall be from a single manufacturer. The pipe shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these Specifications. Qualified manufacturers shall be: PLEXCO Division of Chevron Chemical Company, DRISCOPIPE as manufactured by Phillips Products Co., Inc., or equal as approved by the Engineer.

F. Finished Product Evaluation:

Pipe in process shall be checked visually, inside and out for cosmetic defects (grooves, pits, hollows, etc.)

Pipe outside diameter shall be measured using a suitable periphery tape to ensure conformance with ASTM F714 or ASTM D3035, whichever is applicable.

Pipe wall thickness shall be measured at 12 equally spaced locations around the circumference at both ends of the pipe to ensure conformance with ASTM F714 or ASTM D3035, whichever is applicable.

Pipe length shall be measured.

Pipe marking shall be examined and checked for accuracy.

Pipe ends shall be checked to ensure they are cut square and clean.

G. Compatibility:

1. Contractor is responsible for compatibility between pipe materials, fittings and appurtenances.

H. Warranty:

1. The pipe MANUFACTURER shall provide a warranty against manufacturing defects of material and workmanship for a period of ten years after the final acceptance of the project by the OWNER. The MANUFACTURER shall replace at no expense to the OWNER any defective pipe/fitting material including labor within the warranty period.

Part 2: Products

A. Materials for Pipe Sizes 4-Inch Diameter and Larger:

1. Materials used for the manufacture of polyethylene pipe and fittings shall be made from a PE 3408 high density polyethylene resin compound meeting cell classification 345434C per ASTM D3350; and meeting Type lll, Class C, Category 5, Grade P34 per ASTM D1238.

2. High Density Polyethylene (HDPE) pipe shall comply with AWWA Specifications C906.

3. If rework compounds are required, only those generated in the Manufacturer's own plant from resin compounds of the same class and type from the same raw material supplier shall be used.

4. Dimensions and workmanship shall be as specified by ASTM F714. HDPE fittings and transitions shall meet ASTM D3261. HDPE pipe shall have a minimum density of 0.955 grams per cubic centimeter. All HDPE pipe and fittings shall have a Hydrostatic Design Basis (HDB) of 1,600 psi.

5. HDPE pipe and accessories 4-inch diameter and larger, shall be 160 psi at 73.4°F meeting the requirements of Standard Dimension Ration (SDR) 17 as MINIMUM STRENGTH.

6. The pipe Manufacturer must certify compliance with the above requirements.

B. Fittings:

1. All molded fittings and fabricated fittings shall be fully pressure rated to match the pipe SDR pressure rating to which they are made. All fittings shall be molded or fabricated by the manufacturer. No Contractor fabricated fittings shall be used unless approved by the Engineer.

2. The manufacturer of the HDPE pipe shall supply all HDPE fittings and accessories as well as any adapters and/or specials required to perform the work as shown on the Drawings and specified herein.

3. All fittings shall be installed using butt-fused fittings, thermo-fused fittings/couplings, or flanged adapters and must be approved by the Engineer. NO size on size wet taps shall be permitted.

4. All transition from HDPE pipe to ductile iron or PVC shall be made per the approval of the Engineer and per the HDPE pipe manufacturer's recommendations and specifications. A molded flange connector adapter within a carbon steel back-up ring assembly shall be used for pipe type transitions.

   Transition from HDPE to ductile iron fittings and valves shall be approved by Engineer before installation.

   No solid sleeves shall be allowed between such material transitions.

   Fittings and transitions shall be as manufactured by Phillips DRISCOPIPE, Inc., 1000 Series Pressure Pipe, Chevron Chemical Company Plexco/Spiralite pipe, or equal.

   The pipe supplier must certify compliance with the above requirements.

C. Pipe Identification:

1. The following shall be continuously indent printed on the pipe or spaced at intervals not exceeding 5-feet:

   Name and/or trademark of the pipe manufacturer.

   Nominal pipe size.

   Dimension ratio.

   The letters PE followed by the polyethylene grade in accordance with ASTM.

   D1248 followed by the hydrostatic design basis in 160's of psi, e.g., PE 3408.

   Manufacturing standard reference, e.g., ASTM F714 or D-3035, as required.

   A production code from which the date and place of manufacture can be determined.

2. Tracing Wire:

   Directional Drilled HDPE shall have wire conforming to Copperhead Industries Reinforced #1245 Extra-High Strength Tracer Wire and affixed to the drilling head/reamer per Detail M-17.

3. Marking Tape: Marking tape shall be installed per Engineer's approval.

Part 3: Execution

A. Joining Method:

1. The pipe shall be joined with butt, heat fusion joints as outlined in ASTM D2657 and conform to the Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene Pipe, Technical Report TR-33/2005, published by the Plastic Pipe Institute (PPI). All joints shall be made in strict compliance with the manufacturer's recommendations. A factory qualified joining technician as designated by pipe manufacturer or experienced, trained technician shall perform all heat fusion joints in the presence of the ASPA inspector.

2. On days butt fusions are to be made, the first fusion shall be a trial fusion in the presence of an ASPA Inspector. The following shall apply:

   Heating plate surfaces shall be inspected for cuts and scrapes and shall be free of dirt and residue. Heater surfaces should be between 400°F (minimum) to 450°F (maximum). Measure the temperature @ 12:00, 3:00, 6:00 and 9:00 o'clock positions using a pyrometer of infrared thermometer at locations where the heating plate will contact the pipe/fitting ends. The maximum temperature difference between any two points on a single heating surface must not exceed 24°F. If this temperature is exceeded, the heating plate shall be cleaned per the manufacturer's recommendations.

   The fusion or test section shall be cut out after cooling completely for inspection.

   The test section shall be 12" or 30 times (minimum) the wall thickness in length and 1" or 1.5 times the wall thickness in width (minimum).

   The joint shall be visually inspected as to continuity of "beads" from the melted material, and for assurance of "cold joint" prevention (i.e. – joint shall have visible molded material between walls of pipe). Joint spacing between the walls of the two ends shall be a minimum of 1/16" to a maximum 3/16".

3. The polyethylene flange adapters at pipe material transitions shall be backed up by stainless steel flanges conforming to ANSI B16.1 and shaped as necessary to suit the outside dimensions of the pipe. The flange adapter assemblies shall be connected with corrosion resisting bolts and nuts of Type 316 Stainless Steel as specified in ASTM A726 and ASTM A307. All bolts shall be tightened to the manufacturer's specified torques. Bolts shall be tightened alternatively and evenly. After installation, apply a bitumastic coating to bolts and nuts.

Part 4: Installation

A. High Density Polyethylene (HDPE) Pipe shall be installed in accordance with the instruction of the manufacturer, as shown on the Drawings and as specified herein. A factory qualified joining technician as designated by the pipe manufacturer shall perform all heat fusion joints.

B. HDPE shall be installed by Directional Bore Method.

C. Care shall be taken in loading, transporting and unloading to prevent damage to the pipe. Pipe or fitting shall not be dropped. All pipe or fitting shall be examined before installation, and no piece shall be installed which is found to be defective. Any damage to the pipe shall be repaired as directed by the Engineer. If any defective pipe is discovered after it has been installed, it shall be removed and replaced with a sound pipe in a satisfactory manner by the contractor, at his own expense.

D. Under no circumstances shall the pipe or accessories be dropped into the trench or forced through a directional bore upon "pull-back".

E. Care shall be taken during transportation of the pipe such that it will not be cut, kinked or otherwise damaged.

F. Ropes, fabric or rubber protected slings and straps shall be used when handling pipes. Chains, cables or hooks inserted into the pipe ends shall not be used. Two slings spread apart shall be used for lifting each length of pipe.

G. Pipe shall be laid to lines and grade shown on the Drawings.

H. Sections of pipe with cuts, scratches or gouges exceeding 5 percent of the pipe wall thickness shall be removed completely and the ends of the pipeline rejoined.

I. The pipe shall be joined by the method of thermal butt fusion. All joints shall be made in strict compliance with the manufacturer's recommendations.

J. Mechanical connections of the polyethylene pipe to auxiliary equipment such as valves, pumps and tanks shall be through flanged connections which shall consists of the following:

1. A polyethylene flange shall be thermally butt-fused to the stub end of the pipe.

2. A 316 stainless steel back up ring shall mate with a 316 stainless steel flange.

3. A 316 stainless steel bolts and nuts shall be used.

K. Flange connections shall be provided with a full-face neoprene gasket.

L. Directional Bore Installation:

1. Refer to ASPA Specification 02320 - Horizontal Directional Drilling in its entirety

Part 5: Cleaning

A. At the conclusion of the work, thoroughly clean all of the new pipelines to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period by forcing a cleaning swab through all mains 4" or greater. Flushing velocities shall be a minimum of 2.5 feet per second. All flushing shall be coordinated with ASPA Inspector and Water Resources Department. Debris cleaned from the lines shall be removed from the job site.

Part 6: Testing

A. Pressure testing shall be conducted per Manufacturer's recommendations and as approved by the ASPA Engineer.

B. All HDPE mains shall be field-tested. Contractor shall supply all labor, equipment, material, gages, pumps, meters and incidentals required for testing. Each main shall be pressure tested upon completion of the pipe laying and backfilling operations, including placement of any required temporary roadway surfacing.

C. All mains shall be tested at 150 percent of the operating design pressure of the pipe unless otherwise approved by the Engineer.

D. Pressure testing procedure shall be per Manufacturer's recommendations or as follows:

1. Fill line slowly with water. Maintain flow velocity less than 2 feet per second.

2. Expel air completely from the line during filling and again before applying test pressure. Air shall be expelled by means of taps at points of highest elevation.

3. Apply initial test pressure and allow to stand without makeup pressure for two to three hours, to allow for diametric expansion or pipe stretching to stabilize.

4. After this equilibrium period, apply the specified test pressure and turn the pump off. The final test pressure shall be held for one to three hours.

5. Upon completion of the test, the pressure shall be bled off from a location other than the point where the pressure is monitored. The pressure drop shall be witnessed by the resident project representative and ASPA representative at the point where the pressure is being monitored and shall show on the recorded pressure read-out submitted to the Engineer of Record.

E. If any test of pipe laid disclosed leakage significant pressure drop greater than the manufacturer's recommended loss, the Contractor shall, at his/her own expense, locate and repair the cause of leakage and retest the line. The amount of leakage which will be permitted, shall be in accordance with AWWA C600 Standards.

F. All visible leaks are to be repaired regardless of the amount of leakage.

41. UNDERGROUND DUCTWORK

A. Acceptable Manufacturers:

1. The BlueDuct® by AQC Industries, Roseville, MN 55113, (877-783-1520). www.aqcind.com and e-mail: team@aqcind.com.

2. Manufacturer's Representative, Controlled Air, Cincinnati, OH, (513-981-2733), E: joe@controlled-air.com.

B. Underground Duct System:

1. Complete duct system (including: round duct, run-outs, diffuser boots, etc.) must be from one manufacturer and be of the same material, construction and connection method throughout.

2. Ductwork shall be closed cell plastic material that is recyclable, does not emit volatile organic compounds, and conforms to ASTM-D2412. Ductwork shall be resistant to mildew, mold (UL 181B), and radon gas (BSS 7239-88). Ductwork shall have integral R-10 equivalent thermal insulation value, without the use of external insulation, per NSF's P374 Protocol and verified by an NSF Thermal Testing Report.

3. All joints shall be sealed via gasket or bolts and sealant.

4. Non-flanged joints shall use a clamp and gasket system. Clamps shall be polyethylene with stainless steel plates and stainless-steel screws. Gaskets shall comprise of ¼" thick butyl rubber sealant tape that is water and UV resistant and shall not stain. Gaskets shall comply with ASTM-E84 for flame and smoke spread.

5. Flanged joints and duct branches shall use a co-polymer adhesive caulking sealant that is water and UV resistant. Flanges shall be connected with stainless steel bolts.

6. Duct system shall be installed by an AQC Industries' trained installer.

7. Fiberglass style (FRP) ductwork or PVC coated galvanized steel ductwork shall NOT be acceptable.

8. Duct system performance shall exceed SMACNA's Leakage Class 1 requirements at the system design static pressure. Assembled ductwork shall be able to maintain pressure with no leakage.

9. Duct system shall carry a 10 year Limited Warranty.

10. The complete underground duct system shall be tested for leakage after final assembly.

11. Follow SMACNA air duct leakage test standard.

12. Allow 24 hours for The BlueDuct sealant to cure after final assembly before testing the duct system. Additional curing time may be required in high ambient conditions.

42. PIPE FITTINGS

A. Fittings for all piping systems shall be of the appropriate type and shall conform to the following unless described elsewhere in the specifications.

B. Steel Piping:

1. Unless otherwise specified, fittings on black steel pipe 1 1/2" in size and under may be gray iron thread-end, minimum Class 125. They shall be manufactured according to ANSI B16.4 with material used conforming to ASTM A 126 (A). In lieu of this, thread-end fittings may be malleable iron or forged steel. Malleable iron fittings shall be manufactured according to ANSI B16.3 with the material used conforming to ASTM A 197. Forged steel fittings shall be manufactured according to ANSI B16.11 with material used conforming to ASTM A 105. All of the above described fittings shall be threaded in accordance with ANSI B2.1 for taper pipe threads. Note that malleable iron or steel thread-end fittings shall be used where specified below and/or as required by applicable codes.

2. Except as noted below, fittings on black steel pipe 2" in size and over shall be carbon steel buttweld type, made from ASTM A 106 Grade B seamless pipe. Fittings shall correspond to ANSI B16.9 with standard bevel ends and shall be in accordance with the Verification and Identification program accepted by ASME. Where lines are coated and wrapped, fittings shall be covered in a similar manner. Note that where small steel lines are required to be welded, appropriate socket weld fittings may be used.

3. Where flanges, flanged fittings, etc., other than steel are shown or otherwise indicated, they shall be cast iron, minimum Class 125, conforming to ASME B16.1 or ductile iron, minimum Class 150, conforming to ASME B16.42. Steel flanges and flanged fittings shall be minimum Class 150 and shall be in accordance with ASME B16.5. Fittings, flanges, etc., shall be manufactured in accordance with applicable ASME requirements. Threaded flanges shall have taper pipe threads in accordance with ANSI B2.1.

4. In lieu of welding tees, branch connections may be made using equivalent schedule welding outlet fittings provided the nominal diameter of the branch line is less than 1/2 the diameter of the run line and does not exceed 6" in size. Branch outlet fittings shall be integrally reinforced connection adapters forged of ASTM A 105 steel with funneled (tapered) inlet design shaped to fit the run pipe and butt weld, socket or threaded outlet as determined by size and/or service. Fittings shall be manufactured in accordance with the requirements of ANSI B16.9 for Steel Butt Welding Fittings and applicable requirements of the ANSI B31.1 Power Piping Code.

5. Except where otherwise indicated, connections at valves, unions, etc. shall be screwed or flanged as determined by size and/or service. Where flanged connections occur, the use of screwed companion flanges will be allowed in lieu of weld-neck flanges on lines through 3" except for high pressure service, where specified to the contrary or where threaded joints are otherwise prohibited.

6. Bolting shall utilize only carbon steel machine bolts and bolt studs, threaded in accordance with ANSI B1.1, coarse thread series. Bolt stud length to allow no more than two thread extensions.

C. Pressure Ratings:

1. Thread-end fittings, flanges, flanged fittings, etc. for various steel piping systems shall be rated in accordance with the following:

Water (Maximum 100 psig - not to exceed 250°F)

Threaded Fittings...gray iron - minimum Class 125; malleable iron - minimum Class 150; Flanges, flanged fittings, etc....cast iron - minimum Class 125.

D. Copper Piping/Tubing:

1. Solder-joint wrot copper, cast copper alloy and cast bronze pressure fittings shall be used on copper tube piping. Wrot copper fittings shall be in accordance with ANSI B16.22 and shall be made from commercially pure copper and red bronze mill products per ASTM B75. Cast copper fittings shall be in accordance with ANSI B16.18 and shall be made from Copper Alloy C84400 per ASTM B584.

2. Cast bronze threaded fittings shall be made to the requirements of ANSI B16.18 and material composition shall be in accordance with ASTM Specification B584. Flanges for copper lines shall be cast copper alloy pipe flanges, minimum Class 150, and shall comply with ASME B16.24. Cast copper alloy flared tube fittings shall be in accordance with ANSI B16.26.

3. Engineered press fittings with O-ring seal may be utilized on copper piping installations. They shall meet the material and sizing requirements of ASME B16.18 or ASME B16.22 and the O-ring seal shall be of EPDM. The mechanical method of joining shall be recognized by BOCA, SBCCI and IAMPO as well as applicable state and local codes. The fittings shall be designed for use with K, L, and M hard copper tubing and shall be rated for service to 200 psi or above at 250°F.

4. In general, connections to equipment, equipment isolation valves, control valves, etc., shall be made utilizing flanges or cast copper alloy (bronze) unions, as determined by size and/or equipment construction.

E. Grooved End Piping:

1. Fittings used with grooved-end pipe shall be standard full flow type, made with grooves or shoulders designed to accept gasket and coupling. They shall be of malleable iron, ductile iron, wrought steel (seamless or fabricated) or wrot copper. Allowable working pressure for these fittings shall at least equal coupling working pressure...Unless otherwise indicated, fittings used with galvanized steel piping shall be hot-dipped galvanized and fittings with all other steel pipe shall be dip coated with enamel.

2. Where a manufactured grooved-end fitting pattern is not available, such fittings may be machined or roll-grooved from Schedule 40 seamless steel pipe, standard wall seamless welding fittings or solder-joint wrot copper fittings as described elsewhere in this item of the specifications.

3. Gaskets and couplings shall be as described in Item PIPE AND PIPING.

F. Dissimilar Metal Piping:

1. Where piping systems of dissimilar metal are joined, dielectric fitting assemblies shall be provided. Refer to Item UNIONS in this section of the specifications. Note that shut-off (ball) valves shall be installed on the system side of and adjacent to the dielectrics on closed loop systems.

43. VALVES

A. Valves of each type furnished on this project shall be of one make and each valve shall have manufacturer's name and trademark together with design working pressure (Class) clearly indicated on the body. Underwriters approved valves shall bear the U.L. label. Note that valves shall be full line size unless specifically indicated otherwise.

B. Gate valves, globe valves, swing check valves and needle valves shall be in accordance with the following paragraphs where applicable.

C. General:

1. Steel Piping Systems...Unless otherwise indicated, valves 2" and under shall be bronze with thread ends and valves 2 1/2" and over shall be iron body, bronze mounted, with flanged ends or all steel with flanged or welding ends.

2. Copper Piping Systems...Unless otherwise indicated, valves 3" and under shall be bronze and generally with solder ends. Valves 4" and over shall be iron body, bronze mounted, with flanged ends.

D. Materials:

1. Bronze castings shall meet ASTM B 61 or B 62 specifications. Iron castings shall meet ASTM A 126, Class B specifications. Steel castings shall conform to ASTM specification A 216, Grade WCB.

2. Packing for shut-off valves shall be of a non-asbestos type, suitable for its designated service.

3. Shut-off valves shall have stems designed for ample strength and machined to function easily. Bronze shut-off valves shall have malleable iron or aluminum alloy handwheels and stems with corrosive resistant properties per ASTM B-62.

E. End Connections:

1. Thread-end connections for bronze and/or iron valves shall conform to the requirements of ANSI B2.1 and solder-end connections for bronze valves shall conform to the requirements of ANSI B16.18.

2. End flanges of cast iron valves shall be faced and drilled to conform to requirements of ANSI B16.1.

3. End connections on steel valves shall conform to the applicable requirements of ANSI B16.5 and B16.10 for flanges, ANSI B1.20.1 for thread ends and ANSI B16.25 for butt weld ends.

F. Standards Compliance:

1. The following additional standards shall apply to the valve types referenced above.

   Cast Iron Gate Valves.....MSS SP-70
   Cast Iron Globe Valves.....MSS SP-65
   Bronze Gate and Globe Valves....MSS SP-80

G. Design:

1. Bronze gate valves shall have a solid wedge disc, union bonnet and rising stem.

2. Bronze globe and angle valves shall have union bonnet and regrinding seat and disc.

3. Bronze swing check valves shall have screwed bonnet or cap, bronze disc and regrinding seat. Valve body shall display an arrow indicating direction of flow.

4. Cast iron swing check valves shall have bronze trim, bolted bonnet, flanged ends, and replaceable seat rings and hinge pin.

5. Steel gate valves shall have straight-thru ports and shall be OS&Y design with rising stem, bolted bonnet and seal-welded seat rings. Valves shall have standard CR-13 and stainless disc and trim unless otherwise mentioned.

6. Steel globe valves shall be OS&Y design with bolted bonnet and standard trim. Steel swing check valves shall have bolted cap and standard trim and shall be suitable for use in vertical as well as horizontal lines.

7. Needle valves shall be all bronze with rising stem, union bonnet and conical seat opening.

8. Other valves shall be as described below under their specific heading.

H. Duty:

1. The pressure - temperature ratings (non-shock) for all valves shall comply with the pressure class specified for the system(s) listed. In addition, ratings for steel valves shall conform to the Standard Class Valve ratings shown on ANSI Standard B16.34.

2. Pressure - temperature ratings shall be adjusted as required when valves are solder-end type. The adjustment made shall be based on the solder used as specified in Item MATERIALS AND WORKMANSHIP. Maximum system temperature for solder-end valves shall not exceed 250°F.

3. The minimum rating (Class) for bronze, iron and steel valves for other than ASME code jurisdictional limit piping shall be as indicated for the following listed hydronics piping system(s):

SYSTEM PRESSURE	BRONZE	IRON	STEEL
Under 100 PSIG	150	125	-

I. Manufacturer:

1. The above described valves shall be as manufactured by Crane, Hammond, Jenkins, Kitz, Milwaukee, Nibco, Powell or Vogt.

2. Other, miscellaneous types of valves shall be in accordance with and as described in the following paragraphs.

J. Ball Valves:

1. Valves shall be in accordance with following and shall incorporate a noncorroding mirror finished ball, multiple rings of Teflon impregnated packing and high tensile blow-out proof stem with insulation accommodating extension handle and memory stop. Body shell/wall thickness to be in accordance with requirements of ANSI B16.34. Lever handle shall be of nickel plated or stainless steel with plastic grip. Quarter turn of handle shall rotate ball from full open to full closed position.

2. On lines 2" and under, valves shall be of bronze, forged brass or carbon steel with standard port and Type 316 stainless steel ball and stem. They shall be rated minimum 600 psig WOG, cold non-shock and 150 psig saturated steam. Body shall be single piece with threaded ends or two piece with solder ends and shall incorporate an adjustable packing gland and reinforced Teflon seat. Valves shall be in conformance with Federal Specification WW-V-35C. For higher pressure steam applications (50 psig and above), valves 1-1/2" and 2" in size shall be as described below.

3. On lines 2 1/2" and over, valves shall be standard port with adjustable packing gland and minimum ANSI Class 150, carbon steel split body with ANSI B16.5 flanged ends or 3-piece bronze solder end body. Valves shall be rated minimum 600 psig WOG and 150 psig saturated steam. Ball and stem shall be Type 316 stainless steel and bearing sleeve and seat shall be of reinforced Teflon. All manually operated valves 4" and over shall be provided with a hand-wheel type gear operator and locking device. In addition, where these valves are installed 8 feet or more above floor level, they shall be fitted with chain operators and non-rusting chains.

4. The following additional standards shall apply to ball valves for sizes 2 1/2" and over:

   Bronze.....WW-V-35B
   Steel.....MSS SP-25, MSS SP-61 and MSS SP-72

5. Valves shall be as manufactured by Apollo, Flow-Tek, Jamesbury, Kitz, Milwaukee, Nibco, Watts, W K M or Worcester. Install in accordance with manufacturer's recommendations including disassembly of sweat end valves. In addition, for sizes 1-1/2" and above, they shall have flanged ends.

K. Balancing Valves:

1. Line size 2" and under – Valves shall be all bronze combination indicating, balancing and shut-off type with thread ends (steel pipe) or sweat ends (copper pipe) and shall be rated for minimum 125 psig service, or higher as required, at 250 deg. F. Valves shall provide bubble tight shut-off and shall be repackable under pressure. They shall be equipped with readout meter ports and shall provide for precise flow measurement and precision flow balancing. Valve body shall incorporate a drain connection. Valves shall be as manufactured by Amtrol, Armstrong, Bell & Gossett, Flow Design, Homestead, Illinois, MEPCO, Sarco, Taco or Tour & Andersson. The manufacturer shall supply published performance data for each valve size.

2. Line size 2-1/2" and over – Valves may be similar to the above or shall be globe style or Y-pattern style design. They shall have bronze, cast iron or carbon steel body, flanged ends and stainless steel stem with corrosion resistant plug, ball or seat disc and seal. Valves shall provide three functions: (1) Flow Measurement, (2) Flow balancing and (3) Positive bubble-tight shut off. Valve body shall incorporate non-leaking metering ports. The valve shall have a venier-type setting from the number of turns of the hand wheel or stem extension to establish specified flow and shall incorporate a locking feature to achieve a precision, tamper-proof balancing set point. Valves shall be designed for a working pressure of 150 psig or greater, as required to meet design/field conditions, at 250° F. The flanged end balancing valves shall be by Armstrong, Amtrol, Bell & Gossett, MEPCO, Taco, Tour & Anderson or Victaulic. The manufacturer shall supply published flow capacity charts and performance data for each valve size furnished.

L. Silent Check Valves:

1. Unless otherwise indicated, valves shall be globe style center-guided type with bronze or stainless steel trim, renewable bronze or resilient seat and stainless steel spring. Disc to be all bronze and fully guided, top and bottom. Body shall have ANSI drillings and an open area equal to or greater than connected pipe. All parts to be field repairable or relacebale. Valves shall be as manufactured by Hammond, Metraflex, Miller, Mueller, Victaulic or Williams-Hager and shall be a minimum 125 lb. class or greater as required to meet design/field conditions.

2. Valves size 2" and under shall have bronze or cast iron body with thread, sweat or flanged ends and valves size 2-1/2" and over shall have carbon steel or cast iron body with flanged ends. Flanges shall conform to ANSI B16.1 for cast iron or B16.5 for steel.

3. In lieu of the above, wafer style check valves may be utilized where space is limited. A stainless steel spring shall close the discs when no-flow conditions exist. Valves shall be minimum ANSI 125 and shall conform to ANSI B16.34 as it applies to check valves. Wafer style check valves shall be as manufactured by Miller, Mueller, Proquip or Williams-Hager.

M. Butterfly Valves:

1. Unless otherwise indicated, butterfly valves shall be water service type with self-adjusting stem seals; machined and streamlined disc; full diameter stem and replaceable, resilient reinforced seat. Valves shall be guaranteed bubble tight at design pressure. Body shall be cast iron, ductile iron or carbon steel and shall be full lug style with tapped lugs for end of line service at full rated pressure. Design shall accommodate ANSI standard flat or raised face flanges. Disc shall be bronze, bronze alloy or stainless steel and stems shall be stainless steel with corrosion resistant bearing. Valves 6" and under shall have locking type handle operator with adjustable open position stop. Valves 8" and over shall have hand wheel operated worm gear actuators. Where necessitated by insulation thickness, provide extended neck and stem. Valves shall be as manufactured by Centerline, Grinnell, Hammond, Keystone, Jamesbury or Nibco and shall be rated at 150 psig working pressure or above, as required. The seat and seals shall consist of an elastomer recommended for water service at temperatures of 250°F continuous, at full rated pressure for hot water applications and shall have an elastomer recommended for service from 10° F to 180° F at full rated pressure for cold water applications.

2. Where butterfly valves are installed in grooved end piping systems, they shall have end connections designed to accommodate the couplings and gaskets specified for these systems. Grooved end valves, conforming to applicable portions of the above specification, shall be as manufactured by Victaulic or Grinnell.

44. GAS SHUT-OFF VALVES

A. Manually operated gas shut-off valves for boilers shall be AGA rated to at least 2 psig. Valves shall have a thread-end brass body, brass plug and a lever handle and check. They shall be suitable for indoor use with natural gas or propane at ambient temperatures of 32 to 125°F.

45. UNIONS

A. Unions shall be provided wherever necessary to facilitate connecting to apparatus and installing necessary fittings. In addition, unions shall be provided at the following locations:

1. Adjacent to and downstream of any valve not flanged.

2. At the final connection to any item of equipment not flanged.

B. Except as noted in the following, thread-end unions shall be used for all steel piping 1-1/2" and under. They shall be carbon steel with ball-to-cone joint and shall be rated Class 2000 or above. Unions shall conform to MSS SP-83 and ends shall be threaded to ANSI B2.1.

C. Flange unions shall be used for steel piping 2" and over and shall be cast iron, minimum Class 125 or higher as required, conforming to ANSI B 16.1 or ductile iron, Class 150 or higher as required, conforming to B16.42. They shall be complete with suitable gasket and bolts. Note that galvanized unions with cadmium plated bolts shall be used on galvanized steel piping.

D. Copper lines shall, in general, utilize sweat-end copper alloy unions. They shall be cast pressure fittings manufactured in accordance with ANSI B16.18. On copper lines 4" and above, however, flange unions shall be used, with minimum Class 150 cast copper alloy flanges complying with MSS SP-106 and ASME B16.24.

E. Where dissimilar metals are involved, minimum Class 150 bronze flange dielectric piping connections incorporating non-metallic bolt sleeves and isolating washers shall be utilized on lines 2-1/2" and over. For dissimilar piping 2" and under, connections shall incorporate thread-to-sweat, Class 150 brass union couplings. Note that temperature and pressure ratings, etc., of these connections shall be comparable to the ratings specified for other components of the piping system.

F. Where a dissimilar metal piping connection is installed on a closed loop system runout, provide a shut-off (ball) valve on the main side of and adjacent to the connection to permit isolation from the system for service.

46. GASKETS

A. Gaskets for bolted joints shall be suitable for pressure and temperature at design conditions and shall be impervious to fluid being conducted. Gaskets shall not be thicker than required for the condition of the installation. Flat faced, cast iron, brass and bronze flanged joints shall be made with full face gaskets. Ring gaskets shall be used for raised face flanged joints. Outside diameter of ring gasket shall be equal to inside diameter of bolt hole circle. Inside diameter of flange gaskets shall not be less than ID of pipe. Mechanical joint, O ring and nonstandard gasketing shall be as recommended by the manufacturer.

47. STRAINERS

A. Piping strainers, where called for in the specifications and/or shown on the drawings, shall be Y Type or Tee Type line strainers as manufactured by Armstrong, McAlear, Mueller, Sarco, Victaulic, Yarway or equal.

B. Construction, end connections, materials, etc., shall be as described in Item VALVES. Unless otherwise indicated, strainers shall have a 20 mesh stainless steel screen. Design working pressure shall be in accordance with system requirements. See Item PIPE FITTINGS.

C. At installation provide a nipple and valve assembly on all blow-off covers. Blow-off lines, valves shall be ball type. The blow-off assembly on closed hydronic system applications shall have a line extension to a floor drain. As an alternate, blow-off connections through 1 1/4" in size may be provided with a 3/4" valve with quick coupling hose-end connection in lieu of a line extension.

48. EXPANSION TANKS

A. Furnish and install, where shown on the drawings, a pre-pressurized diaphragm type expansion tank(s) as manufactured by Amtrol, Bell & Gossett, Taco or Thrush. Capacity, etc. shall be as indicated on the drawings. Tank assembly shall incorporate an integral floor stand for vertical installation or horizontal mounting saddle supports, as indicated on the drawings, as well as miscellaneous tappings, charging valve, and a pressurized air chamber isolated and sealed by an elastomer diaphragm.

B. The tank shall be of steel, designed and constructed per Section VIII of the ASME Boiler and Pressure Vessel Code for a working pressure of 125 psig or higher as required and shall bear the ASME stamp. It shall have a Polypropylene liner and shall be rated for an operating temperature of 240 deg F. The diaphragm shall be of heavy duty Butyl rubber or other suitable material and the system connection shall be of stainless steel.

C. All exposed metal surfaces shall have a standard, shop applied coat of rust-inhibiting primer.

49. RELIEF VALVES

A. Furnish and install, where shown on the drawings, a pressure relief valve for closed loop hydronic system(s). It shall have lifting lever, iron body and non-corrosive trim. Opening water pressure shall be as indicated on the drawings. Valve shall be manufactured by McDonnell and Miller, B & G, Conbraco or Kunkle and shall bear the ASME label. All valves for heating system application shall be BTU rated by the manufacturer.

50. WATER PRESSURE REDUCING VALVE

A. Furnish and install, where shown on the drawings, a line size water pressure reducing valve to regulate make-up water as required for each closed loop hydronic system by maintaining a minimum preset downstream line pressure.

B. The valve shall be a direct operated, spring loaded, diaphragm type regulator with bronze body and renewable composition disc. Thread-ends shall conform to ANSI B2.1; solder-ends shall conform to ANSI B16.1 and design working pressure shall be at least 150 psig at 100°F. Valve(s) shall be Boylston, Fisher, Leslie or Spence.

51. HYDRONIC SYSTEM SPECIALTIES

A. Where indicated for equipment piping, furnish and install hydronic system specialties as herein described. Installation shall be in accordance with manufacturer's recommendations.

B. Suction diffuser...to be the size and type indicated on the drawings and designed to provide optimum flow conditions at pump inlet. It shall consist of an angle pattern minimum ANSI Class 125 body with flanged ends, flow straightening vanes and a removable element serving as a combination diffuser - strainer - orifice cylinder with pump protection openings. An upstream tapping shall be provided for a pressure gauge connection. The orifice cylinder and strainer shall be designed for maximum free area. The unit shall be furnished with a bronze or stainless steel startup strainer and the body shall have an access flange for element removal. The orifice cylinder shall be stainless steel and designed to withstand a pressure differential equal to pump shut-off head.

C. The above described unit shall be as manufactured by Bell & Gossett, Taco, Victaulic or approved equal. Body construction shall be of cast iron or ductile iron and flanges shall be in accordance with ANSI B 16.l. Design working pressure shall be at least 175 psig at 250°F.

D. The installation shall include an adjustable foot support and a ball valve/blow-down line run to a floor drain or terminated with hose end connection as indicated on the drawings. Line shall be sized equal to the blow-down tapping size.

E. Triple duty valve...to be a combination vertical lift non-slam check, calibrated balance, and positive shut-off valve. It shall have a non-ferrous seat and shall be designed to permit repacking under full line pressure. The assembly shall incorporate a stainless steel stem, a spring-loaded, bronze disc and an adjustable flow calibration stop. The valve shall be as manufactured by Bell & Gossett, Taco, Victaulic or approved equal. Body construction shall be of cast iron or ductile iron and flanges shall be in accordance with ANSI B 16.l. Rated working pressure shall be at least 175 psig at 250°F.

F. Flexible metal hose connectors…to be lengths of braided flexible metallic hose designed to isolate piping from equipment vibration. They shall consist of a corrugated metal inner tubing (Type 321 stainless steel) and an outer shield consisting of a stainless steel wire braid. End connections 1-1/2" and below shall be threaded carbon steel and 2" and above shall be flanged. Flanges shall be forged steel, minimum Class 150 and connector rated working pressure shall be at least 150 psi at 250°F. Connectors shall be as manufactured by Metraflex, Minnesota Flexible or Proco Products, and shall be medium length classification where a length is not specified.

52. COIL ISOLATION / FLOW BALANCE ASSEMBLIES

A. Furnish and install the following described coil connection assemblies for terminal air unit coils as indicated on the drawings.

B. The supply side assembly shall incorporate a full port ball valve and a union fitting with pressure-temperature readout port. The return side arrangement shall consist of a dielectric union fitting with pressure-temperature readout port and a separate assembly consisting of a high signal-low loss venturi with differential pressure-temperature readout ports and a balance type ball valve with integral air vent tapping, memory stop lever handle and indicator pad.

C. All items shall be of forged brass and rated for at least 400 PSI WOG service at 250°F. Valves shall have a repackable blowout-proof stem and shall be furnished with a chrome plated forged brass ball, Viton O-rings and virgin PFTE seats and packing. The manufacturer shall attach a balance data plastic tag to each valve indicator pad stating the balance valve model number, the design flow rate and differential pressure, and the manufacturer's designated venturi number. A space shall be provided on the tag to record the final valve setting when system balance is complete.

D. The above described integrated piping assemblies shall be as furnished by Hydronic Components, Inc., or engineer approved equal.

53. AIR VENTS

A. Air vents shall be installed on each hydronics system coil. Unless furnished by the unit manufacturer, vents shall consist of a 3/4" dia. X 4" long nipple, 3/4" to l/4" reducer, a 1/4" ball valve with necessary nipples, etc., a 90□ ell and flexible copper bleed tubing.

B. Main air vents shall be float type air eliminators installed at the vent connection of air separators, at the top of all main risers and at other points as necessary to keep the system free from air at all times. These units shall have a cast iron body with bolted cover and 3/4" N.P.T. bottom inlet connection, hardened stainless steel valve head and seat, and a stainless steel float and lever assembly. Design working pressure shall be at least 150 psig at 250□F. Vents shall be B & G Model 107A, Amtrol Series 720, Armstrong No. 21-AR, Hoffman No. 792 or Sarco Type 13W and shall be installed as required and/or as detailed on the drawings.

C. Furnish and install a ball valve on the system side of each vent. Run a full, outlet sized vent line from the unit to waste.

54. AIR SEPARATOR

A. Furnish and install, where shown on the plans, an external air separation unit consisting of a steel tank with tangential inlet and outlet connections, an internal perforated stainless teel air collector tube and a removable stainless steel strainer appropriately sized. Bottom of tank shall be provided with a blow-down connection.

B. The unit shall have the capacity indicated on the drawings and shall be equipped with flanged inlet and outlet connections as required. The air collector tube shall terminate with an appropriately sizxed air outlet connection at the top of the tank. Design and construction shall be in accordance with ASME Code requirements for at least a 125 psig working pressure at 375°F and a vessel shall bear the ASME "U" symbol. Flanges shall be in accordance with applicable ANSI requirements.

C. The above described separator unit shall be as manufactured by Amtrol, Bell and Gossett, Taco or Thrush. The manufacturer shall have published figures with regard to pressure drop and air removal efficiency for equipment furnished.

55. AIR PURGER

A. Furnish and install, where shown on the drawings, an in-line cast iron air scoop type purge unit as manufactured by Amtrol, B & G, Taco or Thrush. Unit shall be line size, internally baffled and shall have flanged or thread-end connections as determined by size. It shall be designed to continuously separate air from circulating water and shall be constructed for an operating pressure of 125 psig at 300º F or greater to meet system pressure requirements.

56. THERMOMETERS, GAUGES, ETC.

A. Thermometers shall be as manufactured by Ashcroft, Marshalltown, Trerice or Weksler. Furnish with elongated stem and install in brass or carbon steel well with lagging extension.

1. Thermometers shall be bimetal, every angle type with all stainless steel construction and adjustable, anti-parallax, 5" diameter dial.

2. Dial range shall be such that normal operating temperatures will read near midpoint of dial. Listed accuracy shall be within 1% of scale range.

3. All thermometers shall be installed so that dials can be read from a point 5'-6" above the floor.

4. Note: At the completion of the job all thermometers shall be calibrated against a master thermometer that has had its accuracy verified.

B. Pressure gauges shall be as manufactured by Ashcroft, Marshalltown, Trerice or Weksler.

1. Gauges shall have Bourdon tube pressure element, rotary geared movement, micrometer adjustable pointer and plastic coated metal dial. Tube and movement shall be of stainless steel and case shall be of cast aluminum or polished stainless with 4-1/2" diameter dial. Accuracy shall be within l% of scale range.

2. All gauges shall be selected for a midpoint scale reading at normal operating pressure. Hydronic system gauges shall be installed with a bar stock needle valve. Steam gauges shall be installed with brass coil syphon and lever handle cock (250 psi steam design w.p.).

3. Gauge plug fittings shall be provided where shown for insertion of test thermometer or pressure gauge stems. They shall be furnished with the appropriate body extension as determined by piping insulation requirements.

4. Units shall be of all brass construction with dual seal cores of Nordel and shall be rated for operation to 275°F at 500 psig. Cores shall be sized to accept a 1/8" O.D. probe.

5. Fittings shall be furnished with color coded and marked caps with gasket seal.

57. CIRCULATING PUMPS

A. Furnish and install, where shown on the plans, a base mounted, single stage, end suction pump with capacity, characteristics, etc., as called for.

B. Pump shall be vertically split, centrifugal type with ASTM A48 Class 30 cast iron volute, flanged openings and back pull-out capability. The assembly shall be equipped with a cast bronze enclosed type impeller, a high tensile alloy steel shaft, hardened stainless steel shaft sleeve and internally flushed, heavy-duty mechanical seal (rated for continuous service from to 250°F on hot water applications). High point in impeller casing shall have a bronze pet cock air vent and low point shall have a drain plug. Suction and discharge connections shall have pressure gauge tappings.

C. Service specifications shall be 50 psig suction pressure and at least a 150 psig working pressure. Pump shall be subjected to 200 psig hydrostatic test pressure at factory. In addition, pump shall meet or exceed AVS Standards for bearing life and shaft deflection at seal face. Thrust bearing location shall permit shaft expansion in both directions.

D. The volute shall have integrally-cast pedestal support feet securely bolted to the base. Volute flanges shall be faced and drilled to minimum ANSI 125 lb. Standards. The pump assembly, including heavy duty coupling and NEMA rated motor, shall be mounted on a heavy structural steel base. The arrangement shall be such that removal of the bearing frame, mechanical seal and rotating element can be achieved without disturbing the piping or electrical connections.

E. The structural steel base shall be a rigid, fully welded unit with closed ends, open top grouting areas and a tapped drainage opening. Minimum stiffness shall conform to applicable requirements of ANSI/H1 1.3.4. The shaft coupling shall be a flexible spacer type which shall be enclosed by an ANSI/OSHA - compliant coupler guard secured to the base. The pump bearing housing unit shall be provided with heavy-duty, regreaseable ball bearings which can be replaced without disturbing piping connections.

F. The impeller shall be hydraulically balanced by back vanes or back wear rings and balancing holes. It shall then be dynamically balanced to ANSI Grade G6.3 and keyed to the shaft. Note that the impeller diameter for the pump selection shall not exceed 90% of volute cut-water diameter.

G. Motor shall be classified as Premium Efficiency and shall be precision aligned with the pump. Motor speed (RPM) shall be as indicated on the drawings. It shall be tri-voltage type (200/230/460-volt) and sized to prevent overloading with pump operating at any point on its characteristic curve. See Item MOTORS AND STARTERS.

H. Pump shall be by Bell & Gossett or Taco. It shall be factory tested to Hydraulic Institute Standards, thoroughly cleaned and then painted with high grade machinery enamel prior to shipment.

I. A spare mechanical seal for each size pump shall be furnished by the pump supplier.

J. At time of installation and prior to grouting-in of base, alignment of pump and motor shall be carefully checked. Realign, if necessary, according to manufacturer's recommendations so impeller freely rotates without binding.

58. MISCELLANEOUS BOILER ROOM PIPING

A. Piping in the boiler room shall be provided as shown and as necessary to insure proper functioning of the equipment. If additional miscellaneous valves, vents, piping, apparatus, etc., are required for greater flexibility and/or better operation of the system or to meet specific code requirements, they shall be provided as part of this contract.

B. In lines 8 feet or more above floor level, gate and globe valves 4" and over, as well as ball or disc type valves 3" and over, shall be chain operated.

C. Where the gas valve train and piping at the boiler is to be field installed, it shall be made up as indicated by the burner manufacturer. Install with line strainers on both the main gas line and pilot line downstream from the shut-off valves or cocks.

D. Separate vent lines for main gas and pilot regulators, check gauge test vent, etc., shall be run to the outside and terminated with a weatherproof head and screen, all in accordance with code requirements. Note that for multiple boilers, vent lines may not be combined. Vent lines shall be aluminum or stainless steel tubing with the proper fittings including weatherproof head and screen. They shall be sized as required to be in accordance with burner manufacturer's recommendations and the mandates stipulated by the inspecting authority. Note that lines 3/4" and above may be Schedule 40 black steel but must be primed and painted with an alkyd enamel.

59. CHEMICAL POT FEEDER

A. Furnish and install, as indicated on the drawings, a pot type by-pass chemical feeder. It shall be of welded steel construction with a rated working pressure of at least 125 psi at 2501F and a container capacity of 2 gallons or more. The feeder shall be by A & F Machine, BFS or Mitco and shall be furnished with drain and vent petcocks, fill valve and funnel. It shall be installed and piped complete with inlet and outlet isolation valves, drain valve, and hose end adapter.

60. AIR DUCT / SYSTEM CLEANING

A. The air duct/system cleaning portion of the project is governed by this item of the specifications. The following covers the scope, specific cleaning and performance requirements, detailed procedures, verification of cleanliness, applicable reference standards, etc., as well as the qualification requirements of the Cleaning Contractor.

B. Qualification of the Duct System Cleaning Contractor (the Contractor):

1. Membership: The Duct System Cleaning Contractor shall be either a certified member of the National Air Duct Cleaners Association (NADCA) or shall maintain membership in a nationally recognized non-profit industry organization dedicated to the cleaning of Duct systems.

2. Certification: The Duct System Cleaning Contractor shall have a minimum of:

a. At least one Air System Cleaning Specialist (ASCS) certified by NADCA on a full time basis or shall have staff certified by a nationally recognized certification program and organization dedicated to the cleaning of Duct systems.

3. Supervisor Qualifications: A person certified as an ASCS by NADCA or maintaining an equivalent certification by a nationally recognized program and organization, shall be responsible for the total work herein specified.

4. Equipment, Materials and Labor: The Duct System Cleaning Contractor shall possess and furnish all necessary equipment, materials and labor to adequately perform the specified services.

a. The Contractor shall warrant that its employees have received safety equipment training, medical surveillance programs, individual health protection measures, and manufacturer's product and material safety data sheets (MSDS) as required for

the work by the U.S. Occupational Safety and Health Administration, and as described by this specification.

b. The Contractor shall maintain a copy of all current MSDS documentation and safety certifications at the site at all times as well as comply with all other site documentation requirements of applicable OSHA programs and this specification.

c. The Contractor shall submit to the Engineer all material safety data sheets (MSDS) for all chemical products proposed to be used in the cleaning process.

5. Licensing: The Duct System Cleaning Contractor shall provide proof of maintaining the proper license(s), if any, as required to do work in this state. In addition, the Contractor shall comply with all Federal, state and local rules, regulations and licensing requirements.

C. Standards for Contractor

1. NADCA Standards: The Duct System Cleaning Contractor shall perform the services specified in accordance with the current published standards of the National Air Duct Cleaners Association (NADCA).

a. All terms in this specification shall have their meaning defined as stated in the NADCA Standards.

b. NADCA Standards must be followed with no modifications or deviations being allowed unless approved, in writing, by the Engineer.

D. Documents

1. Mechanical Drawings: The Owner will provide the Duct System Cleaning Contractor with one copy of the following documents:

a. Project drawings and specifications

b. Approved construction revisions pertaining to the Duct system

c. Any existing indoor air quality (IAQ) assessments or environmental reports prepared for the facility.

E. Scope of Work

1. This section defines the minimum requirements necessary to render Duct components clean, and to verify the cleanliness through inspection and/or testing in accordance with these specifications and applicable NADCA Standards.

2. The Contractor shall be responsible for the removal of visible surface contaminants and deposits from within the Duct system in strict accordance with these specifications.

3. The Duct system encompasses any interior surface of the facility's air distribution system for conditioned spaces and/or occupied zones. This includes the entire heating, air conditioning and ventilation system from the points where the air enters the system to the points where the air is discharged from the system. The return air grilles, return air ducts (except ceiling plenums and mechanical room) to the air handling unit(s) (AHU), the interior surfaces of the AHU, the mixing box, coil compartment, condensate drain pans, humidifiers and dehumidifiers, supply air ducts, fans, fan housings, fan blades, air wash systems, spray eliminators, turning vanes, filters, filter housings, reheat coils, and supply diffusers are all considered part of the Duct system. The Duct system may also include other components such as dedicated exhaust and ventilation components and make-up air systems.

F. Duct System Inspections and Site Preparations

1. Duct System Evaluation: Prior to the commencement of any cleaning work, the Contractor shall perform a visual inspection of the Duct system(s) to determine appropriate methods, tools, and equipment required to satisfactorily perform this project.

   Damaged system components found during the inspection shall be documented and brought to the attention of the Engineer.

2. Site Evaluation and Preparations: The Contractor shall conduct a site evaluation, and establish a specific, coordinated plan which details how each area of the building will be protected during the various phases of the project.

G. General Duct System Cleaning Requirements

1. Containment: Debris removed during cleaning shall be collected as described below. Precautions must be taken to ensure that debris is not otherwise dispersed outside the Duct system during the cleaning process.

2. Particulate Collection: Where the particulate collection equipment is exhausting inside the building, HEPA filtration with 99.97% collection efficiency for 0.3-micron size (or greater) particles shall be used. When the particulate collection equipment is exhausting outside the building, mechanical cleaning operations shall be undertaken only with particulate collection equipment in place, including adequate filtration to contain debris removed from the Duct system. Also, when this equipment is exhausting outside the building, precautions shall be taken to locate the equipment so that the discharge is down wind and away from all air intakes and other points of entry into the building.

3. Controlling Odors: All reasonable measures shall be taken to control offensive odors and/or mist vapors that may occur during the cleaning process.

4. Component Cleaning: Cleaning methods shall be employed such that all Duct system components must be visibly clean as defined in applicable standards (see NADCA Standards). Upon completion, all components must be returned to those settings recorded just prior to cleaning operations.

5. Air-Volume Control Devices: Dampers and any air-directional mechanical devices inside the Duct system must have their position marked prior to cleaning and, upon completion, must be restored to their marked position.

6. Service Openings: The Contractor shall utilize service openings, as required for proper cleaning, at various points of the Duct system for physical and mechanical entry, and inspection.

   Contractor shall utilize the existing service openings already installed in the Duct system where possible.

   Other openings shall be created where needed and they must be created so they can be sealed in accordance with industry codes and standards.

   Closures must not significantly hinder, restrict, or alter the airflow within the system.

   Closures must be properly insulated to prevent heat loss/gain or condensation on surfaces within the system.

   Openings must not compromise the structural integrity of the system.

Construction techniques used in the creation of openings should conform to requirements of applicable building and fire codes, and applicable NFPA, SMACNA and NADCA Standards.

Cutting service openings into flexible duct is not permitted. Flexible duct shall be disconnected at the ends as needed for proper cleaning and inspection.

Rigid fiber glass duct board duct systems shall be resealed in accordance with NAIMA recommended practices. Only closure techniques which comply with LJL Standard 181 or UL Standard 181 a are suitable for fiber glass duct system closures.

All service openings capable of being re-opened for future inspection or remediation shall be clearly marked and shall have their location reported to the Engineer in project report documents.

7. Ceiling sections (tiles): The Contractor may remove and reinstall ceiling sections to gain access to Duct systems during the cleaning process.

8. Air distribution devices (registers, grilles & diffusers): The Contractor shall clean all air distribution devices.

9. Air handling units, terminal units (VAV, dual duct boxes, etc.), blowers and exhaust fans: The Contractor shall insure that supply, return, and exhaust fans and blowers are thoroughly cleaned. Areas to be cleaned include blowers, fan housings, plenums (except ceiling supply and return plenums), scrolls, blades, or vanes, shafts, baffles, dampers and drive assemblies. All visible surface contamination deposits shall be removed in accordance with NADCA Standards. The Contractor shall:

    a. Clean all air handling unit (AHU) internal surfaces, components and condensate collectors and drains.

    b. Assure that a suitable operative drainage system is in place prior to beginning wash down procedures.

    c. Clean all coils and related components, including evaporator fins.

10. Duct Systems: The Contractor shall:

    a. Create service openings in the system as necessary in order to accommodate cleaning of otherwise inaccessible areas.

b. Mechanically clean all duct systems to remove all visible contaminants to the degree that the systems are capable of passing Cleaning Verification Testings (see NADCA Standards).

H. Health and Safety

1. Safety Standards: The Contractor shall comply with all applicable federal, state, and local requirements for protecting the safety of the contractors' employees, building occupants, and the environment. In particular, all applicable standards of the Occupational Safety and Health Administration (OSHA) shall be followed when working in accordance with this specification.

2. Occupant Safety: No processes or materials shall be employed in such a manner that they will introduce additional hazards into occupied spaces.

3. Disposal of Debris. All debris removed from the Duct System shall be disposed of in accordance with applicable federal, state and local requirements.

I. Mechanical Cleaning Methodology

1. Source Removal Cleaning Methods: The Duct system shall be cleaned using source removal mechanical cleaning methods designed to extract contaminants from within the Duct system and safely remove contaminants from the facility. It is the Contractor's responsibility to select source removal methods which will render the Duct system visibly clean and capable of passing cleaning verification methods (See applicable NADCA Standards) and other specified tests, in accordance with all general requirements. No cleaning method, or combination of methods, shall be used which could potentially damage components of the Duct system or negatively alter the integrity of the system.

All methods used shall incorporate the use of vacuum collection devices that are operated continuously during cleaning. A vacuum device shall be connected to the downstream end of the section being cleaned through a predetermined opening. The vacuum collection device must be of sufficient power to render all areas being cleaned under sufficient negative pressure so that containment of debris and the protection of the indoor environment is assured.

All vacuum devices exhausting air inside the building shall be equipped with HEPA filters (minimum efficiency), including hand-held vacuums and wet vacuums.

All vacuum devices exhausting air outside the facility shall be equipped with particulate collection capability including adequate filtration to contain debris removed from the Duct system. Such devices shall exhaust in a manner that will not allow contaminants to re-enter the facility. Release of debris outdoors must not violate any outdoor environmental standards, codes or regulations.

All methods require mechanical agitation devices to dislodge the debris adhered to interior Duct system surfaces, such that said debris may be safely conveyed to vacuum collection devices. Acceptable methods will include those which will not potentially damage the integrity of the ductwork, nor damage porous surface materials such as liners inside the ductwork or system components.

2. Methods of Cleaning Fibrous Glass Insulated Components:

Fibrous glass thermal or acoustical insulation elements present in any equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment, while the Duct system is under constant negative pressure. These elements are NOT permitted to get wet in accordance with applicable NADCA and NAIMA standards and recommendations. Cleaning methods used shall not cause damage to fibrous glass components and upon completion shall render the system capable of passing Cleaning Verification Tests (see NADCA Standards).

3. Damaged Fibrous Glass Material

If there is any evidence of damage, deterioration, delamination, friable material, mold or fungus growth, or moisture such that fibrous glass materials cannot be restored by cleaning or resurfacing with an acceptable insulation repair coating, they shall be identified for replacement.

When requested or specified, the Contractor must be capable of remediating exposed damaged insulation in air handlers and/or ductwork requiring insulation replacement.

Replacement material: In the event fiber glass materials must be replaced, all materials shall conform to applicable industry codes and standards, including those of UL and SMACNA.

NOTE: Replacement of previously damaged insulation is not covered by this specification.

4. Cleaning of coils

Any cleaning method may be used that will render the coil visibly clean and capable of passing Coil Cleaning Verification (see applicable NADCA Standards). Coil drain pans shall be subject to Non-Porous Surfaces Cleaning Verification. The drain for the condensate drain pan shall be operational. Cleaning methods shall not cause any appreciable damage to, displacement of, inhibit heat transfer, or cause erosion of the coil tubes or fin surface, and shall conform to coil manufacturer's recommendations when available. Coils shall be thoroughly rinsed with clean water to remove any latent residues.

5. Antimicrobial Agents and Coatings

Antimicrobial agents shall only be applied if active fungal growth is reasonably suspected, or where unacceptable levels of fungal contamination have been verified through testing.

Application of any antimicrobial agents used to control the growth of fungal or bacteriological contaminants shall be performed after the removal of surface deposits and debris.

Only antimicrobial agents registered by the U.S. Environmental Protection Agency (EPA) specifically for use within Duct system shall be used. Such agents shall be applied in strict accordance with manufacturer's instructions.

Antimicrobial coating products for both porous and non-porous surfaces shall be EPA registered, water soluble solutions with supporting efficacy data and MSDS records.

Antimicrobial coatings shall be applied according to manufacturer's instructions. Coatings shall be sprayed directly onto interior ductwork surfaces, rather than "fogged" downstream onto surfaces. A continuous film must be achieved on the surface to be treated by the coating application. Application of any biocidal coatings shall be in strict accordance with manufacturer's minimum millage surface application rate standards for effectiveness.

J. Cleanliness Verification

1. General: Verification of Duct System cleanliness will be determined after mechanical cleaning and before the application of any treatment or introduction of any treatment-related substance to the Duct system, including biocidal agents and coatings.

2. Visual Inspection: The Duct system shall be inspected visually to ensure that no visible contaminants are present.

   If no contaminants are evident through visual inspection, the Duct system shall be considered clean. However, the Owner reserves the right to further verify system cleanliness through Surface Comparison Testing or the NADCA vacuum test specified in the NADCA standards.

   If contaminants are evident through visual inspection, that portion(s) of the system where contaminants are visible shall be re-cleaned and subjected to re-inspection for cleanliness.

   NADCA vacuum test analysis must be performed by a qualified third party experienced in this type of testing procedure.

3. Verification of Coil Cleaning

   Cleaning must restore the coil pressure drop to within 10 percent of the manufacturer's listed pressure drop and/or the pressure drop measured when the coil was first installed. If the original pressure drop is not known, the coil will be considered clean only if it is completely free of foreign matter and chemical residue, based on a thorough visual inspection. (See NADCA Standards.)

K. Pre-Existing System Damage

1. The Contractor will not be held responsible for problems resulting from prior inappropriate or careless cleaning techniques of others.

L. Post-Project Report

1. At the conclusion of the project, the Contractor shall provide a report to the Engineer indicating the following:

   a. Success of the cleaning project, as verified through visual inspection and/or gravimetric analysis.

   b. Areas of the system found to be damaged and/or in need of repair.

M. Applicable Standards and Publications

1. The following current standards and publications of the issues currently in effect form a part of this specification to the extent indicated by any reference thereto:

National Air Duct Cleaners Association (NADCA): “Assessment, Cleaning & Restoration of HVAC Systems (ACR 2013),”

National Air Duct Cleaners Association (NADCA): “Understanding Microbial Contamination in HVAC Systems,” 2005.

National Air Duct Cleaners Association (NADCA): “Introduction to HVAC System Cleaning Services,” 2005.

National Air Duct Cleaners Association (NADCA): Standard 05 “Requirements for the Installation of Service Openings in HVAC Systems,” 2004.

Underwriters’ Laboratories (UL): UL Standard 181.

American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE): Standard 62-89, "Ventilation for Acceptable Indoor Air Quality".

Environmental Protection Agency (EPA): "Building Air Quality," December 1991.

Sheet Metal and Air Conditioning Contractors' National Association (SMACNA): “HVAC Duct Construction Standards - Metal and Flexible,” 1985.

North American Insulation Manufacturers Association (NAIMA): "Cleaning Fibrous Glass Insulated Air Duct Systems," 1993.

61. DUCTWORK

A. General:

1. Furnish and install all ductwork and related sheet metal work indicated and/or specified or required for the mechanical system(s) shown on the plans. Refer to Items PROTECTION, INSERTS AND SLEEVES, GRILLES, DIFFUSERS, ETC. and TEMPERATURE CONTROL for specific items of work that may not be covered on the drawings or in the following but shall be part of the work under this item of the specifications.

2. Galvanized sheet steel utilized for duct construction and other sheet metal fabrication work under this section shall conform to ASTM A-653 and A-924. Where stainless steel ductwork is specified, duct material shall be Type 304 or Type 316 in accordance with ASTM A-240.

3. All ductwork, miscellaneous sheet metal work, etc., shall be fabricated, sealed and erected in a first class and workmanlike manner in accordance with applicable provisions of local and/or state building codes, in accordance with standard practice of the Sheet Metal and Air Conditioning Contractor's National Association as described in applicable SMACNA manuals of construction standards and in accordance with the International Mechanical Code. Where figure numbers in these manuals are mentioned, they shall be referred to as the required method of design and fabrication.

4. Duct connections to flanges of air distribution system equipment shall be sealed and mechanically fastened in accordance with applicable code requirements. Ducts shall be supported from and/or anchored to the building structure as indicated in the manual and shall be so installed as to be completely free from vibration with system mechanical equipment in operation. Note that for all welding operations the processes and practices covered in applicable portions of the AWS D9.1, Code for Welding Sheet Metal, shall be adhered to.

5. Ductwork shown on drawings shall be considered as diagrammatic for clearness in indicating the general run, size, connections required, etc. and may not be shown in its exact position. Ductwork may have to be offset, lowered or raised as required or as directed at the site. The possibility of a requirement for this shall be taken into account when preparing the bid for the work and such adjustments shall be accomplished at no additional cost. Duct sizes indicated are inside dimensions. Where a duct size must be altered to avoid interferences or because of clearance restrictions, the revised size shall provide approximately the same air handling characteristics.

6. Factory fabricated materials used for installation of air duct systems shall meet the listing requirements of UL Standard181 where applicable.

7. Provide approved type, sight-thru access units in ductwork for inspection of and access to duct mounted fire dampers, smoke dampers, control dampers and filters (This requirement is not applicable to fire damper installations with air devices installed in a rated ceiling assembly). For low pressure ductwork, access units in general shall be similar and equal to Cesco series CAD 10, Advanced Air series 85 or equal. Care shall be taken to insure that the doors and method of installation are adequate to meet pressure requirements. However, access units similar and equal to McGill Airflow series ARR or series ASR with vacuum relief capability, retaining chain, sealing gasket, insulated frame and transparent window door shall be installed in ductwork for medium and/or high pressure service immediately downstream from all fire dampers and other rapid closing devices such as smoke dampers, etc. All viewing panels shall be of wired glass or of high-impact acrylic where approved. Note that on low pressure systems, access doors may be shop fabricated in accordance with applicable details illustrated in the SMACNA Duct Construction Standards manual.

8. Properly sized and pressure rated access doors shall also be provided as required for service or inspection at duct mounted air flow monitoring stations, coils, etc. They shall have an insulated frame and door, sealing gasket and bolted cover.

9. Note that access unit construction shall be of galvanized steel, stainless steel, aluminum, etc., as required to match duct construction.

10. On low pressure ductwork, vacuum relief units downstream of fire dampers, etc. shall also be provided as mentioned above. They shall consist of adjustable pressure relief doors, Ruskin PRD 18 or equal, installed to open inwardly to relieve a high vacuum condition within the duct. They shall incorporate negator springs for door closure upon relief of vacuum or system shutdown.

11. Holes punched in uninsulated ductwork for instrument readings or other purposes shall be closed and sealed with lock type plugs which cannot be dislodged by duct pressure or vibration. Similar type openings in insulated ducts shall be provided with instrument test holes, Ventlok No.699 or equal.

12. All ductwork penetrating floors, rated walls and/or smoke partitions or connected to room air devices installed in fire rated ceilings, shall be of not less than No.22MSG galvanized steel construction. Perimeter clearances at penetrations shall be sealed with an approved fire stop in accordance with the requirements of NFPA90A and as required by State and/or local codes. (See Item INSERTS AND SLEEVES.)

13. The use of dissimilar metals between ducts and duct supports shall be avoided unless a coating or tape is applied to both contact surfaces. Galvanized steel hangers with aluminum ductwork need not comply with this requirement.

14. The installation of fire dampers and the installation of ductwork connecting to fire dampers shall be in accordance with applicable installation instructions of the damper manufacturer as well as SMACNA and NFPA standards. In addition, the ductwork installation shall meet applicable requirements of any governing local codes.

15. With installations involving duct mounted control dampers, the contractor shall provide filler sheet metal insert spacers between the perimeter of the damper and the duct to prevent bypass where damper size does not correspond to duct size.

16. Where balancing dampers are to be installed in branch ducts, etc. (see Item GRILLES, DIFFUSERS, ETC.) they shall be placed near the branch take-off in order to minimize any noise carry-over to the conditioned space.

17. Flexible connectors shall be run with as few bends, turns, etc. as possible and connections that are run to terminal air boxes shall have at least three (3) diameters of straight duct ahead of the tie-in. All installations shall be provided with sufficient supports to limit connector sag to 2-1/2” maximum. Support bands shall be minimum 1-1/2" wide and the final support shall be within 18 inches of the terminal air box/air device. Attachments at both ends shall be made with an approved type of steel draw-bands or fasteners and UL 181 listed duct tape. Note that installations having abrupt turns or sharp bends are not acceptable.

18. Air devices shall be installed in accordance with manufacturer's published instructions. For all ceiling mounted air devices on the project, coordinate the actual model selected with the specific type of ceiling involved. Note that louvers to be furnished and/or set in exterior walls under this section of the work shall be carefully caulked around the full perimeter when being installed in order to achieve a totally watertight installation.

B. Low Pressure:

1. Unless otherwise specified, ductwork shall be constructed from mild steel galvanized sheets of lock forming quality and shall conform to the recommended gauges and construction methods listed in the SMACNA Duct Construction Standards manual for specified pressure requirements. Galvanized coating thickness shall be of commercial designation G 90 (ASTM A 653/A 653M) LFQ chem treat. Ductwork exposed to view shall have a milli-phosphatized finish. Where stainless steel ductwork is specified, ducts shall have a standard finish unless otherwise called for. With regard to fabrication/construction, the pressure-velocity classification for low pressure ductwork shall be for a static pressure rating of 2" w.g. Positive or Negative unless otherwise shown on the drawings.

2. Ducts shall be properly braced and reinforced, and each panel of rectangular ductwork shall be girth beaded or cross-broken where stipulated in the manual. Upper attachment of hanger rods and straps shall be selected for a safety factor of not less than four, based on ultimate loads. For rectangular ducts over 54" in width, hangers shall be angle trapeze type with rod or supports.

3. Factory fabricated "slide-on" transverse joints and components shall be utilized. Note that on rectangular ductwork 42" wide or less, formed-on flanges will be acceptable provided they are constructed as SMACNA T-24 flanges including the use of corners, bolts, cleat and gasketing.

4. All supply, return and exhaust duct systems, including plenums, shall have joints and seams sealed in accordance with the requirements listed under paragraph 6.2.4.2 of ASHRAE Standard 90.1. Sealants shall be formulated for ductwork installations and shall be UL listed. In addition, they shall be LEED compliant with no VOCs or HAPs. The recommended temperature range shall be suitable for the application.

5. On rectangular ductwork, all sub-branch connections to main branch ducts shall be made with branch duct tap-in fittings with 45° entry throat, gasket and volume damper or with straight tap connections utilizing rectangular bellmouth fittings with gasket and volume damper. On round or flat oval duct runouts as well as small runouts with flexible connectors, provide conical bellmouth take-offs with gasket and damper unless otherwise indicated. Take-off fitting material shall match the duct material (i.e.: galvanized, stainless or aluminum).

6. Provide quadrant locking type splitter dampers where shown or where required to properly apportion system air in main branch supply ducts. Provide the necessary dampers in supply and return sub-branch ducts as required in order to accomplish the balancing process. See applicable portions of appropriate SMACNA manual.

7. Provide air turning vanes in each duct elbow or similar fitting. Turning vanes shall be fabricated and installed as indicated in the manual with double vanes used for longer unsupported lengths.

8. Provide vanes in short radius elbows and where shown on the plans to properly distribute air across entire face of duct. Vanes shall be fabricated and installed in accordance with requirements as shown in the manual.

9. For distribution systems where the diffuser or register is within 24 inches of the trunk duct, provide the supply runout with an equalizing grid in addition to the balancing damper.

10. Where discharge plenums with duct collars are required for terminal air boxes, they may either be furnished by the box manufacturer or fabricated by the sheet metal contractor.

C. Duct Liner:

1. Provide duct liner where called for on the drawings. Unless otherwise specified, it shall be the high-performance, faced glass fiber type. The liner shall incorporate only long glass fibers made from the rotary production process and bonded together with a thermosetting resin. A black composite, non-woven mat with fire-retardant acrylic coating shall be tightly bonded to the air-stream side to provide a tough, durable surface. The liner shall conform to ASTM C1071 Type I or II material specifications.

2. The liner shall be 1-1/2" thick (R-6) for supply ductwork and 1" thick (R 4.3) for return ductwork unless otherwise indicated and shall be rated for duct velocities up to 5,000'/minute or more. The material shall have a thermal rating of 250°F and a maximum "C" value of 0.24 per inch thickness at 75°F mean temperature when tested per ASTM C 177. It shall comply with NFPA 90A and 90B as well as UL 723 and shall have an NRC value for a 2 inch thickness of not less than .90 as tested per ASTM C 423. For a 1 inch thickness the NRC value shall be not less than .70 per the above referenced test.

3. At installation the liner shall be accurately cut to size and placed in strict accordance with manufacturer's recommendations using mechanical fasteners and an approved sealer and adhesive fasteners shall compress the insulation no more than 1/8". Adhesive shall be formulated for duct liner applications. The adhesive film coverage shall be a minimum 90% of the contact surface and fastener spacing shall be as specified below. In addition, all transverse edges and exposed longitudinal joints shall be sealed with an acrylic coating when not sealed by the manufacturer. Adhesive material shall meet the requirements of ASTM C 916 and MIL-A-3316C, Classes 1 and 2, Grade A.

4. Note that all lined ducts shall be sized to maintain net free area of duct dimensions shown on the drawings.

5. Mechanical fasteners shall be spaced in accordance with SMACNA standards and shall not compress the liner more than 1/8 inch. Longitudinal corner joints shall be overlapped and compressed.

6. All transverse joints shall be firmly butted without gaps. Any tears on the air stream surface shall be repaired or that segment of the lining shall be replaced. Metal nosings (channel or zee profile) shall be securely installed over transverse liner edges facing the airstream at fan discharge locations and at any liner section preceded by unlined duct. Duct liner shall be interrupted at duct heaters, fire dampers, etc., as required by code.

D. Outside Air (Air Intake) Ductwork:

1. Outside air ductwork from roof mounted air intake hoods and/or wall mounted air intake louvers to air handling units, fans, etc. shall be pitched and of liquid-tight construction with all seams continuously soldered or welded and all joints made up with connecting flanges and gaskets. Galvanized duct weld seams shall be given a coat of Galvinoleum1225 red. Make provisions as required for draining low points.

E. Miscellaneous Duct Joints:

1. All concealed exhaust duct joints shall be sealed with UL listed metal faced duct tape. The tape shall have a published tensile strength of at least 35 lbs/inch width and shall conform to applicable SMACNA standards.

F. Flexible Duct Connectors:

1. Flexible air connectors shall be the pre-insulated type consisting of a corrosion-resistant steel helix permanently bonded to a liner consisting of multiple layers of reinforced aluminum foil/polyester laminate. The assembly shall be covered with a 1 1/2" glass fiber blanket encased in a fire retardant, aluminum metalized, reinforced vapor barrier jacket. Duct connectors shall comply with applicable requirements of NFPA Standard 90A, BOCA and SBBC, and shall be listed as Class1 Connector, UL Standard 181. Rated temperature range shall be 0° to 250° F, UL rated velocity shall be at least 4,000 fpm and UL rated internal working pressure listings shall be at least positive 6" w.g. and negative 4" w.g. through 16" diameter.

2. Connectors shall be installed in accordance with manufacturers' recommendations and limited to a maximum length of 8 feet. Unless dimensioned otherwise, supply connectors shall be selected either to match inlet connection size of the air device or to have an air velocity not exceeding 800 feet per minute.

3. Flexible connectors indicated for return or exhaust air service shall meet the above criteria except that they need not be insulated unless specifically called for and shall be sized for an air velocity not exceeding 700 feet per minute.

G. Miscellaneous:

1. The selection of ceiling mounted air devices shall be appropriate for the type of ceiling involved. Where surface mounted installation is required, the devices shall be designed for surface mounting or shall be installed with the proper trim-strip assembly required to achieve a finished appearance.

H. Higher Pressure (High Velocity) Systems

1. The following covers supply ductwork extending from any central station air handling equipment operating at static pressures exceeding 2" w.g. to terminal air units as well as any other ductwork subjected to operating pressures above the low pressure limit. Unless otherwise specified, ductwork shall be fabricated from commercial grade galvanized sheet steel of lock forming quality. Ductwork shall be constructed and sealed as described in the following and shall be leak tested according to industry-accepted test procedures.

I. Rectangular:

1. Rectangular duct sections shall be made up and installed in accordance with requirements and recommendations of the SMACNA Duct Construction Standards manual. Unless otherwise indicated, the static pressure rating in the pressure-velocity classification table shall be 6"w.g.

2. Gauge of metal, construction, reinforcement, etc. shall be as called for in applicable portions of the SMACNA manual. Galvanized steel shall have a G 90 zinc coating (ASTM A 653/A 653M) LFQ chem treat. Ductwork exposed to view shall have a milli-phosphatized finish. Transverse joint connectors shall be approved, factory fabricated "slide-on" type with all necessary components required to achieve a rigid, air-tight joint. Longitudinal seams shall be Pittsburgh lock. The Ductmate Systems and Ductmate W.D.C.I. proprietary duct connection systems will be acceptable.

3. Where noted internally lined duct shall be constructed with a perforated inner wall of G 60 galvanized sheet metal covering a 2" thickness of rigid high density, high performance insulation made from long glass fibers bonded with a thermosetting resin and having a maximum "C" value of 0.24 per inch thickness at 75 F. The airstream side and all cut edges of the insulation shall have a durable acrylic surface treatment and the allowable velocity limit of the duct liner material, as stated by the manufacturer, shall be 6,000'/minute. Finally, the exposed face of the liner shall be covered with an approved type of retaining fabric that does not materially affect the acoustic properties of the insulation.

J. Round:

1. Round duct conduit shall be of spiral lock seam or longitudinal seam construction. The construction specifications shall conform to the requirements for medium pressure service (through 6" W.G.) unless otherwise indicated. Gauge of metal, girth reinforcing (where required), joint details, etc. shall be as presented in the SMACNA Duct Construction Standards manual. No interior stiffeners or reinforcement will be permitted. Unless otherwise indicated, all sheet metal shall be minimum G 90 galvanized steel (ASTM A 653/A 653M) LFQ chem treat. Where stainless steel ductwork is called for, it shall be fabricated from either type 304 or type 316 material.

2. Conduit shall be supplied in 6 foot and 12 foot standard lengths and cut on the job. Assembly shall be with matched dimension sleeve couplings. Couplings shall be reinforced by rolled beads. When assembling duct sections, non-gasketed couplings shall be painted with mastic before engagement, then mechanically fastened, taped and repainted at joint as described under "Installation". Note that all ductwork shall be assembled in accordance with manufacturer's recommendations.

3. Takeoffs shall be made using 45° lateral fittings, combination tees or conical tees of an approved type as detailed in the manual and as described below under "Fittings".

K. Double Wall:

1. Where shown on the drawings or otherwise called for, medium and high pressure round ducts of spiral lock seam or seam-welded construction, as described above, shall be double walled and internally insulated. Insulation must completely fill the space between the inner wall and the outer pressure shell. It shall consist of minimum 2" thick blanket fiberglass having a maximum "k" factor of 0.27 at 75°F mean and an installed "R" value of 6 or greater. The inner wall shall be of galvanized steel unless otherwise specified and shall be perforated where indicated on the drawings. When a perforated inner wall is provided, the insulation shall have a protective cover on the air stream side consisting of an approved type of retaining fabric to serve as a barrier against fiber entrainment into the airstream.

2. Perforated inner walls shall have hole size and spacing to give specific acoustic impedance approximating the listed noise reduction characteristics of "acoustic k27" duct as published by McGill Airflow. When the inner wall is specified to be of stainless steel it shall be fabricated from either type 304 or type 316 material.

L. Fittings:

1. Fittings and branch connections for rectangular ducts shall be designed, fabricated and installed in accordance with the requirements of the SMACNA High Pressure Duct Construction Standards manual. Material shall be as previously specified for duct sections.

2. Branch take-offs, directional changes, etc. for round and/or flat oval ducts shall be made with standard, approved type manufactured fittings similar to those illustrated in the SMACNA Duct Construction Standards and/or a listed manufacturer's catalog. Branch take-offs shall be made using either oval-to-round taps, conical laterals, boot style 90 degree tees or other approved configuration of a low loss branch fitting/connection. Where divided flow fittings are indicated, only full body fittings will be acceptable.

3. Fittings for round and flat oval ducts shall be machine formed from G-602 galvanized sheet metal in accordance with ASTM A-653 and A-924, with seams and joints continuously welded. Where stainless steel ductwork is specified, fittings shall be stainless type 304 or 316 in accordance with ASTM A-240.

4. There shall be no projection of metal edges into the airstream on any fitting. For duct sizes through 8", elbows shall be 2 section, die-stamped fittings. Elbows on larger ducts shall be of gored construction with continuous weld seams. Elbows shall be fabricated to a minimum centerline radius of 1.5 times duct width in the plane of the bend. Elbows not die-stamped shall be fabricated in general accordance with the requirements given in the SMACNA manual. All mitered ells shall have turning vanes and may be used only where space conditions prohibit the use of specified/approved fittings.

5. Fittings for double wall ducts shall be similar to the above but shall be furnished with internal insulation covered with solid metal liners matching adjacent ductwork liners. Type and thickness of insulation shall be similar to the insulation for adjacent ductwork.

6. Manufacturer: Medium and high pressure round ductwork, fittings, etc. shall be as manufactured by United Sheet Metal, Eastern Sheet Metal, JTD Spiral, Lindab or Semco.

M. Installation:

1. Unless gasketed, self-sealing fittings and couplings are used, round and oval duct shall be assembled using either heat-shrink type duct bands or tape and sealer. If duct bands are not used, assembly for non-gasketed fittings and couplings shall be as follows:

   Clean male end of duct section or fitting with solvent, wipe dry and apply sealer with brush. Join pieces and secure joint with sheet metal screws. Apply additional sealer over joint and wrap with cloth duct tape. Allow sealer to cure at least 24 hours before ductwork pressure testing.

2. Duct sealer shall carry the UL label and shall conform to applicable smoke developed and flame spread ratings as set forth in NFPA90A. The sealer shall have a minimum 70% solids to avoid undue shrinkage after curing and shall have the required thermal range. Water soluble material will not be acceptable.

3. All double-walled, internally insulated duct and fittings shall be assembled and installed in strict accordance with manufacturer's published instructions. Connections shall be made using precision slip-joint couplings furnished by the duct system manufacturer.

N. Flexible Duct Connectors:

1. Flexible air connectors shall be used in making final connections to terminal air control units. Maximum connectors length shall not exceed 6'.

2. Flexible connectors for systems other than low pressure shall incorporate 2 element spiral construction consisting of a corrosion-resistant steel wire helix permanently bonded to and enclosed in a liner consisting of multiple layers of reinforced aluminum foil/polyester laminate, mechanically interlocked without adhesives. They shall be factory covered with l 1/2", 3/4 lb. density glass fiber blanket insulation sheathed in a vapor barrier jacket of fire retardant material guaranteed not to age harden. UL rated internal working pressure shall be at least 12"w.g. positive and 5"w.g. negative through 16" diameter. Flexible connectors shall be tested in accordance with the ADC flexible air duct test code FD72 Rl and shall be so listed.

3. Flexible air connectors shall be listed as a Classl Connector, UL Standard181 and shall comply with applicable requirements of NFPA Standard90A, BOCA, ICBO and SBBC. They shall have a listed temperature range of 0° to 250° F and a UL rated velocity of 5,000fpm or greater.

4. The above described connectors shall be installed with approved type steel draw-bands or fasteners and UL 181 listed duct tape in accordance with manufacturer's recommendations.

5. Where insulation facing is damaged, it shall be carefully sealed with an aluminum faced UL 181 listed duct tape except where exposed. If ductwork is exposed, connectors with damaged facing shall be replaced.

O. Exposed Round Duct (Bare Metal):

1. All exposed round ductwork shall be SPIROsafe as manufactured by Lindab Inc. or approved equal. Ductwork shall be single or double wall as indicated on the drawings. The duct system shall consist of fittings that are furnished with factory installed sealing gaskets and spiral duct sections which, when properly assembled and installed, will totally seal the duct joints without the use of duct sealer. Flanged joint assembly will not be acceptable.

2. Double wall duct sections and fittings shall sandwich 2" fiberglass insulation (Maximum K value not to exceed 0.26 at 75°F) between the inner and outer walls. Where the inner wall is required to be perforated, the air side face of the insulation shall be covered with a retaining fabric to provide tear retention without significant reduction of acoustical properties.

3. All duct sections and fittings shall be of G-90 galvanized steel conforming to ASTM standards A-653 and A-924.

4. Components shall be constructed per SMACNA's Duct Construction Standards for service to + 10 in. W.G. Duct sections shall be of spiral lock seam construction with a mechanically formed seam locking indention evenly spaced along the spiral seam. Sealing gaskets shall be made of EPDM and positively attached to the fitting. They shall be classified by UL for flame spread and smoke developed in accordance with ASTM E84-91a. Straightline branch take-offs shall be made with conical tees, expanded base saddle taps or expanded base 90 deg. tees.

5. The above described system shall meet SMACNA's Leakage Class 3 performance criteria (as defined in the SMACNA Duct Design Manual) from -20 in. W.G. to +12 in. W.G.

6. Where direct, duct-mounted registers are indicated they shall be similar and equal to SPIROcomfort supply/return registers with double deflection blades and balancing damper. These devices shall be of galvanized steel with a similar surface appearance and designed so that the flanges always meet flush to the duct regardless of duct diameter.

P. Underground Ductwork:

1. Where underground ductwork is indicated on the plans furnish and install 4 mil PVS coated (inside and outside) galvanized spiral pipe and fittings as supplied by Foremost Manufacturing, United Sheet Metal, or approved equal. All joints shall be made with stainless steel screws, glass fabric and an approved sealer. Installation shall be in accordance with recommendations of NESCA as well as the duct manufacturer.

2. In lieu of PVS coated spiral pipe, underground duct may be constructed of PVC where permitted by code. The PVC pipe shall have a minimum pipe stiffness of 8 psi at 5% deflection when tested in accordance with ASTM D2412. Plastic duct fittings shall be constructed of either PVC or high density polyethylene. All such fittings shall conform to the requirements of the SBCCI Standard Mechanical Code and the BOCA National Mechanical Code. Duct system assembly shall be by solvent welding in strict accordance with manufacturer's instructions.

3. All required excavation and backfill involved in the installation of underground air duct shall be done under this section of the work.

62. FIRE DAMPERS

A. In general, the dampers described in this item are to be made of galvanized steel. However, with installations involving stainless steel or special lining (coated) duct systems, the dampers shall be of stainless steel.

B. Rating and Construction:

1. Fire dampers shall be provided for the locations shown on the plans. All fire dampers shall be dynamic rated and shall have an Underwriter's Laboratories, Inc. label for 1-1/2 hour or 3 hour rating as required. In addition, they shall meet the requirements for fire dampers per NFPA 90A.

2. Dampers shall be of the interlocking blade curtain type. Dampers for vertical air flow shall have stainless steel negator springs for positive operation. Dampers for horizontal air flow shall be gravity operated. Blades shall be designed for 180° rotation on damper closure. Damper assembly shall be of welded, riveted or bolted construction and shall be complete with fusible link and link retainer as well as galvanized steel, factory assembled sleeve.

3. Components shall be fabricated of galvanized steel meeting ASTM A 525 65with gauges required by UL listing R-13317. The damper frame shall be designed to function as the mounting sleeve and shall equal or exceed the requirements of UL Standard 555. Wherever possible, dampers in ductwork shall be selected to provide 100% free area.

4. All units shall be installed in accordance with the installation instructions furnished by the manufacturer. Retaining angles shall be field attached to the sleeve on both sides of the wall or floor openings as per NFPA 90A. Collar adapters shall be furnished where required.

5. Where fire rated ceilings are involved, penetrations for diffusers, grilles, etc. shall be provided with fire damper assemblies designed and rated for the application. The assemblies shall be U.L. labeled for use in duct drops through fire rated floor/ceiling assemblies. They shall be similar and equal to Greenheck Series CRD and shall be provided with a standard fusible link. Blades shall be provided with UL Classified, factory applied thermal blanket insulation as required.

C. Manufacturer:

1. Dampers shall be as manufactured by Advanced Air, Airstream, Air Balance, Cesco, Greenheck, Prefco, Ruskin, Safe Air or Tuttle and Bailey.

63. ISOLATING DUCT CONNECTORS

A. Connections of rigid metal duct to individual fans as well as all other motor operated air handling equipment, shall be made using isolating type duct connectors. They shall be heavy duty manufactured units utilizing double-folded stainless steel joint seams and shall be made from waterproof and airtight flame retardant material of Neoprene double-coated glass fiber fabric with a tear strength of 25/25 or higher and a tensile strength of 300 / 300 or higher. The fabric shall have a listed temperature range of -40 deg. F to 200 deg F or above.

B. Units shall be UL listed with a 25/50 rating and shall meet the standards for vibration isolation connectors in duct systems as covered in NFPA 90A and 90B.

C. Isolating connectors shall be installed with the recommended slack and connector length shall not exceed 10". They shall be attached in such a way that the fabric is shielded with metal at the seams and the installation is completely airtight. Corners and flanges shall be of stainless steel.

64. INSULATION

A. Provide the required insulation for all ductwork, piping, equipment, etc., as described and listed in the following:

B. General Requirements:

1. All insulating materials, linings, tapes, coverings, etc., to be used on this project shall have composite fire and smoke hazard ratings, as tested by procedure ASTM E84, NFPA 255, NFPA 258 and UL 723, not exceeding flame spread 25 and smoke developed 50 unless otherwise noted. Specific items of equipment that are factory insulated are not governed by this item of the specifications. Note, however, that in sealed chases and shafts or other similar concealed and isolated spaces, and in mechanical equipment rooms, it will be acceptable to have pipe insulation and coverings installed with a smoke developed rating as high as 150. (See NOTE at the end of this item.)

2. Insulation Index - Ductwork, Equipment and Piping shall be covered with the classification and thickness of insulation noted in the Insulation Index listed in this item of the specifications.

3. Surface Finish - All field applied surface finish reinforcing mesh, as listed in the index, shall be equal to #10 glass fiber open weave reinforcing mesh (referred to as glass cloth). When tested according to ASTM method D-579, the mesh material shall indicate a tensile strength warp of 75 lbs/sq.in. and fill of 75 lbs/sq.in. Material shall be applied in accordance with manufacturer's recommendations. Refer to "Coverings" at the end of this item for specific requirements regarding factory-applied jackets, field-applied metallic jackets, etc.

4. Miscellaneous - Duct and equipment coverings, linings, etc. shall be interrupted as required by applicable provisions of NFPA 90A, and similarly, shall not conceal any service openings. Note that unless otherwise specified, lined ductwork need not be externally insulated.

C. General Instructions:

1. Before field insulation is applied, all items to be covered shall have been tested in accordance with requirements of the specifications - See Item TESTING. Tests shall be verified by the Engineer before proceeding with the work.

2. Prior to the application of insulation or insulation adhesives, the surfaces to be covered shall be thoroughly cleaned of all dust, dirt, grease and moisture. Also, determine whether any piping systems are to be painted prior to receiving insulation.

3. Where insulation is butted, all laps and joints shall be sealed with adhesive. The use of staples is acceptable only as an installation aid and not as a substitute for adhesive. Where staples are used on pipe covering in exposed locations, care must be taken to locate the staple joints in such a way that they are not in direct view.

4. On steel piping incorporating pipe shoes at support points, insert insulation into the shoe cavities and seal the ends with a mastic or caulking having a suitable temperature rating.

5. Where insulation is applied to flanges on heated lines, the pipeline insulation shall be stopped off a sufficient distance to allow removal of flange bolts without disturbing the insulation. Flanges shall be covered as specified. On lines subject to sweating, all surfaces shall be covered, and joints shall be sealed in a manner to prevent condensation.

6. Where valves are insulated, cover the valve bonnets to a point just below the stuffing box.

7. Where two layers of insulation are used, stagger all joints both ways. Secure each layer independently.

8. Continue insulation through walls, partitions, floors and pipe sleeves unless otherwise indicated on the drawings or prohibited by Code requirements.

9. Duct insulation shall be provided as required on all lined ducts where duct liner has been interrupted or terminated.

10. Insulation manufacturer's names and product names that may appear in the specifications have been listed as a guide to make and/or a standard to quality. Products of equal quality and performance by other manufacturers will be considered on approval by the Engineer.

D. Adhesives, Coating, Vapor Barrier Materials:

1. All factory attached vapor barrier materials, and all adhesives, mastics, coatings and insulation materials applied as herein specified shall be acceptable under NFPA standards 90A and/or shall have a dry flame spread index not to exceed 25 when tested in accordance with applicable Federal Standards. In addition, materials shall be in accordance with applicable portions of MIL-A-3316C, Classes 1 and 2, Grade A.

2. The toxicity of the solvents used on the premises must be such that the maximum allowable concentration (MAC) in parts per million (PPM) is 200 or higher according to the latest value published by the American Conference of Governmental Industrial Hygienists.

3. Prior to use, submit certification by the manufacturer for each of the above materials used with respect to the flame index and toxicity.

4. The lap-seal system described in the General Instructions shall only be installed when ambient conditions are within the range stipulated by the manufacturer.

E. Insulating Cements:

1. These materials shall be listed as mineral fiber, hydraulic setting insulating and finishing cement.

F. Equipment/Systems Insulation Index:

ITEM	CLASS	THICKNESS	SURFACE FINISH
Ductwork and Equipment			
Exposed...Supply, return & outside air ductwork; uninsulated damper frames	A or C	2"	(See Coverings)
Transition sections of air handling equipment	A	2"	(See Coverings)
Concealed...Supply, & outside air ductwork; damper frames			
Concealed...Unlined return air ductwork	B or C	1-1/2"*	(See Coverings)
Equipment (hot) (a)	E	2"	
Equipment (cold) (b)	A or C	2"	Glass Cloth & Lagging

* Thickness listed is for Class B (blanket) insulation. Class C insulation thickness to be only as required to achieve an equivalent, "as installed", R value.

** This shall include any portion of the hood itself that is above a surrounding ceiling.

Regarding the Insulation Index above, note that where Aluminum Jacket is listed (under SURFACE FINISH), refer to the paragraph headed Metallic Covering/Aluminum Jacket appearing under the section “Coverings” at or near the end of this item.

Equipment referenced in Insulation Index above:

(a) Air purger, expansion tanks. Note that cylindrical vessels 20" and over in diameter shall have the metallic (aluminum) jacket as specified under "Coverings".

(b) Chilled water pump casings, chilled water system air separators, chiller surfaces subject to sweating including water boxes. Insulation for pump casings needs only to be 1" thick.

Piping System	Class and Thickness
Chilled water (indoor):	"C", "E" - 1-1/2"
City water:	"C", "E" - 1"
Hot water (liquids) thru 200F:	
short runouts - thru 1-1/4" (max. 6' length).....	"C", "E" - 1-1/2"
all other piping - thru 2".....	"C", "E" - 2"
2-1/2" and above.....	"C", "E" - 2"
Refrigerant lines:	
Liquid and hot gas lines.....	"C" - 1", "E" - 1"

All valves and flanges shall be insulated to thickness of adjacent piping. See specification under Class "C" Insulation. Exception: Hot lines 2-1/2" and below-maximum 180° F. service.

All condensate coil drain lines (except short runs to floor drains that are contained within mechanical rooms) shall be insulated with 1/2" thickness of Class "C" or Class “E” insulation.

NOTE: Class "E" insulation may be used in cramped or otherwise inaccessible areas on chilled water lines. Unslit tubing 1" thick, shall be used on lines through 5" in size. On lines over 5" where Class "E" insulation is used it shall be 1/2" thick sheet material, installed in layers as required.

G. Materials:

1. Class "A" Insulation:

Mineral fiber rigid or semi-rigid board with either a factory-applied foil-reinforced kraft facing (similar to a Class "B" facing) or ASJ facing (similar to a Class "A" facing) as manufactured by CertainTeed, Johns Manville, Knauf, Manson, Owens Corning or Schuller. The "k" factor for this insulation shall be 0.23 or less at 75°F mean. Product shall conform to the property requirements of government specifications, HH 1 558B (Amendment 3) Form A, Class 1 and Class 2 and ASTM specification CG12, Type 2. Published temperature range shall extend from 20°F or lower to 400°F or greater.

Insulation for rectangular duct or flat areas shall be rigid board (minimum 3 pcf) and shall be fastened to the surface with welding pins and white cup head caps to match facing. Pins shall be spaced not over 12" apart each way with min. 2 rows per side and not more than 3" from each board edge or corner. Care must be taken to insure that no wrinkle is present on facing.

Insulation over duct stiffeners and standing seams shall be built-up using a 4" wide strip of insulation adhered to duct insulation.

Insulation for large round ducts shall be similar to the above but with the mineral fibers running in a vertical plane to permit one dimensional flexibility. The "k" factor for this specific insulation shall not exceed 0.30 at 75°F mean, and the minimum thickness permitted when used on supply ducts is 2". On small diameter ducts use standard density mineral fiber sectional pipe insulation with factory applied ASJ jacket.

All joints shall be butted tightly and sealed with a 4" wide tape of the same material as the factory applied facing. The tape shall be cemented with adhesive.

Corners of apparatus casing and rectangular ductwork at or near floor level shall be protected with 1-1/2" X 1-1/2" metal edge corner, securely fastened. These surfaces shall be finished with adhesive and glass cloth as follows:

a. Apply a flooding brush coat of UL listed lagging adhesive and embed cloth facing into wet coating with a 3" overlap at all seams. Smooth out carefully to avoid wrinkles. Apply a finish coat of lagging adhesive at the recommended rate to entire outer facing surface.

NOTE: All duct insulation vapor barrier jacketing shall be non-corrosive.

2. Class "B" Insulation:

Mineral fiber blanket - type insulation faced with a reinforced aluminum foil laminated to UL rated kraft similar to a Class "B" facing as manufactured by CertainTeed, Knauf, Johns Manville, Manson, Owens Corning or Schuller. The "k" factor for this insulation shall be 0.29 or less at 75°F mean and the installed R value shall be 6.0 or greater for 3" duct wrap and 4.2 or greater for 2" duct wrap. Product shall meet performance specifications as published by GSA and HUD/FHA. Published temperature range shall extend from 40°F to 250°F or greater, faced. Duct wrap shall be in compliance with ASTM C553, Type II, Class F-1.

Insulation shall be adhered to duct surface using 6" wide strips (on 12" centers) of UL listed fire retardant duct adhesive. Butt edges and secure with 2" wide strips of jacket overlap and seal. When cooling is involved, use a pressure sensitive tape in addition in order to assure a vaporproof joint.

Insulation over duct stiffeners and standing seams shall be built up using a 4" wide strip of insulating material adhered to adjacent duct insulation and sealed with tape.

On ducts greater than 30" in width, in addition to adhesive as specified above, insulation shall be held in place with perforated base anchor clips at the bottom of the duct installed at the manufacturer’s recommended spacing. Clips shall be attached to clean metal with construction adhesive.

NOTE: At Contractor's option, standard density mineral fiber sectional pipe insulation (nominal 1-1/2" wall thickness) with factory applied ASJ jacket (Class "C" insulation) may be used on all round ducts, both exposed and concealed. All laps and joints shall be sealed in accordance with manufacturer’s installation instructions. The use of staples is not permitted.

3. Class "C" Insulation:

Nominal 4 pound density mineral fiber sectional pipe insulation wrapped with a factory applied ASJ jacket (similar to a Class "C" jacket) as manufactured by CertainTeed, Knauf, Johns Manville, Manson, Owens Corning or Schuller. The "k" factor shall be 0.23 or less at 75°F mean. Product shall conform to ASTM C 1136 (jacketing), ASTM C 547 and shall meet UL 723 ratings. Published temperature range shall extend from 0°F to 800°F or greater. At installation all longitudinal and circumferential (butt) joints shall be closed and sealed in accordance with manufacturer's instructions. The use of staples is permitted only with hot pipe or duct insulation applications in concealed locations at contractor's option. Note that for exterior work, the insulation shall have an all-weather (AWJ) jacket consisting of a factory-applied weather-resistant jacket reinforced with fiber glass fabric.

On insulated pipelines, all fittings, flanges, valves, etc. shall be covered with premolded/mitered fiberglass insulating units equal to the thickness of adjacent pipe insulation. Note that on lines subject to sweating such as chilled water, etc., all of the above described work shall be given a flooding coat of vapor barrier mastic. Finally, all exposed fittings, valves and flanges shall be provided with preformed molded PVC jacket covers, as manufactured by CertainTeed, Knauf or Johns Manville. Covers shall be white with gloss finish, shall be UL 25/50 rated and shall meet the requirements of ASTM D 1784, Class 14253-C. Mechanical fasteners shall be of stainless steel.

Flanges and valves on hot lines 2-1/2" and below - maximum 160°F service) need not be insulated unless otherwise called for or, because of location and/or accessibility, insulation would be required for personnel safety.

In general, all heated pipelines 2-1/2" and larger will be supported by adjustable clevis pipe rolls or double rod trapeze type pipe rolls. Except as noted in the following paragraph, formed galvanized steel protection saddles will be furnished with these supports by the piping contractor where pipelines are of steel. Where such piping is of copper, furnish rigid preformed and precompressed insulation segments to be used at the support points. Unless otherwise called for, pipelines 2" and smaller will be supported by adjustable clevis hangers. The above is described more fully under Item SUPPORTS, HANGERS AND BRACKETS.

Insulation at support points on all cold lines 1-1/2" and larger shall incorporate water-resistance treated calcium silicate segments or precompressed and preformed segments of molded glass fiber. These inserts shall have sufficient compressive strength to support the pipe without deforming to a thickness less than the adjacent insulation. At support points on all such insulated lines, formed steel protection shields will be provided, along with the support elements, by the piping contractor. See Item SUPPORTS, HANGERS AND BRACKETS.

4. Class "E" Insulation:

Flexible, elastomeric cellular insulation (tubular or sheet) - as manufactured by Armacell, IMCOA, Johns Manville or Rubatex. The "k" factor for this material shall be 0.27 or less at 75°F mean and the published temperature range shall extend from 40°F or below to at least 220°F or greater. On thicknesses thru at least 1-1/2" the flame spread rating shall be 25 or less and the smoke developed rating shall be 50 or less based on ASTM E 84. Tubular material for piping shall conform to ASTM C534, Type I and be factory pre-slit longitudinally with mating surfaces adhesive coated and protected by release liners. In addition, all longitudinal joints shall be sealed with a manufacturer’s approved tape. All other joints shall be butted and sealed with the appropriate adhesive. Fabricate segments for valves and fittings and install according to manufacturer's recommendations. Piping exposed in mechanical rooms, etc. shall be given two coats of a white, water-based, semi-gloss latex enamel specifically formulated for this type of application. Note that adhesive shall not be field applied on or with any installation involving plastic pipe or tubing. For chilled water applications, wrap circumferential joints with duct tape.

Outdoor piping with Class “E” insulation shall be wrapped with an approved, 5-ply laminate, white covering consisting of alternating layers of aluminum foil and polyester film factory coated with pressure sensitive acrylic adhesive and kraft release liner.

H. Coverings:

1. Weatherproof (Exterior) Duty:

Piping exposed to weather shall be insulated as previously specified and then covered with an aluminum jacket as described below and having a laminated moisture retarder. Note that this jacketing requirement does not apply to flexible elastomeric foam type insulation.

2. Standard (Indoor) Duty:

Class "A" - Facing: All service type (ASJ) to be similar to a white, vinyl coated and embossed, vapor barrier laminate. Water vapor perm rating not to exceed 0.02. (ASTM E96, Proc. A) Tensile strength to equal or exceed 75 lbs./in.

Class "B" - Facing: Similar to a foil scrim kraft (FSK) vapor barrier - to be an aluminum foil laminated to a treated kraft. Vapor barrier perm rating not to exceed 0.02. (ASTM E96, Proc. A) Tensile strength to equal or exceed 30 lbs./in.

Class "C" - Jacket: All service type (ASJ) to be a white, embossed foil, vapor-barrier laminate. Water vapor perm rating not to exceed 0.02 perms (ASTM E96, Proc. A) Tensile strength to equal or exceed 75 lbs./in.

3. Metallic Covering/Aluminum Jacket:

Where a protective metallic covering or aluminum jacket is called for, it shall be an embossed, .016 gauge aluminum jacket, lapped and banded etc., in accordance with manufacturer's recommendations. Back side of jacket to have an inert coating.

65. ROOF CURBS

A. Fans:

1. Curbs supplied for roof mounted general exhaust fans furnished under this section shall be of the prefabricated type specifically sized to accommodate the supported equipment. Curb material shall match supported equipment material, being either heavy gauge aluminum, galvanized steel, or stainless steel. Curbs shall have continuously welded corners and a pressure-treated 2"x2" wood nailer. Construction shall incorporate 1-1/2" rigid thermal/acoustical insulation securely contained within the shell by means of insulation retainers.

2. Roof curbs shall be a minimum 12" high and shall have an integral perimeter can't. Curbs shall be selected to be compatible with the type of roof involved and constructed to accommodate roof pitch so that supported equipment is dead level.

3. Note that unless indicated otherwise, curbs shall be furnished for all roof mounted equipment specified under this section.

B. Pipe:

1. Roof curbs required for pipe support shall consist of a heavy gauge galvanized steel support element of unitized construction with integral base plate, 3 pound density insulation and a pressure-treated 2" x 2" wood nailer. The unit shall have graduated step boots with stainless steel adjustable clamps, fastening screws and a thermoplastic cover. Where these supports are not appropriate for the type of roof structure/system involved, submit drawings for consideration indicating the type of curbs/supports being proposed.

66. EXHAUST FANS

A. The exhaust fans for this project are listed in the Fan Schedule on the drawings along with all pertinent data, optional accessories, etc. The manufacturers listed on the schedule are considered as a criteria for type, quality, workmanship, etc. Fans meeting the criteria indicated on the schedule and as manufactured by Acme, Greenheck, Jenn Air, Penn or Loren Cook will be considered equal.

67. FAN POWERED TERMINAL AIR BOXES

A. Furnish and install fan powered terminal air boxes where shown on the plans. Units shall have the performance characteristics, size, capacity, etc. indicated on the drawings. Performance characteristics, size, capacity, etc. shall be as indicated on the drawings. Performance ratings shall be based on tests conducted using applicable sections of ASHRAE Standard 36 72. In addition, the boxes shall be certified under the ARI Standard Certification Program and carry the ARI Seal.

B. Unit casing shall be of minimum 26 gauge steel, or equivalent sheet aluminum, and shall have a rectangular air discharge. One-piece aluminum backdraft shall be provided on fan discharge. Dampers shall be factory set and aligned for precise seal. Leak rate shall not exceed two percent at 0.5" static pressure. Note that the primary air inlet collar shall have a circumferential bead to avoid the possibility of slippage at the draw-band connection of the flexible duct connector.

C. Box interior surfaces shall be acoustically and thermally lined with dual density mat faced glass fiber insulation. In addition, the box shall have built-in sound baffle(s) to achieve low sound levels, both radiated and discharge. All exposed edges shall be sealed to prevent erosion. Liner shall be UL listed and meet NFPA 90A requirements.

D. The control air valve shall be integrally mounted and provided with the required actuator. The valve actuator shall be large enough to ensure smooth, precise operation at up to 4" inlet duct pressure. The box inlet connection shall be sized to permit flexible duct attachment to the outside of the connection collar. The box shall be provided with a multi-point inlet sensor with center averaging capable of achieving ±5% volume control with any duct attachment within SMACNA standards. The primary air damper assembly shall incorporate a mechanical stop and the damper blade shall have synthetic, resilient seals. Valve leakage shall not exceed 10 CFM at a 3" static pressure differential.

E. Controls shall be electric as indicated on the drawings and/or described elsewhere in the specifications.

F. Electrically controlled boxes shall be provided with integrally mounted transformers, 24 volt electric actuators and solid-state proportional controls. In addition, supply air sensor and remote-mounting electronic (thermistor sensing) thermostats shall be provided with electrically controlled boxes.

G. Controls will be furnished by the project control equipment supplier and sent to the box manufacturer for factory mounting at the box manufacturer's expense.

H. Fan(s) shall be centrifugal type with forward curved aluminum or galvanized steel wheel.

I. Housing shall be minimum 18 gauge steel and fan board shall be constructed from 16 gauge steel. Motor shall be permanent split-capacitor type, direct drive, three-speed with low voltage starting and shall be permanently lubricated. Motor shall have internal thermal overload protection and temperature rise design criteria shall be less than 50°C at any speed. Motor speed shall be adjustable from a 3 speed selector switch. In lieu of 3 speed capability, the unit may incorporate an SCR controller permitting infinitely variable speed regulation. Motor and fan housing shall be isolated from the box casing. All boxes shall have bottom access door.

J. The coil shall be the hot water type seamless with copper tubes and aluminum fins, galvanized steel casing and flanged duct connection.

K. Note that with installations incorporating ducted returns, provisions shall be made for side access to filters.

L. All boxes shall be provided with fan inlet sound attenuators and externally mounted filter frames with 1 inch deep throwaway filters. The attenuator casing shall be of minimum 26 gauge galvanized steel, lined with high density, mat faced insulation. Exposed edges of insulation shall be sealed.

M. Box configuration shall be for "parallel" airflow. Internal fan power wiring, including fused disconnect, shall be provided so that only one field power connection is required. All electrical components shall be U.L. listed and installed in accordance with the N.E.C. All electrical components, including low voltage controls, shall be mounted in sheet metal control enclosures. The entire assembly shall be UL or ETL listed and constructed to meet applicable recommendations of NFPA 90A.

N. The above described equipment shall be as manufactured by Titus, Trane or Carrier.

68. TERMINAL AIR BOXES

A. Terminal air boxes shall be single duct, variable volume terminal air control units. They shall have pressure independent electronic control and shall be reset, where required, for air flow as indicated on the drawings. Boxes shall have a factory mounted transformer, 24 volt motor-driven damper actuator, volume control damper, and an averaging type inlet air flow sensor to perform as hereinafter specified. Casing and damper shall be of ultra-low leakage construction and the unit shall be tested and rated in an ARI certified laboratory. All materials shall meet applicable UL 181 recommendations and comply with NFPA 90A. In addition, all boxes shall be certified under the current ARI Standard 880 Certification Program and carry the ARI Seal.

B. The box casing shall be constructed of minimum 22 gauge galvanized or zinc coated sheet steel or minimum 0.040 sheet aluminum with minimum 2" long inlet connection collar and a bottom access panel for box and/or coil cleaning. The inlet collar must have a circumferential raised bead to avoid the possibility of slippage at the draw-band connection of the flexible duct connector. Interior casing surfaces shall be thermally and acoustically lined with a 3/4" thick fiber free polymer foam insulation system. All boxes shall have bottom access doors. The insulation material shall comply with the following standards:

UL 181 (Air Erosion)
UL 181 (Mold Growth and Humidity)
UL 723 (Flame and Smoke - 25/50)
ASTM E 84 (Flame and Smoke - 25/50)
ASTM C 665 (Fungi Resistance)

C. The air volume control damper shall be of coated or galvanized, heavy gauge steel with plated damper shaft rotating in Delrin or bronze oilite self-lubricating bearings. Shaft ends shall be marked to indicate damper position. The damper assembly shall incorporate a mechanical stop and the damper blade shall have synthetic, resilient perimeter seals to limit close-off leakage. The damper actuator shall be a brushless DC motor with conditioned feedback.

D. The electronic control components, including a DDC controller, will be furnished to the box manufacturer by the controls contractor to be factory mounted in a metal enclosure on the box. All such controls shall be installed, wired, etc., in accordance with control contractor's printed instructions.

E. The inlet air flow sensor shall be a multi-point, center averaging, flow cross sensing unit. It shall be the type that will amplify the duct VP by a factor of 1.75 and shall have gauge taps for flow measurement. The actuator shall be capable of applying sufficient torque to the damper shaft for smooth, precise operation. Damper positioning shall be through the motor/actuator assembly controlled by the DDC controller referenced above.

F. Installations of terminal air boxes shall have acoustically lined discharge ductwork and/or plenums, where required, to conform to maximum NC levels listed on the drawings. Plenums may either be furnished by the box manufacturer or fabricated by the installer. Sound ratings/performance shall be ARI certified. Plenum lining shall be identical to the lining of the associated box.

G. The terminal units with accessories described above shall be furnished by Price, Titus, Trane, Carrier or Tuttle and Bailey.

H. Hot water reheat coils shall be provided by the box supplier. They shall have galvanized steel casings, minimum 2" copper tubes and non-ferrous fins. Multi-row coils shall be headered to minimize field connections. Coils shall be suitable for operating pressure of 125 psig and shall be leak tested to 300 psig. A full width access panel, readily openable using wing nuts or the like, shall be provided for inspection of and access to the coil if enclosed within the box. Externally mounted coils shall have casing flanged for duct connection. All reheat coils shall be rated based on tests run in accordance with the current ARI Standard 410.

69. GRILLES, DIFFUSERS, DAMPERS, ETC.

A. For a complete listing of all grilles, registers, diffusers, etc., refer to the Air Device Schedule on the drawings. Note that any NC level ratings indicated on the schedule are based on ANSI/ASHRAE Standard 70-1991 and manufacturer's equipment must be tested and rated in accordance with this standard.

B. Grilles, diffusers, registers, etc. as manufactured by Price, whose catalog numbers appear on the drawings, have been used for criteria of type and duty. Equivalent devices furnished by Metal-Aire or Titus will be considered equal. Devices that are of extruded aluminum shall have an etched satin anodized finish.

C. Equip all ceiling diffusers and other supply air devices with equalizing grids and opposed acting volume dampers. Equalizing grids shall have individually adjustable airfoil louvers, spring tensioned. Vanes shall be of extruded aluminum and the frame shall be of enameled steel or aluminum.

D. Ceiling mounted air devices shall be designed for compatibility with the specific type of ceiling system in which they are to be installed. Slot diffusers used with lay-in ceilings shall be furnished with T-bars and shall have cross notches as required. Where fixed/inaccessible ceilings are involved, air devices shall be designed for surface mounting.

E. Note that where perforated face type ceiling diffusers are used, they shall be provided with field-adjustable discharge direction deflectors mounted to the bottom side of the inlet collar in lieu of having equalizing deflectors.

F. Where diffusers or other supply air devices are mounted at or near the bottom face of exposed ductwork, provide an air volume extractor with controller. If such an installation is above an inaccessible ceiling, provide a remote adjustment adaptor securely mounted to the ceiling surface.

G. Primary, duct-mounted manual balancing dampers, where indicated on the drawings and/or required to achieve specified system performance in low pressure ductwork, shall be in accordance with the following:

H. Rectangular...Frame shall be 16 ga. galvanized steel formed to maximize structural rigidity and fabricated with tabbed corners. Blades shall be single skin, 16 ga. galvanized steel with formed edges and longitudinal reinforcement grooves. Axles shall be square or hexagonal and bearings shall be corrosion resistant. Maximum blade width shall not exceed 8" and multiple blade units shall be opposed acting.

I. Round...Frame and blade to be of minimum 20 ga. galvanized steel. Axle shaft shall be square, and bearings shall be corrosion resistant.

J. All dampers shall be suitable for operation to 180°F and all units shall be provided with a locking hand quadrant. On ducts requiring insulation, hand quadrant stand-off brackets shall be provided and, when installed with stainless steel duct systems, dampers and frames/housings shall be of stainless steel construction.

K. On medium/high pressure (SMACNA Leakage Class 2 and above) ductwork installations, all balancing dampers shall be designed, built and rated to operate at a face velocity of 5,000 fpm. They shall incorporate the following features:

Optimum linear balancing performance blade or blades
Gasketed, shaft-mounted non-corroding bushings
Integral shaft-blade assembly
Sheet metal insulation stand-off
Locking blade quadrant with position indicator
Gasketed shaft penetrations
Full fitting body assembly

L. In double wall duct installations, damper units shall be similar to the above but shall be of double wall construction with solid inner liner enclosing the appropriate thickness of fiberglass insulation.

M. All spiral duct system damper units shall be constructed to meet SMACNA Leakage Class 3 performance specifications although tight shut-off is not a requirement. Dampers shall be rated for operation to 200°F. Note that with stainless steel duct installations, damper units shall be of stainless steel construction.

N. Exterior wall louvers shall be the stationary, drainable-blade type weather louvers, as manufactured by Greenheck, whose catalog numbers, material and finish requirements, etc., are indicated on the drawings. Louvers as manufactured by Airolite, American Warming, Arrow, Dowco, Krueger, Ruskin or Louvers and Dampers that conform to these specifications and are considered equivalent will be acceptable.

O. Louver frames and blades shall be of 12 gauge extruded aluminum alloy and assembled completely by welding. Jambs shall incorporate integral downspouts. Units shall have an anodized finish and a factory applied coat of acrylic lacquer. All louvers shall bear AMCA Licensed Ratings seals for both air performance and water penetration.

P. Provide a removable aluminum 1/2 inch mesh wire screen, mounted in an extruded aluminum frame, on the interior of the louver.

Q. Note: Verify and coordinate the exact size requirements of all wall louvers with the general contractor for compliance with the actual dimensions of the corresponding wall and/or sash openings where such louvers are to be installed.

70. UNIT HEATERS

A. Unit heater(s) shall be of the propeller fan type with adjustable horizontal air deflectors or vertical-blow diffusers as required. Capacity and characteristics shall be as noted on the drawings. Casing shall be constructed of die formed minimum 20 gage steel with standard color baked enamel finish.

B. Coils shall be constructed of seamless copper tubing with non-ferrous fins and shall be designed and listed for 150 psi working pressure. Coil capacity shall be rated in accordance with AMCA Standards.

C. Fan blades shall be constructed of aluminum and shall be dynamically balanced. The unit shall be provided with an OSHA approved fan guard.

D. Motor shall be totally enclosed, permanent split-capacitor type with built-in thermal overload protection and shall be permanently lubricated.

E. Equipment shall be in conformance to ISO 9001:2000 standards, shall be CSA certified and manufactured by Rittling, Sterling or Trane.

F. Furnish a UL listed, HP rated, specification grade manual starter switch for field mounting.

71. PROPYLENE GLYCOL

A. Provide the chilled water piping system with a special heat transfer medium as described below. Prior to and during the filling process, follow manufacturer's instructions and the procedures outlined in the following paragraphs.

B. The heat transfer medium shall consist of a solution of clean tap water pre-mixed with the specified percentage (by volume) of an inhibited propylene glycol based industrial heat transfer fluid. This fluid shall be specifically formulated for use in HVAC piping systems and shall contain corrosion inhibitors and buffers as well as an anti-foam agent.

C. This solution shall be premixed by the chemical manufacturer, shall have a distinctive color for easy identification, and shall have a pH between 8.0 and 9.5.

D. Preparation For Fill:

1. Prior to filling the system it shall be tested, cleaned and flushed as previously specified under specification Items TESTING and PREPARATION OF SYSTEMS. If grease and/or oil was used in fabrication and erection of the piping, trisodium phosphate (TSP) or other approved cleaning agent shall be used as recommended by published instructions of the manufacturer/supplier.

2. Note: On existing installations where the heat transfer solution is to be replaced, the contractor shall include the cost of draining and proper disposal of the old solution as well as testing, cleaning and flushing the system. Proper disposal involves the legal disposal of the solution and obtaining the disposal manifest which must be subsequently turned over to the owner within seven (7) days. A copy of the manifest shall also be submitted to the engineer at this time.

E. System Fill:

1. After the final flush the glycol solution, as specified above, shall be introduced into the system. It shall be brought to the job premixed in bulk tank truck or storage drums. The contractor shall provide fittings, etc. for the fill procedure as recommended by the fluid supplier and/or as detailed.

2. The contractor shall be responsible for pumping the glycol solution into the system. During the fill process the contractor shall check repeatedly, as required, to insure that all air is forced from the system and that all coils, tube bundles, etc. are completely purged.

3. After the system has been filled, purged of air and the solution circulated for a minimum of twelve hours, a sample shall be taken and submitted to the fluid manufacturer for analysis.

4. The analysis shall verify solution quality, concentration of corrosion inhibitors, presence of anti-foam agent and buffers, propylene glycol concentration and absence of contaminants.

F. Miscellaneous:

1. The fluid manufacturer's report shall be submitted to the Engineer for review prior to its inclusion in the project submittal records furnished to the Owner.

2. The piping system, within the mechanical room(s), etc., shall be clearly labeled, as specified in item PIPE AND DUCT MARKING, including indication of the specified glycol percentage.

G. Manufacturer:

1. The heat transfer fluid shall be Dow Chemical Co.; Dowfrost HD, Covalent Laboratories; ColdFLOW HTP, or equal by Union Carbide.

72. ADJUSTABLE FREQUENCY MOTOR CONTROLLER

A. General:

1. Provide an adjustable frequency speed control package for the motor driven equipment, where shown on the drawings, with input power at the voltage and phase as indicated. The output power rating of the controller shall not be less than the full load rating of the motor, plus 5%. Controller shall be the latest design solid state device with reduced harmonics and ultra-low capacitance, listed by UL or CUL and mounted in an enclosure as described in the following.

2. Manufacturer warranty shall be 36 months commencing from the date of certified start-up and acceptance.

B. Manufacturers:

1. Adjustable frequency controllers shall be manufactured by Yaskawa HV600 or approved equal by, Eaton/Cutler-Hammer, or Allen Bradley.

C. Operating and Control Features:

1. The controller shall be capable of varying its output in response to a 0-10 VDC/4-20 mA signal, as provided. The controller supplier shall coordinate type of interface required with the Building Automation Contractor (BAC). Provide a control transformer, oversized by at least 100 VA, within a housing. In addition, provide controls, mounted in the face of the enclosure.

2. Speed control shall be linear from 10 to 100 percent of full speed. Both minimum and maximum speed pre-set limits shall be adjustable. Controller output frequency shall not change as a result of up to a 10 percent input voltage fluctuation. The acceleration and deceleration period shall be fully adjustable. Provide current limit function to avoid excessive automatic acceleration and deceleration when an overcurrent condition exists. The volts-to-hertz ratio shall be adjustable. Critical frequency rejection points (minimum of 3) shall be provided and shall be programmable, with deadband available.

3. The speed control output transistors shall be Insulated Gate Bipolar Transistor (IGBT) type for PWM design to provide a switching frequency of up to 15 kHz in order to eliminate the audible noise associated with PWM designs. The audible noise emitted from the motor must be within 5 dB of the normal motor noise during across-the-line operation at all frequencies within the audible spectrum (up to 15 kHz operating frequency). The controller must be selected for operation at or above 8 kHz without derating to satisfy the conditions for current, voltage, and horsepower as indicated on the equipment schedule.

4. The controller design shall permit disconnection of power from the input or output feed, with the controller running under load, without damage to the controller components. In addition, it shall be designed and built to withstand an output line short (phase-to-phase or phase-to-ground) without damage to the controller components. The controller shall shut down on short circuit and detection of any of the following conditions: current 150 percent above rated current; phase loss; input overvoltage and undervoltage; high internal temperature, ground fault and under frequency.

5. The controller shall have an automatic restart function that will attempt restart (programmable up to 10 attempts) after the unit trips off when power is lost. A time delay between restarts shall be provided. The unit shall not attempt to restart more than five times in the automatic mode. In addition, the controller shall have a “power dip” ride-thru feature of at least 2 seconds (120 cycles) to prevent unnecessary trip-out due to momentary input power interruptions.

6. The drive system (motor and controller) shall provide a minimum power factor of 95 percent at power input throughout the speed range, and a minimum efficiency (output-to-input line) of 94 percent at 100 percent speed and 70 percent at 50 percent speed.

7. The controller shall be in compliance with IEEE519. Total Harmonic Voltage Distortion (THVD) for the controller shall be no greater than 5 percent, not including pre-existing conditions, at point of common coupling. The supplier of the controller shall provide a DC Link Choke or line reactor to ensure compliance (In order to assure compliance with maximum allowable THVD variations, information concerning: point of common coupling (PCC) as well kVA; secondary voltage; and impedance of the transformer involved will be furnished as required).

8. The controller shall meet the requirements for Radio Frequency Interference (RFI) above 7 MHz as specified by FCC regulations, part 15, subpart J, for Class A devices (EMI/RFI filter required).

9. The following additional functional features for the controller shall be provided.

   Manual bypass shall be incorporated on all units. It shall be a complete bypass of the controller to allow the motor to start and stop through a bypass contactor (starter). Bypass design shall be a 3-contactor arrangement, (input contactor, output contactor and bypass starter) with door-interlocked circuit breaker. The output contactor and bypass starter must be mechanically and electrically interlocked. Bypass circuitry shall be provided by the controller manufacturer as a part of the controller package. All safeties (smoke, freeze stats, motor overloads, etc.) shall remain functional in the bypass mode. Controller shall be able to start into a rotating load to facilitate transfer from bypass operation.

   Output Overload Relay B Provide an overload relay for motor protection with manual reset pushbutton, all inside the enclosure. Provide the proper size overload elements to match motor nameplate ratings before allowing the motors to be put into service. Provide overload for each motor where multiple motors are served by one controller.

   Enclosure - Unless otherwise indicated, the controller shall be supplied in a ventilated, NEMA 1 enclosure. Note that the VFD, Bypass, Circuit Breaker and all related components, filters, overloads, etc., shall be mounted within this single enclosure.

D. Submittals:

   1. Provide complete wiring diagrams to the BAC for use in interfacing controlled equipment. Also submit these wiring diagrams with the shop drawings.

E. Installation and Start-up:

   1. The HVAC Contractor shall be responsible for the mounting of the controller as well as all set-up and commissioning. Power wiring will be performed by the Electrical Contractor.

   2. Each controller shall be mounted to a Uni-strut frame where indicated on drawings. Provide an 8” square by 3/8” painted steel base plate at the bottom of each vertical Uni-strut channel to distribute weight on the floor. Note that small units may be direct mounted to the casing of an air handling unit being served when such installation is approved by the AHU manufacturer.

3. Control start-up shall be under the supervision of the manufacturer's representative. Start-up services shall consist of an initial start-up programming and check out of the controller for proper operation. After start-up, the representative shall also work with the BAC as part of commissioning the temperature control system. In addition to start-up services, the manufacturer's representative shall provide a minimum of two (2), four-hour training classes at the job site for Owner instruction regarding operation, maintenance and servicing.

4. A certified start-up report for each controller shall be furnished to the contractor by an authorized representative of the controller equipment manufacturer.

73. CHIMNEY AUTOMATION SYSTEM

Part 1: General

A. Summary

1. The intent of this specification is to provide a mechanical venting system that will function over variable flow and maintain specified draft at all times. The following are components of the system:

ENERVEX CASI, Chimney Automation System, listed to UL378, Standard for Draft Equipment and UL705, Standard for Power Ventilators and UL60947, Standard for Low-Voltage Switchgear and Controlgear.

Electrical connections.

Stack Connections.

B. Codes and Standards

1. The following published specification standards, tests, or recommended methods of trade, industry or governmental organizations apply to work in the section:

UL – Underwriters Laboratories.

National Electrical Code.

C. Submittals

1. System vendor shall coordinate equipment product data submittal sheets and shall provide a comprehensive set of interfaced drawings and stack design calculations, which shall serve as the basis for system evaluation by consulting engineer.

2. Submit the following to the Owner's Representative.

   Comprehensive set of mechanical venting calculations based on the Chimney Design Equation published in the ASHRAE Handbook. Calculations must show flue gas volumes, pressure losses, fluctuations in natural draft at different loads and seasonal temperatures as well as estimated temperatures in each venting section to assure compliance with fan temperature rating and detect potential condensation issues. The total draft range must be documented by mechanical venting calculations based on the actual ASHRAE degree range for the geographical location of the installation. The calculations must show the draft over the entire firing range at low, medium and high design temperatures.

   Power Venter descriptive literature, dimensional diagrams, and electrical diagrams.

   Control descriptive literature, dimensional diagrams, and electrical diagrams.

   Specification review with respect to submitted equipment identifying all areas of compliance and exceptions.

   Certification of listing for the actual application by recognized testing laboratory.

3. Manufacturers not named in these specifications, but those that have received prior approval by the consulting engineer as required within 10 days prior to bid date, shall be permitted one opportunity to receive formal submittal approval. If the consulting engineer does not grant this approval, the contractor shall submit on the manufacturer's name in these specifications only or the contractor will be charged for the submittal review time for alternate manufacturers.

4. In the event the Contractor wishes to submit an alternate mechanical draft system manufacturer for consideration by the Engineer/Owner, the Contractor shall submit to the Engineer/Owner, a minimum of 14 days prior to bid date, a complete technical proposal based on the alternate system, including equipment brochures, detailed technical data sheets, detailed drawings, detailed wiring diagrams, detailed operational description, comprehensive set of mechanical venting calculations based on the Chimney Design Equation published in the ASHRAE Handbook, evidence of manufacturing capability and evidence of third-party listing. If any of the above materials specified for the product substitution proposal are not included in the product substitution proposal, those proposals shall be considered non-responsive and incomplete and shall be rejected by the Engineer/Owner.

D. Quality Assurance

1. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture and shall be of a standard catalog product.

2. Mechanical draft system guaranteed to operate satisfactory and efficiently and to provide a constant draft that does not fluctuate more than +/- 0.01" W.C. under stable load conditions.

3. Scheduled equipment performance is minimum capacity required.

4. Scheduled electrical capacity shall be considered as maximum available.

E. Manufacturer Warranty

1. All equipment is to be guaranteed against defects in materials and/or workmanship for a period of 24 months from the date of installation, or 30 months from date of shipment, whichever occurs first. The warranty shall be provided by the equipment vendor and shall include the parts necessary to repair or replace all defective parts and materials.

F. Operating and Maintenance Manuels

1. Provide to Owner's Representative complete Operation and Maintenance manuals with product literature on the power venter and controls, dimensional and wiring diagrams.

Part 2: Products

A. Manufacturer, Chimney Automation System

1. Furnish ENERVEX Chimney Automation System(s) with design volume and design pressure as scheduled on the drawings and specified. The entire system must conform to UL378, Standard for Draft Equipment, UL705, Standard for Power Ventilators and UL60947, Standard for Low-Voltage Switchgear and Controlgear.

B. Description, Chimney Automation System

1. The power venter design shall be of a true inline design with intake and exhaust centered on a horizontal axis. The power venter housing shall be type 316L stainless steel with a minimum thickness of 0.063". The power venter shall be of the direct drive design and rated for use with temperatures up to 1400oF (760oC). The drive unit consisting of the impeller and the motor shall be removable from the housing without having to remove the entire fan from the chimney system. The power venter must be listed for use with all types of heating appliances, and this shall be acknowledged in the installation manual.

2. The backward inclined impeller shall be constructed of 316L stainless steel. It must be balanced statically and dynamically with balancing weights being an integral and non-removable part of the impeller.

3. The motor must be an air-cooled, maintenance-free variable speed permanent magnet motor with pre-lubricated and sealed ball bearings. It must have an integrated insulated rotor and shaft system that protects the bearings from damages by keeping discharge voltage peaks on a bare shaft surface below 4 volts. The motor must be sensorless and rated at 92% efficiency (motor and controller) and able to operate as low as 50 RPM when controlled via an externally mounted motor controller to allow operation at elevated temperatures. The motor has integrated protection against overloading, blocking over and under voltage and over-heating.

4. The modulating fan control, EBC24, must be a true PID-based control with infinitely variable speed settings and in a NEMA 1 rated enclosure. It shall interfere with the operation of the heating appliances by preventing burner operation during emergencies where a mechanical or electrical problem occurs.

5. The features must be part of the compliance with UL378, Standard for Draft Equipment and UL60947, Standard for Low-Voltage Switchgear and Controlgear:

128 x 64 pixel LCD screen

32-Bit microcontroller with internal 512 kB FLASH-memory, 32 MB External SPI FLASH

Two RS485 ports for expandable functionality and connectivity

Integrated BUS interface to allow for future expansion.

Programmable microprocessor for selective programming of, but not limited to, draft, intermittent vs. continuous fan operation, purge times, sensor sensitivity, alarm limits and delays, manual overrides, low/high limit fan speeds via the operating panel.

A standard board that interlocks with up to 2 boilers/appliances so a call for heat activates the power venter and releases the individual burner once the pre-set draft has been established.

“Plug-and-Play” self-check that detects connections, setting requirements and accessories during each start-up.

An integrated and programmable proven draft function that can be set for automatic and manual reset.

Bearing cycle activation every 7 days if the power venter has not been operating during the past 7 day period.

A normally open (NO) contact is available within the control to activate a visual or audible alarm (by others), or to interlock with a Building Management System.

An alarm function that will display the fault code on the LCD display and signal an audible alarm (by others). The control shall log the last 10 fault codes.

Ethernet port for TCP/IP networking

Graphical web interface for monitoring the 0-10V in/outputs, alarms, and set points.

Upgrade of firmware can be done via the web interface to ensure controller is always up to date.

Remote monitoring and management capabilities standard, including the ability to adjust system configuration remotely.

Ability to upload or download configuration file via web interface or USB.

Adjustable pre-purge, so the control will allow the power venter to prime the mechanical room prior to appliance startup.

Adjustable post-purge, so the control will allow the power venter to operate for up to 3 minutes after the burner has shut down.

USB port for firmware upgrade and data logging

6. The bi-directional pressure sensor, XTP, shall be certified for use with oil- or gas-fired appliances and shall include a chimney probe along with tubing for installation in the chimney or stack as shown on the manufacturer's submittal and feature:

   The range of operation shall be -1.0 - +1.0 inWC, with a minimum accuracy of +/-0.25% of span.

   The pressure drift shall be less than +/- 0.25% full scale, the offset longtime drift (1 year) shall not exceed +/- 0.005 inWC and the sensor response time shall be less than 0.25 seconds.

7. Motor speed controller (MSC), ENERVEX EDrive, must be factory programmed and provide with the following specifications:

   All features shall be included in the motor controller enclosure, which shall be NEMA 4x rated.

   Sensorless Vector Control type that is suitable for all types of high-efficiency Permanent Magnet Motors as well as standard induction motors.

   Internal Category C1 EMC filter and brake chopper and have flying start capability.

   Analog input

   Built-in keyboard and Bluetooth connectivity. Programmable via PC with OptiTools Studio.

   Able to operate in environments of up to (50°C)

   Rated for 150% overload for 60 secs and 175% for 2 secs.

C. Performance, Chimney Automation System

1. The Chimney Automation System will ensure that the draft set-point (in. W.C.) is reached and maintained within 20 seconds of burner light-off. This can be measured with an external manometer at the appliance outlet.

2. Ramp-up and ramp-down time of the fan will be no more than 20 seconds.

3. The Chimney Automation System will maintain the draft set-point to within +/- 0.01" W.C.

4. The control will shut down the appliance(s) within 15 seconds if draft is not maintained as stated above.

D. Sequence of Operation

1. Each heating appliance must be interlocked with the control. Upon a call for heat, the control will activate the power venter to establish draft in the chimney system. Once the draft set-point is reached, the control will enable the appliance(s) calling for heat to fire. This sequence is repeated every time an appliance calls for heat without the control interrupting the sequencing of the heating appliances.

2. When an appliance shuts down, the power venter will adjust its speed to satisfy the draft set-point. Once the last appliance has shut down, the power venter will continue to run in post-purge mode for a set period of time to remove residual flue gases.

3. If proper draft cannot be maintained because of a mechanical or electrical failure, the control will go into alarm mode and the integrated proven draft function will shut down all appliances within 15 seconds. While in alarm mode, the control constantly monitors the draft. If the failure corrects itself or is corrected via intervention, the system will restart automatically.

4. If the failure is not corrected, the control will utilize the integrated Operating Priority function. During a following call for heat, the control determines if one or more appliances can operate safely at the given draft conditions. If so, the heating appliance(s) will be able to operate without chimney fan operation. After two (2) hours, the control verifies chimney fan operation and, if present, the control will go back to normal operation. Otherwise, the control will continue to operate in Operating Priority mode. The self-check is repeated every two (2) hours infinitely. During a period without power venter operation, the control is in alarm mode to notify the Building Management System.

5. If the power venter is out of commission for seven (7) consecutive days, the Bearing Cycle Activation function will allow the fan to operate at a low speed for a short time. This is automatically repeated every seven (7) consecutive days the chimney fan does not operate.

E. Stack Connection

1. Furnish slip connection type as required.

F. Relay Board for EBC24 Control (for 2 boilers or more only)

1. Furnish an internal relay to interlock multiple boilers with eh EBC24's safety functions.

G. Balancing Baffles

1. Furnish balancing baffles, type BBF is constructed of 316L stainless steel housing for each boiler/appliance where specified by manufacturer if applicable. The BBF is UL listed for UL 378 Draft Equipment and in Canada for ULC/ORD-C378 Draft Equipment. Any alternate baffles shall carry the same listings.

H. Electrical Requirements

1. Power supply shall be:

   To the EBC24 control: 1x120V AC, 60 Hz.

   To the motor speed controller: As shown on schedule.

2. All wiring shall be in accordance with the National Electrical Code.

I. Alternate Manufacturers

1. All product substitution proposals on the basis of alternative mechanical draft system manufacturers must include detailed information regarding product performance and include a listing report by a nationally recognized testing laboratory that verifies that the entire system is in compliance with UL378, Standard for Draft Equipment, UL705, Standard for Power Ventilators and UL60947, Standard for Low-Voltage Switchgear and Controlgear and meets all the specifications listed. It is the Contractor's responsibility to assure that a substituted system meets the complete detailed functions specified herein. If a substituted system does not provide all these functions, the Contractor will be fully liable for bringing the installed system into compliance or replacing it with the originally specified manufacturer's system.

J. Schedule

Unit Tag	Servicing	Manufacturer	Model No.	Electrical Data			RPM	HP (kW)	Notes
				Amps	Volts	Phases			
BEF-1	B-1, B-2	ENERVEX	TDF 250	7.8	120	1	2000	.5 (.37)	1, 2, 3 ,4

K. Notes:

1. MSC to be provided by fan manufacturer per UL listing

2. Provide fan disconnect

3. Fan manufacturer to provide modulating pressure control to maintain pressure set point

Part 3: Execution

A. Installation

1. Complete structural, mechanical, and electrical connections in accordance with manufacturers' printed instructions.

2. Installing contractor shall install all Chimney Automation System components as indicated on drawings, including low voltage shielded wiring from XTP sensor to EBC24 controller and line voltage wiring from EBC24 to the power venter. He must ensure the following.

   Allow satisfactory arrangement in the space available.

   Verify fan operating voltage is the equivalent to the supply voltage AND rated voltage of the MSC.

3. Connecting to stack:

Install per plans and in accordance with manufacturer's printed instruction.

B. Operating Tests, Start-Up, And On-Site Services

1. System vendor's service organization shall employ senior service technicians having experience in all aspects of trouble shooting, corrective service, and preventive maintenance O&M reporting.

2. After installation is completed:

Test the operation of the chimney automation system and:

Increase and decrease draft setting to verify the mechanical draft system reacts as specified.

Increase and decrease firing rate to verify the mechanical draft system reacts as specified.

Verify that the ramp-up time during start up does not exceed 20 seconds. This is defined as the time from the burner is released until the draft settles at the specified draft value.

Use an external manometer (draft gauge) to verify that the draft does not drift more than +/- 0.01" W.C. during a stable load.

Test safety control by firing boiler and:

Shut off the power venter.

Shut off the control.

3. Provide services of factory representative of chimney automation system manufacturer to:

Confirm proper installation of power venter and controls.

Start-up and adjust control and balancing baffles.

Test individual controls for proper operation.

Set draft for specified operation.

Test safety system.

4. Submit a written report signed by manufacturer's authorized representative, confirming that safety and operating controls have been properly installed.

C. Operating Instructions

1. Instruct Owner's Representative and designated personnel in the proper operation and maintenance of the packaged system.

74. STACK FOR GAS BURNING BOILER

A. General

1. Manufactured chimneys for category II, III, & IV applications where the appliance is a natural gas burning boiler.

B. Reference Standards

1. UL 1738/ ULC S636-95 – Standard for Venting Systems for Gas-Burning Appliances Categories II, III, and IV

2. ANSI Z228.1 (NFPA 54) – The National Fuel Gas Code

3. ASHRAE – Handbook, Equipment Volume, Chapter "Chimney, Gas, Vent, and Fireplace Systems"

4. NFPA 211 – Standard for Chimneys, Fireplace, Vents, and Solid Fuel – Burning Appliances

5. SMACNA – HVAC Duct Construction Standards – Metal and Flexible

C. Products

1. Provide double wall metal vent, tested to UL 1738 and UL listed for use with category II, III, and IV gas fired appliances.

2. Vent shall be rated for up to 550° F continuous fire and 40" water column positive pressure.

3. Fabricate with 1 inch minimum air space between walls.

4. Construct inner liner of 24 gauge minimum corrosion resistant 316 stainless steel in accordance with UL listing.

5. Construct outer shell of 24 gauge minimum type 430 stainless steel.

6. Vent shall be listed for 2" clearance to combustibles and 0" clearance to non-combustibles.

7. Provide all required accessories for a complete system each bearing factory applied UL Label, including but not limited to supports, appliance connectors, drain fittings, and terminations.

D. Installation

1. Install in accordance with the manufacturer's instructions.

2. Install in accordance with recommendations of ASHRAE – Handbook, Equipment Volume, Chapter "Chimney, Gas, Vent, and Fireplace Systems and ANZI Z223.1, (NFPA54).

3. Install breechings with a minimum number of joints. Align accurately at connections with internal surfaces smooth.

4. Support breechings from building structure, rigidly with suitable ties, braces, hangers, and anchors to hold to shape and prevent buckling. Support vertical vent as required to adjacent structural surfaces. Refer to SMACNA HVAC Duct Construction Standards –Metal and Flexible for equivalent duct support configuration and size.

5. Pitch breechings (1/4" per linier foot) with positive slope up from equipment to chimney or stack.

6. Maintain UL listed minimum clearances from combustibles.

7. Inner liner joints shall be sealed by use of Vee Bands and Silicone Sealant.

8. Assemble parts and accessories as required for complete installation.

9. Chimneys extending above roof surfaces must terminate as required by local code, or as required in NFPA 211.

10. Level and plumb the vertical stack.

11. Clean breeching and chimney during installation, removing dust and debris.

12. At appliances, provide slip joints permitting removal of appliances without removal or dismantling of breechings or chimneys.

13. All parts exposed to the outside air that are fabricated from aluminized steel shall be protected by a minimum of one base coat and one finish coat of paint, such as Rust-O-Leum, clean metal primer and appropriate topcoat, or equivalent. Paint to be supplied and applied by installing contractor.

75. TEMPERATURE CONTROL

A. General

1. Furnish and install, as hereinafter specified, a complete microprocessor-based building environmental control, automation, and monitoring system to perform control functions in relation to a programmed strategy and the status of the data environment. It shall incorporate an integrated DDC system of temperature controls and shall be open protocol utilizing the ASHRAE standard of "BACnet" communications. The installation shall be complete in every respect including all labor, materials, equipment, and services necessary. The temperature control system for the project shall be an extension of the Owner's existing iVu system. A new iVu Express CIV-OPNEXP server will be required and will need to be located in the Administration Building Server Room.

Both Trane and Carrier equipment is specified. Controls for each vendor must be BACnet compatible. All wiring and programming will be the responsibility the Building Automation Contractor.

The Building Automation Contractor (BAC) shall be by invitation only and shall be restricted to the vendors listed below. Point to Point Systems is the Base Bid Temperature Controls Vendor. Also see Bidders Proposal Form for Temperature Controls Alternates H-1 & H-2.

Chris Brown
Point to Point Systems
620 East First Street
Dayton, OH 45402
W: 800-685-2082
M: 937-902-6148
E: cbrown@P2Psystems.net

Doug Habegger
Controls Division Manager
Habegger Commercial Group
W: 513-224-8050
M: 513-266-7284
E: doughabegger@habeggercorp.com

Tim Spencer
Hobbs Industrial Piping
2516 Nordic Road
Dayton, Ohio 45413
W: 937-818-5065
M: 937-604-3976
E: tspencer@hobbsindpiping.com

2. The building automation and control system shall consist of all controllers, sensors, thermostats, control valves, automatic dampers and actuators (where indicated in the following description of operation and shown on plans), switches, etc., along with the control panels and all necessary actuators as well as electronic and electric relays to fulfill the intent of the following specifications and description of operation.

3. The required controllers for such items as terminal air boxes, fan powered terminal air boxes, etc., shall be furnished by the BAC and shipped to the box manufacturer for mounting and wiring unless specific arrangements are made to the contrary.

4. All temperature control/building automation system wiring including any wiring items required by the BAC shall be provided by the BAC unless specifically designated, either on the electrical plans or in the electrical specifications, for such work to be done by the electrical contractor. All wiring by the BAC shall conform to the National Electrical Code and shall be installed as indicated in the electrical specifications, notes, and/or plans.

   Low voltage wiring (less than 50 volts) shall be run with insulated conductors in metal conduit where exposed, and in metal conduit or with plenum-rated cable where concealed. All wiring in conduit must be color coded and tagged and conductors shall be minimum 20-gauge, 150 volt rated. Cable shall be installed with appropriate wire ties, hardware, supports, etc., for open wiring runs. All such wiring shall be run in rigid galvanized steel conduit or E.M.T.

   Power wiring required for DDC controllers, transformers, actuators, etc. shall be provided by the BAC unless it is called for in the electrical specifications or shown on the electrical drawings.

5. Bulb wells (for fluidic sensing devices) and automatic valve bodies shall be installed in the pipelines by the piping contractor. Flare nuts, etc. required for the automatic valve installation will not be the responsibility of the BAC.

6. The BAC shall be responsible for the furnishing and engineering drawings that indicate the interlocking of the external control equipment internal control equipment and also for drawings showing wiring inherent to the building automation system (including internal wiring diagrams of equipment to be interlocked with the building automation system). The prime heating, ventilating and air conditioning contractor shall furnish all equipment wiring diagrams to the BAC for inclusion with the building automation wiring diagrams. A final review will be done by the Engineer. A complete description of the operation, keyed to the building automation wiring and general control diagrams, shall be included with this submittal.

7. Note that the BAC shall submit, prior to the award of contract, a system architecture drawing showing all DDC Controllers. Included with the drawing shall be product technical literature on all Controllers and the Operator's Workstation, including software.

8. No billing submitted for services performed, material shipped, stored, delivered, and/or installed will be authorized for payment until the completed submittals have been reviewed by the Engineer. This stipulation shall not preclude or interfere with the orderly progression of the project as delineated in the general and/or special conditions portions of these specifications.

B. System Outline

1. The following is a listing of the building equipment to be controlled by the BAC system under this section of the work.

AHU & RTU unit Control
Fan Powered Terminal Box Control with Reheat
VAV/CV Box Control with Reheat
Zone Damper Control
Pump Control
Boiler Control
Unit Heater Control
Exhaust Fan Control
Automation (Point Description) Index

C. Control System Features

1. The following list indicates features or capabilities that shall be incorporated and/or included as part of the building automation and control system.

2. The system database shall be field programmable by the user. The field programmable control capabilities of the system shall include, but not be limited to, the following:

   Optimum Start/Stop
   Demand Limiting
   Scheduled Occupancy Routines Including Holidays
   Hot Water Reset
   Time of Day Routines
   Day/Night Setback
   Chiller Optimization
   Boiler Optimization
   Chilled Water Reset
   Free Cooling
   Enthalpy Based Economizer
   Lighting Control
   History Logging of the Data Environment
   Custom Tailored Reporting
   Accumulating Equipment Run Time
   Air Distribution System Static Pressure Control
   Variable Air Volume Fan Tracking
   Fluid Flow Measurement and Control Alarming
   Programmed Restart of Building Systems
   Direct Digital Temperature Control
   PID Control Loops Adaptive Control Strategies
   Critical Condition Alarming

3. The system shall provide user capability for altering analog values as required.

4. The system shall provide user capability to place programs in a non-active status without eliminating programs from software.

5. Programming and read-out format shall be in English language.

6. The system shall provide a data history of all points in the system in increments selected by the user.

7. The system shall provide data acquisition and logging with mathematical equations transferred to variables for programming inputs and outputs.

8. Provide all field devices including sensors, actuators, conduit, and wiring in the facilities shown on the drawings to fulfill the requirements of the approved Input/Output point listings and/or the following specifications. A complete Input/Output point listing shall be provided as part of detail design submittal by the BAC. The listing may also be in the contract documents. Points not shown on the points list, but required to meet the specified sequence of operations, shall be provided by the BAC.

9. Provide sensors at various locations as required to furnish input to the microprocessor for system control, data history, and trouble diagnosis. The sensors shall be provided in accordance with Input/Output schedules or as design sequences dictate.

10. Provide full factory training of operating and maintenance personnel prior to completion of the installation. Training provisions shall be for at least three (3) people for a period of two (1) four-hour days. Training periods shall be from 7:00 A.M. to 4:00 P.M. or 8:00 A.M. to 5:00 P.M. weekdays.

11. Provide complete detailed shop drawings for review and approval prior to any installation. Shop drawings to include; where applicable, the following: Plan view layouts, Input/Output point listings, point to point wiring diagrams, material list, and product data sheets, providing physical dimensions and technical information. In addition, provide documentation of all programming.

12. Provide operational testing of the microprocessor controller and complete performance field test of the entire control system with certification of performance.

13. Provide all power supply wiring to sensors where required. Shielded wiring and capacitors shall be utilized to eliminate "Noise" problems.

14. Where applicable, provide a sufficient number of Input/Output units as determined from the Input/Output schedules for each system. This number shall include a 10% expansion capability for each system for future Input/Output requirements.

15. The BAC shall provide a minimum three (3) year warranty of the microprocessor controller part of the control system with a guarantee of repair or replacement and operation restored to normal, within twenty-four (24) hours of failure, by trained factory service representatives. In addition, the BAC shall provide the specified warranty on the remainder of the system starting from the date of substantial completion, as noted at the end of this item under “Warranty”.

D. Products

1. General:

Materials and equipment shall be essentially the catalogued products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's latest standard design that complies with the specification requirements. Where two units of the same class of equipment are required, these units shall be products of a single manufacturer. In addition, the component parts of the system shall be the products of the same manufacturer wherever possible. Each major component of equipment shall have the manufacturer's name and address and the model and serial number on a nameplate securely attached in a conspicuous place.

The equipment utilized for control work on this project shall conform to the following applicable equipment specification descriptions.

All standalone DDC controllers, including terminal unit controllers, shall use the same programming language, and shall be capable of "Peer to Peer" communication. (Standalone controllers shall not be dependent upon the operation of the main server unit to operate and/or communicate with other stand-alone controllers.

2. Microprocessor Based Controls:

Power Failure and Automatic Restart:

Should back-up as well as normal electrical service fail, the system shall provide for an orderly shut down of CIU and peripherals without the loss of the contents of memory, registers or machine status. All field hardware (HVAC) shall assume a fail-safe normal position.

Power Failure Recovery:

When recovering from a power failure, the system Automatic Restart Routine shall automatically read the clock and, without human intervention, shall perform the following functions.

Control Dampers:

Where control dampers are required, they shall conform to the following: Damper frames shall be minimum 16-gauge galvanized steel hat channel. Damper blades shall be minimum 16-gauge roll-formed galvanized steel. They shall not exceed six (6) inches in width and shall incorporate mechanically attached edge seals. Dampers and seals shall be suitable for temperature ranges of 20□ to 200□F. Dampers shall be minimum leakage type. Maximum leakage at a static pressure of 4" w.g. shall be 1/2% for opposed blade dampers and 1% for parallel blade dampers. Blades shall rotate on square blade pins. Bearings shall be oil impregnated type and all accessories shall be bronze on zinc plated steel. Dampers shall be sized as shown on the drawings.

Actuators for control dampers shall be positioned for fail-safe operation. See damper and valve actuator description and specifications immediately following Control Valves.

Control Valves:

Valves shall be suitable for actual pressure and temperature conditions. Valve body pressure rating and connection type (screwed, flanged or flared) shall conform to project pipe and valve specifications. Generally, they shall be globe type with equal percentage plug, replaceable seat, and stainless-steel trim. However, control valves for fan coil units and/or terminal air box coils may be ball type with characterizing disc and stainless-steel ball. All control valves shall be sized by the BAC and guaranteed to meet specified load and performance requirements without excessive pressure drop.

Globe type valves used in confined locations shall have back seating features for repacking under pressure. If back seating is not available, provide ball valves for the supply and return to each control element.

Note that actuators for heating system valves shall be positioned to provide heat upon failure of operation. See subsequent paragraph for actuator description and specifications.

Damper and Valve Actuators:

The actuators for all control valves and dampers shall have ample capacity to handle required loads under all normal operating conditions. Damper actuators shall have single or multiple stops as required to satisfy the desired sequence of operation for the system being served. The actuators shall be microprocessor-controlled motors with conditioned feedback utilizing brushless DC motor technology and shall be capable of seating against 50 PSI pressure with no power applied. They shall be UL listed under Standard 873 and shall have a current limiting circuitry or microprocessor overload protection. Note that for rooms requiring monitored positive or negative pressure control, damper motors shall be double fast acting (3-1/2 second through 90º angle of rotation.) Actuators shall be capable of providing proportional response to a 2 to 10 VDC or a 4 to 20 mA control output.

Actuators for dampers on air handling units shall be sent to the manufacturer for mounting at the factory unless specified to be furnished by the air handling unit manufacturer.

Temperature Sensors:

Provide wall mounted space temperature sensors with setpoint adjustment, override, and LCD.

E. Shop Drawings, Misc. Submittals, Etc.

1. Shop Drawings: Furnish shop drawings which shall include plans, sections of equipment, and control spaces identifying and indicating proposed equipment locations, layout, and arrangements of items of equipment, control panels, accessories, piping, permanent label nomenclature, and any other items that must be shown to assure a coordinated installation. Drawings shall include engineering drawings which shall depict the interface of the field equipment to the controller. These drawings shall reference typical wiring diagrams which also shall be submitted. The typical wiring diagrams shall detail the sensor characteristics. Special wiring requirements shall also be depicted as well as the termination terminal numbers. Drawings also shall include adequate clearance for operation, maintenance, and replacement of operating equipment devices. If equipment is disapproved, revised drawings to show acceptable equipment submitted. Piece-meal submittal of drawings or marked-up contract drawings or copies are not acceptable and such submittals will be returned without review. Drawings shall fully show and describe operation and manual procedures available to operating personnel to achieve proper operation of the building upon complete failure of the microprocessor controller.

2. As-Built Control Diagram: Provide on permanent, non-fading material an "as-built" copy of each revised wiring and control diagram, sealed by plastic laminate at each respective equipment location. Provide control adjustment procedures as part of the posted, "as-built" diagrams. Provide a detailed sequence of operation for each system.

3. Operation and Maintenance Manual: Provide two (2) sets of operation and maintenance manuals for all items of equipment listed under "Manufacturer's Data". These manuals shall provide full hardware and software support documentation. They shall be bound in 8½" X 11" hard backed binders.

F. Sequence of Operation: See schematics and notes on drawings

1. Automation (Point Description) Schedules: Various items of mechanical equipment shall be monitored, controlled, alarmed, etc., as previously described under the listing of features for the control system and its field programmable control capabilities. Note that to facilitate checking and cross referencing, a summary of these items or "points" is compiled in a schedule or group of schedules.

G. Adjustments and Final Demonstration

1. After the system is complete and in operation, notify the Architect and Engineer at least one (1) week in advance of the final demonstration. During this demonstration, simulate each and every function to ensure that the controls respond properly to all signals, commands, etc.

2. Thoroughly instruct and supervise the Owner's designated maintenance personnel in the proper operation and programming of the system. The BAC shall be responsible for arranging the instructions at a time convenient to these personnel. The instructions shall be provided by trained employees of the controls manufacturer and shall consist of a minimum of eight (8) hours of direct instruction to thoroughly familiarize the operating personnel with the system. Provide an additional twenty (20) on-site hours of service, in addition to warranty service, on an on-call basis after acceptance of the system for trouble shooting, additional instruction, etc., at no additional cost to the Owner.

3. In addition to the above, refer to the paragraph covering technical instructions in Item INSTRUCTIONS AND MANUALS for additional requirements and information regarding final acceptance and project close-out.

H. Diagrams and Service Manuals

1. Furnish two (2) sets of record drawings for each system in both paper and electronic formats. In addition, furnish two (2) sets of simplified control diagrams for each system, showing location of devices for reading temperatures, pressures, locations of operators, etc. These diagrams are for use by Owner's personnel in quickly becoming familiar with the system for trouble shooting. Sets shall be made up between clear plastic covers.

2. Service manuals, bound in 8½" X 11" hard backed binders, shall be furnished for review at least thirty (30) days before request for final demonstration. After review, the manuals shall be forwarded to the Owner.

I. Warranty

1. The building automation system as installed, shall be warranted by the BAC to be free from defects of workmanship and equipment in the original installation (except from natural causes) for a period of one (1) year from date of substantial completion of the work unless a longer period is stipulated elsewhere in the specifications.

2. The warranty shall extend beyond the specified period for replacements, repairs, etc., required to correct all defective workmanship and/or material for which the Owner has given written notice of malfunction or failure prior to the expiration of the original warranty period.

76. AIR HANDLING UNIT – AHU-1

Part 1: General

A. Work Included

1. Modular Air Handling Unit.

B. Related Sections

1. Glycol System.

2. Temperature Control.

3. Insulation.

C. Quality Assurance

1. Air Coils: Certify capacities, pressure drops and selection procedures in accordance with current AHRI Standard 410.

2. Air handling unit shall be rated in accordance with AHRI Standard 430 for airflow, static pressure, and fan speed performance.

3. Airflow monitoring station: Certify airflow measurement station performance in accordance with AMCA 611.

D. Submittals

1. No equipment shall be fabricated or delivered until the receipt of approved shop drawings from the Engineer.

2. AHU manufacturer shall provide the following information with each shop drawing/product data submission:

Dimensioned arrangement drawings for each AHU including a plan and elevation view of the assembled unit with overall dimensions, lift points, unit shipping split locations and dimensions, installation and operating weights, and installation, operation and service clearances.

All electrical, piping, and ductwork requirements, including sizes, connection locations, and connection method recommendations.

Each component of the unit shall be identified, and mechanical specifications shall be provided for unit and accessories describing construction, components, and options.

All performance data, including capacities and airside and waterside pressure drops, for components.

Fan curves shall be provided for fans with the design operating points indicated. Data shall be corrected to actual operating conditions, temperatures, and altitudes.

For units utilizing multiple fans in a fan section, a fan curve shall be provided showing the performance of the entire bank of fans at design conditions. In addition, a fan curve shall be provided showing the performance of each individual fan in the bank of fans at design conditions. Also, a fan curve shall be provided showing the performance of the bank of fans if one fan is down. The percent redundancy of the bank of fans with one fan down shall be noted on the fan curve or in the tabulated fan data.

A filter schedule must be provided for the air handling unit. Schedule shall detail unit tag, unit size, corresponding filter section location within the AHU, filter arrangement (e.g. angled/flat), filter depth, filter type (e.g. pleated media), MERV rating, and filter quantity and size.

A schedule detailing necessary trap height shall be provided for the air handling unit. Schedule shall detail unit tag, unit size, appropriate trap schematic with recommended trap dimensions, and unit supplied base rail height. Contractor shall be responsible for additional trap height required for trapping and insulation beyond the unit supplied base rail height by adequate housekeeping pad.

A coil valve coordination schedule shall be provided for the air handling unit. Schedule shall detail unit tag, coil type and corresponding section location within the AHU, valve style (e.g. global, ball), valve type (e.g. electronic 2-way/3-way), valve position (e.g. normally open/closed), size, flow coefficient (CV), and close-off pressure.

An electrical MCA - MOP schedule shall be provided for the electrical circuit to which field-power must be supplied. Schedule to detail unit tag, circuit description, voltage/phase/hertz, Minimum Circuit Ampacity (MCA), and calculated Maximum Overcurrent Protection (MOP).

Sound data shall be provided using AHRI 260 test methods. Unit discharge, inlet, and radiated sound power levels in dB shall be provided for 63, 125, 250, 500, 1000, 2000, 4000 and 8000Hz.

3. The AHU manufacturer shall provide appropriate sets of submittals as referenced under item SHOP DRAWINGS and shall submit to the Owner electronic copies of the IOM.

4. The AHU manufacturer shall list any exceptions to the specification.

E. Regulatory Requirements

1. Agency Listings/Certifications

Unit shall be manufactured to conform to UL 1995 and shall be listed by either UL/CUL or ETL. Units shall be provided with listing agency label affixed to the unit.

F. Delivery, Storage, and Handling

1. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

2. Units not shipped fully assembled shall have tags and airflow arrows on each section to indicate location and orientation in direction of airflow. Shipping splits shall be clearly defined on submittal drawings. Each section shall have lifting lugs for field rigging, lifting and final placement of AHU section(s). AHU's less than 100-inches wide shall allow for forklift transport and maneuverability on the jobsite.

3. Unit shall be stretch or shrink wrapped to protect unit from in-transit rain and debris per ASHRAE 62.1 recommendations.

4. Installing contractor shall be responsible for storing AHU in a clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

G. Start-Up and Operating Requirements

1. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters in place, bearings lubricated (if applicable), condensate properly trapped, piping connections verified and leak-tested, belts aligned and tensioned, all shipping braces removed, bearing set screws torqued, and fan has been test run under observation.

H. Warranty

1. AHU manufacturer shall provide, at no additional cost, a standard parts warranty that covers a period of one year from unit start-up or 18 months from shipment, whichever occurs first. This warrants that all products are free from defects in material and workmanship and shall meet the capacities and ratings set forth in the equipment manufacturer's catalog and bulletins.

Part 2: Products

A. Acceptable Manufacturers

1. Approved manufacturers shall be either Trane or Carrier.

B. General

1. Unit layout and configuration shall be as defined in project plans and schedule.

2. Manufacturer to provide a full perimeter integral base frame to support and raise all sections of the unit for proper trapping. Unit base frames not constructed of galvanized steel shall be chemically cleaned and coated with both a rust-inhibiting primer and finished coat of rust-inhibiting enamel.

C. Unit Casing

1. Unit manufacturer shall ship unit in segments as specified by the contractor for ease of installation in tight spaces. The entire air handler shall be constructed of galvanized steel. Casing finished to meet ASTM B117 125-hour salt-spray test. The removal of access panels or access doors shall not affect the structural integrity of the unit. All removable panels shall be gasketed. All doors shall have gasketing around full perimeter to prevent air leakage. Contractor shall be responsible to provide connection flanges and all other framework that is needed to properly support the unit.

2. Casing performance - Casing air leakage shall not exceed leak class 6 (CL = 6) per ASHRAE 111 at specified casing pressure, where maximum casing leakage (cfm/100 ft2 of casing surface area) = CL X P0.65.

3. Air leakage shall be determined at 1.00 times maximum casing static pressure up to 8 inches w.g. Specified air leakage shall be accomplished without the use of caulk. Total estimated air leakage shall be reported for each unit in CFM, as a percentage of supply air, and as an ASHRAE 111 Leakage Class.

4. Under 55F supply air temperature and design conditions on the exterior of the unit of 81F dry bulb and 73F wet bulb, condensation shall not form on the casing exterior. The AHU manufacturer shall provide tested casing thermal performance for the scheduled supply air temperature plotted on a psychrometric chart. The design condition on the exterior of the unit shall also be plotted on the chart. If tested casing thermal data is not available, AHU manufacturer shall provide, in writing to the Engineer and Owner, a guarantee against condensation forming on the unit exterior at the stated design conditions above. The guarantee shall note that the AHU manufacturer will cover all expenses associated with modifying units in the field should external condensate form on them. In lieu of AHU manufacturer providing a written guarantee, the installing contractor must provide additional external insulation on AHU to prevent condensation.

5. Unit casing (wall/floor/roof panels and doors) shall be able to withstand up to 1.5 times design static pressure, or 8-inch w.g., whichever is less, and shall not exceed 0.0042 per inch of panel span (L/240).

6. Floor panels shall be double-wall construction and designed to support a 300-lb load during maintenance activities and shall deflect no more than 0.0042 per inch of panel span.

7. Unit casing panels shall be 2-inch double-wall construction, with solid galvanized exterior and solid galvanized interior, to facilitate cleaning of unit interior.

8. Unit casing panels (roof, walls, floor) and doors shall be provided with a minimum thermal resistance (R-value) of 13 Hr*Ft2*ºF/BTU.

9. Unit casing panels (roof, walls, floor) and external structural frame members shall be completely insulated filling the entire panel cavity in all directions so that no voids exist. Panel insulation shall comply with NFPA 90A.

10. Casing panel inner liners must not extend to the exterior of the unit or contact the exterior frame. A mid-span, no-through-metal, internal thermal break shall be provided for all unit casing panels.

11. Access panels and/or access doors shall be provided in all sections to allow easy access to drain pan, coil(s), motor, drive components and bearings for cleaning, inspection, and maintenance.

12. Access panels and doors shall be fully removable without the use of specialized tools to allow complete access of interior surfaces.

D. Access Doors

1. Access doors shall be 2-inch double-wall construction. Interior and exterior shall be of the same construction as the interior and exterior wall panels.

2. All doors shall be provided with a thermal break construction of door panel and door frame.

3. Gasketing shall be provided around the full perimeter of the doors to prevent air leakage.

4. Door hardware shall be surface-mounted to prevent through-cabinet penetrations that could likely weaken the casing leakage and thermal performance.

5. Handle hardware shall be designed to prevent unintended closure.

6. Access doors shall be hinged and removable without the use of specialized tools.

7. Hinges shall be interchangeable with the door handle hardware to allow for alternating door swing in the field to minimize access interference due to unforeseen job site obstructions.

8. Door handle hardware shall be adjustable and visually indicate locking position of door latch external to the section.

9. All doors shall be a 60-inch high when sufficient unit height is available, or the maximum height allowed by the unit height.

10. Multiple door handles shall be provided for each latching point of the door necessary to maintain the specified air leakage integrity of the unit.

E. Primary Drain Pans

1. All cooling coil sections shall be provided with an insulated, double-wall, galvanized drain pan.

2. The drain pan shall be designed in accordance with ASHRAE 62.1 being of sufficient size to collect all condensation produced from the coil and sloped in two planes, pitched toward drain connections, promoting positive drainage to eliminate stagnant water conditions when unit is installed level and trapped per manufacturer's requirements.

3. The outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition.

4. All drain pan threaded connections shall be visible external to the unit. Threaded connections under the unit floor shall not be accepted.

5. Drain connections shall be of the same material as the primary drain pan and shall extend a minimum 2-1/2-inch beyond the base to ensure adequate room for field piping of condensate traps.

6. The installing contractor is responsible to ensure the unit is installed level, trapped in accordance with the manufacturer's requirements, and visually inspected to ensure proper drainage of condensate.

7. Coil support members inside the drain pan shall be of the same material as the drain pan and coil casing.

F. Fans

1. Fan sections shall have a minimum of one hinged and latched access door located on the drive side of the unit to allow inspection and maintenance of the fan, motor, and drive components.

2. Provide fans of type and class as specified on the schedule. All fans shall be statically and dynamically tested by the manufacturer for vibration and alignment as an assembly at the operating RPM to meet design specifications. Fans that are selected with inverter balancing shall first be dynamically balanced at design RPM. The fans then will be checked in the factory from 25% to 100% of design RPM to insure they are operating within vibration tolerance specifications, and that there are no resonant frequency issues throughout this operating range. Inverter balancing that requires lockout frequencies inputted into a variable frequency drive to in order to bypass resonant frequencies shall not be acceptable. If supplied in this manner by the unit manufacturer, the contractor will be responsible for rebalancing in the field after unit installation. Fans selected with inverter balancing shall have a maintenance free grounding assembly installed on the fan motor to discharge both static and induced shaft currents to ground.

3. Direct drive plenum fans with integral frame motors, shall be mounted on isolation bases. Fan shall be dynamically balanced throughout the operating range to a BV-3 (0.20 in/s) per AMCA 204 test standard. Fan and motor shall be internally isolated with spring isolators. A flexible connection shall be installed between fan and unit casing to ensure complete isolation. Flexible connection shall comply with NFPA 90A and UL 181 requirements. If fans and motors are not internally isolated, then the entire unit shall be externally isolated from the building, including supply and return duct work, piping, and electrical connections. External isolation shall be furnished by the installing contractor in order to avoid transmission of noise and vibration through the ductwork and building structure.

4. MOTORS AND DRIVES

   Motors shall meet or exceed all NEMA Standards Publication MG 1 - 2006 requirements and comply with NEMA Premium efficiency levels when applicable. Motors shall comply with applicable requirements of NEC and shall be UL Listed.

   Fan Motors shall be heavy duty, open drip-proof operable at scheduled voltage. If applicable, motor efficiency shall meet or exceed NEMA Premium efficiencies.

   Direct driven fans utilizing integral frame motors shall use 4-pole (1800 rpm) motors, NEMA Design B, with Class B insulation capable to operate continuously at 104 deg F (40 deg C) without tripping overloads.

Motors shall have a +/- 10 percent voltage utilization range to protect against voltage variation.

G. Coils

1. Coils section header end panel shall be removable to allow for removal and replacement of coils without impacting the structural integrity of the unit.

2. Install coils such that headers and return bends are enclosed by unit casing to ensure that if condensate forms on the header or return bends, it is captured by the drain pan under the coil.

3. Coils shall be manufactured with plate fins to minimize water carryover and maximize airside thermal efficiency. Fin tube holes shall have drawn and belled collars to maintain consistent fin spacing to ensure performance and air pressure drop across the coil as scheduled. Tubes shall be mechanically expanded and bonded to fin collars for maximum thermal conductivity. Use of soldering or tinning during the fin-to-tube bonding process is not acceptable due to the inherent thermal stress and possible loss of bonding at that joint.

4. Construct coil casings of galvanized steel. End supports and tube sheets shall have belled tube holes to minimize wear of the tube wall during thermal expansion and contraction of the tube.

5. All coils shall be completely cleaned prior to installation into the air handling unit. Complete fin bundle in direction of airflow shall be degreased and steam cleaned to remove any lubricants used in the manufacturing of the fins, or dirt that may have accumulated, in order to minimize the chance for water carryover.

6. Hydronic Coils

Supply and return header connections shall be clearly labeled on unit exterior such that direction of coil water-flow is counter to direction of unit air-flow.

Coils shall be proof-tested to 300 psig and leak-tested to 200 psig air pressure under water.

Headers shall be constructed of round copper pipe or cast iron.

Tubes shall be 5/8-inch .020 copper, with aluminum fins.

H. Filters

1. Provide factory-fabricated filter section of the same construction and finish as unit casings. Filter section shall have side access filter guides and access door(s) extending the full height of the casing to facilitate filter removal. Construct doors in accordance with Section 2.04. Provide fixed filter block offs as required to prevent air bypass around filters. Block offs shall not need to be removed during filter replacement. Filters to be of size, and quantity needed to maximize filter face area of each particular unit size.

2. Filter type, MERV rating, and arrangement shall be provided as defined in project plans.

I. Dampers

1. All dampers shall be internally mounted. Dampers shall be premium ultra low leak and located as indicated on the schedule and plans. Blade arrangement (parallel or opposed) shall be provided as indicated on the schedule and drawings. Dampers shall be Ruskin CD60 double-skin airfoil design or equivalent for minimal air leakage and pressure drop. Leakage rate shall not exceed 3 CFM/square foot at one inch water gauge complying with ASHRAE 90.1 maximum damper leakage and shall be AMCA licensed for Class 1A. All leakage testing and pressure ratings shall be based on AMCA Standard 500-D. Manufacturer shall submit brand and model of damper(s) being furnished, if not Ruskin CD60.

J. Access Sections

1. Access sections shall be provided where indicated in the plans to allow additional access for inspection, cleaning, and maintenance of unit components. The unit shall be installed for proper access. Procedure for proper access, inspection and cleaning of the unit shall be provided in the AHU manufacturer's maintenance manual.

K. Marine Lights

1. Marine lights shall be provided throughout AHU sections. Lights shall be instant-on, light-emitting diode (LED) type to minimize amperage draw and shall produce lumens equivalent to a minimum 75W incandescent bulb (1200 lumens). LED lighting shall provide instant-on, white light and have a minimum 25,000 hr life.

2. Light fixture shall be weather-resistant, enclosed and gasketed to prevent water and dust intrusion.

3. Fixtures shall be designed for flexible positioning during maintenance and service activities for best possible location providing full light on work surface of interest and not being blocked by technician.

4. All lights on a unit shall be wired in the factory to a single on-off switch.

5. Electrical contractor shall be responsible for providing 115V supply to the factory-mounted marine light circuit.

L. Variable Frequency Drive (VFD)

1. Variable frequency drive shall be provided, mounted and wired by the AHU manufacturer as indicated on the drawings. All standard and optional features shall be included within the VFD enclosure, unless otherwise specified. The VFDs shall be UL listed. The listing shall allow mounting in plenum or other air handling compartments.

2. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for centrifugal pump and fan control and to eliminate the need for motor derating.

3. With the motor's rated voltage applied to the VFD input, the VFD shall allow the motor to produce full rated power at rated amps, RMS fundamental volts, and speed without using the motor's service factor. VFDs utilizing sine weighted/coded modulation (with or without 3rd harmonic injection) must provide data verifying that the motors will not draw more than full load current during full load and full speed operation.

4. The VFD shall include an input full-wave bridge rectifier and maintain a fundamental power factor near unity regardless of speed or load.

5. The VFD and options shall be tested to ANSI/UL Standard 508. The complete VFD, including all specified options, shall be assembled by the manufacturer, which shall be UL 508 certified for the building and assembly of option panels. Assembly of separate panels with options by a third-party is not acceptable. The appropriate UL stickers shall be applied to both the VFD and option panel, in the case where these are not contained in one panel.

6. The VFD shall have DC link reactors on both the positive and negative rails of the DC bus to minimize power line harmonics. VFDs without DC link reactors shall provide a minimum 3% impedance line reactor.

7. The VFDs full load amp rating shall meet or exceed NEC Table 430-150. The VFD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 160% of rated current for up to 0.5 second while starting.

8. The VFD shall be able to provide full torque at any selected frequency from 28 Hz to base speed to allow driving direct drive fans without derating.

9. An automatic energy optimization selection feature shall be provided standard in the VFD. This feature shall automatically and continually monitor the motor speed and load and adjust the applied voltage to maximize energy savings and provide up to an additional 3% to 10% energy savings.

10. Input and output power circuit switching shall be able to be accomplished without interlocks or damage to the VFD. Switching rate may be up to 1 time per minute on the input and unlimited on the output.

11. An automatic motor adaptation test algorithm shall measure motor stator resistance and reactance to optimize performance and efficiency. It shall not be necessary to run the motor or de-couple the motor from the load to run the test.

12. Galvanic and/or optical isolation shall be provided between the VFDs power circuitry and control circuitry to ensure operator safety and to protect connected electronic control equipment from damage caused by voltage spikes, current surges, and ground loop currents. VFDs not including either galvanic or optical isolation on both analog I/O and discrete I/O shall include additional isolation modules.

13. The VFD shall minimize the audible motor noise through the use of an adjustable carrier frequency. The carrier frequency shall be automatically adjusted to optimize motor and VFD efficiencies while reducing motor noise.

14. Protective Features

Protection shall be provided against input transients, loss of AC line phase, output short circuit, output ground fault, overvoltage, undervoltage, VFD overtemperature and motor overtemperature. The VFD shall display all faults as words. Codes are not acceptable.

The VFD shall be protected from sustained power or phase loss. The VFD shall provide full rated output with an input voltage as low as 90% of the nominal. The VFD shall continue to operate with reduced output with an input voltage as low as 164 V AC for 208/230 volt units, 313 V AC for 460 volt units, and 394 volts for 600 volts units.

The VFD shall incorporate a motor preheat circuit to keep the motor warm and prevent condensation build up in the stator.

The VFD package shall include semi-conductor rated input fuses to protect power components.

To prevent breakdown of the motor winding insulation, the VFD shall be designed to comply with IEC Part 34-17. Otherwise, the AHU manufacturer shall ensure that inverter rated motors are supplied.

The VFD shall include a "signal loss detection" circuit to sense the loss of an analog input signal such as 4 to 20 mA or 2 to 10 V DC and shall be programmable to react as desired in such an instance.

The VFD shall function normally when the keypad is removed while the VFD is running and continue to follow remote commands. No warnings or alarms shall be issued as a result of removing the keypad.

The VFD shall catch a rotating motor operating forward or reverse up to full speed.

The VFD shall be rated for 100,000 amp interrupting capacity (AIC).

The VFD shall include current sensors on all three output phases to detect and report phase loss to the motor. The VFD shall identify which of the output phases is low or lost.

The VFD shall continue to operate without faulting until input voltage reaches 300 V AC on 208/230 volt units.

15. Interface Features

Hand/Start, Off/Stop and Auto/Start selector switches shall be provided to start and stop the VFD and determine the speed reference. A VFD/Off/Bypass selector switch shall be provided.

The VFD shall be able to be programmed to provide a 24 V DC output signal to indicate that the VFD is in Auto/Remote mode.

The VFD shall provide digital manual speed control. Potentiometers are not acceptable.

A lockable, alphanumeric backlit display keypad shall be provided. The keypad shall be remotely mountable up to 10 feet away using standard 9-pin cable.

The keypads for all sizes of VFDs shall be identical and interchangeable.

A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided. These indications shall be visible both on the keypad and on the VFD when the keypad is removed.

A quick setup menu with factory preset typical HVAC parameters shall be provided on the VFD eliminating the need for macros.

The VFD shall include a standard EIA-485 communications port and capabilities to be connected at a future date to a Johnson Controls N2 Metasys or Siemens FLN system at no additional cost to the owner. The connection shall be software selectable by the user.

At a minimum, the following points shall be controlled and/or accessible:

VFD Start/Stop

Speed reference

Fault diagnostics

Meter points

Four additional Form C 230 volt programmable relays shall be available for field installation within the VFD.

BACnet communication shall be provided and shall be factory installed within the VFD.

Two set-point control interfaces (PID control) shall be standard in the unit. The VFD shall be able to look at two feedback signals, compare with two set-points and make various process control decisions.

Floating point control interface shall be provided to increase/decrease speed in response to contact closures.

The following displays shall be accessible from the control panel in unit. Reference Signal Value, Output Frequency in Hz or percent, Output Amps, Motor HP, Motor kW, kWhr, Output Voltage, DC Bus Voltage, VFD Temperature in degrees, and unit CFM.

The display shall be programmed to read in inches of water column (in-wg).

The VFD shall be able to be programmed to sense the loss of load and signal a no load/broken belt warning or fault.

If the temperature of the VFDs heat sink rises to 80ºC, the VFD shall automatically reduce its carrier frequency to reduce the heat sink temperature. If the temperature of the heat sink continues to rise the VFD shall automatically reduce its output frequency to the motor. As the VFDs heat sink temperature returns to normal, the VFD shall automatically increase the output frequency to the motor and return the carrier frequency to its normal switching speed.

The VFD shall have temperature controlled cooling fans for quiet operation and minimized losses.

The VFD shall store in memory the last 10 faults and related operational data.

Eight programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.

Two programmable relay outputs, one Form C 240 V AC, one Form A 30 V AC, shall be provided for remote indication of VFD status.

Three programmable analog inputs shall be provided and shall accept a direct-or-reverse acting signal. Analog reference inputs accepted shall include two voltage (0 to 10 V DC, 2 to 10 V DC) and one current (0 to 20 mA, 4 to 20 mA) input.

Two programmable 0 to 20 mA analog outputs shall be provided for indication of VFD status. These outputs shall be programmable for output speed, frequency, current and power. They shall also be programmable to provide a selected 24V DC status indication.

Under fire mode conditions, the VFD shall be able to be programmed to automatically default to a preset speed.

16. Adjustments

The VFD shall have an adjustable carrier frequency in steps of not less than 0.1 kHz to allow tuning the VFD to the motor.

A minimum of sixteen preset speeds shall be provided.

Four acceleration and four deceleration ramps shall be provided. Accel and decel time shall be adjustable over the range from 0 to 3,600 seconds to base speed. The shape of these curves shall be automatically contoured to ensure no-trip acceleration and deceleration.

Four current limit settings shall be provided.

If the VFD trips on one of the following conditions, the VFD shall be programmable for automatic or manual reset: undervoltage, overvoltage, current limit and inverter overload.

The number of restart attempts shall be selectable from 0 through 20 or infinitely and the time between attempts shall be adjustable from 0 through 600 seconds.

An automatic on delay shall be selectable from 0 to 120 seconds.

17. Service Conditions

VFDs shall provide full output in an ambient temperature from -10 to 50ºC (14 to 104ºF).

VFDs shall provide full output in a relative humidity from 0 to 95%, non-condensing.

VFDs shall provide full output up to 3,300 feet elevation without derating.

VFDs shall provide full output with an AC line voltage variation from -10 to +10% of nominal voltage.

No side clearance shall be required for cooling of any units. All power and control wiring shall be done from the bottom.

18. Warranty

The VFD shall be warranted by the manufacturer for a period of 42 months from date of shipment, or 36 months from start-up, whichever occurs first. The warranty shall include parts, labor, travel costs and living expenses incurred by the manufacturer to provide factory-authorized on-site service.

M. Factory-Installed Motor Wire Termination and VFD

1. VFDs shall be mounted on the exterior casing of the unit.

2. Any welds shall be properly finished with no rough edges. Enclosures shall house circuit breaker disconnects, bypass circuitry, Drive-OFF-Bypass switches, manual speed controls, and control transformers. VFDs and starter/disconnects shall have an external disconnect located on the outside of the access door.

N. Factory Wiring of Lights and VFDs

1. VFDs shall be wired per NEC, UL, and NFPA 90A requirements.

2. All power wiring for voltages greater than 24V and traveling through multiple unit sections shall be contained in an enclosed, metal, power-wiring raceway or EMT. Sections less than 6-inch in length may be contained in FMC.

3. After mounting and wiring of VFD, on the AHU, trained factory personnel shall ensure proper operation of each VFD, through a thorough factory test. Testing shall include a Hypot test of unit wiring to ensure that no weaknesses exist in wiring or motor. VFD shall be energized and the fan run to ensure the VFD will operate throughout the usable range of the drive and that the fan rotation is correct. VFD with bypass shall also be tested in the bypass position to ensure the bypass is operational.

O. Factory-Engineered Automatic Temperature Controls

1. Unit shall be provided with a factory wired, installed and tested unit controller, capable of standalone unit control, or tied into a building automation system through Bacnet communication. All control points in unit shall be tested at the unit manufacturers facility prior to shipment.

2. A momentary push-button reset circuit using a double-pole low limit switch shall be provided by the AHU manufacturer. Low limits shall be factory engineered to maximize coil coverage. Capillary radius clips shall be used at low limit bends to ensure no crimping or wear of low limits. Low limits shall be wired to shut down the fan to protect the unit.

3. On variable volume units, a discharge temperature sensors shall be provided and mounted on the fans by the AHU manufacturer. Temperature sensors mounted within the AHU shall have sensor material selected to integrate with the BAS controller.

4. Averaging temperature sensors shall be provided by the AHU manufacturer. Sensors shall be factory engineered to accurately measure mixed air temperatures. Capillary radius clips shall be used at capillary bends to ensure no crimping or wear of the tube. Temperature sensors mounted within the AHU shall have sensor material selected to integrate with the BAS controller.

5. Valves shall be provided by the AHU manufacturer. Valves shall be shipped from the valve manufacturer directly to the job site or Mechanical Contractor for installation. Electrical connections shall be provided on the valves and at the AHU coil section for field connection.

P. Unit DDC Controller

1. One programmable DDC controller shall be provided by the AHU manufacturer. Complete communications and diagnostics including all AI, BI, AO, BO, set points and alarms shall only require a twisted pair of wires between the unit controller and the BAS. Unit controller shall be factory wired to the unit end devices. Controller shall have a user display touch screen for user interface. The display shall be unit mounted in the factory. Displays shall give user access to AHU status, set points and alarms.

2. The programmable DDC controller and the control components shall be selected, mounted, wired and tested by the AHU manufacturer to ensure delivery of specified performance and to minimize jobsite startup time. Testing shall be performed to ensure wiring continuity between the controller and all devices, and to ensure proper operation of the end devices.

3. Factory mounted controller shall be preprogrammed at the factory to minimize startup delay of the unit(s) at the job site. Controller shall be programmed with manufactures preferred standard basic programming based on unit configuration and options. Any additional programming or custom programming shall be provided at the job site by the unit manufacturer or controls contractor.

Part 3: Execution

A. Shipping

1. Paper copies of the IOM shall also be shipped with each AHU.

2. The AHU manufacturer shall identify all shipments with the order number. Enough information shall be provided with each shipment to enable the Mechanical Contractor to confirm the receipt of units when they are received. For parts too small to mark individually, the AHU manufacturer shall place them in containers.

3. To protect equipment during shipment and delivery, all indoor units shall be completely stretch or shrink wrapped. Wrap shall be a minimum of 7 mil plastic. Pipe ends and pipe connection holes in the casing shall be capped or plugged prior to shipment

4. After loading the equipment for shipment, the AHU manufacturer shall contact the shipping contact on the order and provide the name of the carrier, description of equipment, order number, shipping point, and date of shipment.

B. On-Site Storage

1. If equipment is to be stored for a period of time prior to installation, the Mechanical Contractor shall remove all stretch or shrink wrap from units upon receipt to prevent unit corrosion and shall either place the units in a controlled indoor environment or shall cover the units with canvas tarps and place them in a well-drained area. Covering units with plastic tarps shall not be acceptable.

C. Field Examination

1. The Mechanical Contractor shall verify that the mechanical room and/or roof are ready to receive work and the opening dimensions are as indicated on the shop drawings and contract documents.

2. The Mechanical Contractor shall verify that the proper power supply is available prior to starting of the fans.

D. Installation

1. The Mechanical Contractor shall be responsible to coordinate ALL of his installation requirements with the Owner and the Owner's selected Mechanical Contractor to ensure that a complete installation for each unit is being provided. Coordination efforts shall include such items as unloading and hoisting requirements, field wiring requirements, field piping requirements, field ductwork requirements, requirements for assembly of field-bolted or welded joints, and all other installation and assembly requirements.

2. The AHU manufacturer shall provide all screws and gaskets for joining of sections in the field.

3. The Mechanical Contractor shall verify that the following items have been completed prior to scheduling the AHU manufacturer's final inspection and start up:

   All spring-isolated components have had their shipping restraints removed and the components have been leveled.

   On all field-joined units, that all interconnections have been completed, i.e., electrical and control wiring, piping, casing joints, bolting, welding, etc.

   All water and steam piping connections have been completed and hydrostatically tested and all water flow rates have been set in accordance with the capacities scheduled on the Drawings.

   All ductwork connections have been completed and all ductwork has been pressure tested for its intended service.

   All power wiring, including motor starters and disconnects, serving the unit has been completed.

   All automatic temperature and safety controls have been completed.

   All dampers are fully operational.

   All shipping materials have been removed.

   All (clean) filter media has been installed in the units.

E. Leveling

1. The Mechanical Contractor shall level all unit sections in accordance with the unit manufacturer's instructions. The Mechanical Contractor shall provide and install all necessary permanent shim material to ensure individual sections and entire assembled units are level.

F. Final Inspection and Start-Up Service

1. After the Mechanical Contractor has provided all water and steam piping connections, ductwork connections, and field control wiring, and Electrical Contractor has provided all the field power wiring, the Mechanical Contractor shall inspect the installation. The Mechanical Contractor shall then perform startup of the equipment.

2. The Temperature Control Contractor shall be scheduled to be at the job site at the time of the equipment start up.

3. The Mechanical Contractor, shall perform the following tests and services and submit a report outlining the results:

   Record date, time, and person(s) performing service.

   Lubricate all moving parts.

   Check all motor and starter power lugs and tighten as required.

   Verify all electrical power connections.

   Conduct a start-up inspection per the AHU manufacturer's recommendations.

   Record fan motor voltage and amperage readings.

   Check fan rotation and spin wheel to verify that rotation is free and does not rub or bind.

   Check fan for excessive vibration.

   Remove all foreign loose material in ductwork leading to and from the fan and in the fan itself.

   Disengage all shipping fasteners on vibration isolation equipment.

   Check safety guards to insure they are properly secured.

Secure all access doors to the fan, the unit and the ductwork.

Switch electrical supply "on" and allow fan to reach full speed.

Physically check each fan at start up and shut down to insure no abnormal or problem conditions exist.

Check entering and leaving air temperatures (dry bulb and wet bulb) and simultaneously record entering and leaving chilled water temperatures and flow, steam pressures and flow, and outside air temperature.

Check all control sequences.

77. AIR HANDLING UNITS – AH-C & AH-D

A. See Air Handling Unit Schedule

B. HVAC Equipment Insulation

1. Evaporator fan compartment:

Interior cabinet surfaces shall be insulated with a minimum 1/2 in. thick, minimum 1-1/2 lb density, flexible fiberglass insulation bonded with a phenolic binder, neoprene coated on the air side.

Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

2. Gas Heat Compartment:

Aluminum foil-faced fiberglass insulation shall be used.

Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

C. Direct Digital Control System for HVAC

1. SystemVu™ intelligent integrated Direct Digital Control (DDC) shall provide:

Integrated unit operation for comfort cooling, heating ventilation as well as all monitoring, recording and reporting capabilities. Controller shall also provide diagnostics and alarms of abnormal unit operation through the controller. Controller shall have an intuitive user display and be able to be used in a standalone operation or via building automation system (BAS).

Quick Unit Status LEDs of: Run — meaning all systems are go, ALERT — that indicates there is currently a non-critical issue with the unit, like filters need to be replaced and FAULT — that indicates the unit has a critical issue and will possibly shut down.

Navigation keys for access. Navigation keys shall consist of: TEST, BACK, ENTER, and MENU along with UP and DOWN arrows.

Full back lit user display with 4 line by 30 character text capabilities. Display menu shall be designed to provide guided major menus and sub menus main menus provided below:

Shutdown Unit

Run Status

Settings

Alerts/Faults

Service

Inputs

Outputs

USB

The ability to read refrigerant pressures at display or via BAS network of; Discharge Pressure and Suction Pressure. The need for traditional refrigerant gauges is not required.

USB Data Port for flash drive interaction. This will allow the transfer of data for uploads, downloads, perform software upgrades, back-up and restore data and file transfer data such as component number of starts and run hours.

Reverse Rotation Protection of compressors if field 3-phase wiring is misapplied.

Provide Service Capabilities of:

Auto run test

Manual run test

Component run hours and starts

Commissioning reports

Data logging

Alarm history

Economizer control and diagnostics.

Unit cooling operation down to 40°F.

Auto-Recognition for installation and -commissioning of devices like economizers, space sensors etc.

A 5°F temperature difference between cooling and heating set points to meet the latest ASHRAE 90.1 Energy Standard.

Contain return air sensor, supply air sensor and outdoor air sensor to help monitor and provide data for the unit comfort operation, diagnostic and alarms.

Use of Carrier's field accessory hand-held Navigator™ display.

Supply Air Tempering control operates the gas or electric heat to maintain a minimum supply air temperature during conditions where very cold outdoor air causes the supply air temperature to fall below the configured Supply Air Tempering Setpoint. This occurs during periods where DCV is active and increasing the amount of outdoor air or in cases where the system is operating at very low airflow and the calculated economizer position has increased to maintain a constant ventilation rate.

3-year limited part warranty.

2. RTU Open Protocol, Direct Digital Controller:

Shall be ASHRAE 62 compliant.

Shall accept 18-30VAC, 50-60Hz, and consume 15VA or less power.

Shall have an operating temperature range from –40°F to 130°F, 10% to 90% RH (non-condensing).

Shall include built-in protocol for BACnet.

Shall have an LED display independently showing the status of serial communication, running, errors, power, all digital outputs, and all analog inputs.

Shall accept the following inputs: space -temperature, setpoint adjustment, outdoor air temperature, indoor air quality, outdoor air quality, compressor lock-out, fire shutdown, enthalpy switch, and fan status/filter status/humidity/ remote occupancy.

Shall provide the following outputs: economizer, fan, cooling stage 1, cooling stage 2, heat stage 1, heat stage 2, exhaust, reversing valve/high fan speed.

Shall have built-in surge protection circuitry through solid-state polyswitches. Polyswitches shall be used on incoming power and network connections. Polyswitches will return to normal when the "trip" condition clears.

Shall have a battery back-up capable of a minimum of 10,000 hours of data and time clock retention during power outages.

Shall have built-in support for Carrier technician tool.

Software upgrades will be accomplished by either local or remote download. No software upgrades through chip replacements are allowed.

D. Electric and Electronic Control System for HVAC

Rooftop Units

1. General:

Shall be complete with self-contained low--voltage control circuit protected by a resettable circuit breaker on the 24-v transformer side. Transformer shall have 75VA capability.

Shall utilize color-coded wiring.

Shall include a Unit Control Board to provide connection points for control functions such as: smoke detectors, gas controller, economizer, DDC control components, and low and high pressure switches.

The heat exchanger shall be controlled by an integrated gas controller (IGC) microprocessor. See heat exchanger section of this specification.

2. Safeties:

Compressor over-temperature, over-current. High internal pressure differential.

Low and high pressure switches shall be provided.

Automatic reset, motor thermal overload protector.

Heating section shall be provided with the -following minimum protections:

High temperature limit switches.

Induced draft motor speed sensor.

Flame rollout switch.

Flame proving controls.

E. Panel Air Filters

1. Standard filter section:

Shall consist of factory installed, low velocity, disposable MERV 13 2 in. thick fiberglass filters of -commercially available sizes.

Unit shall use only one filter size.

Filters shall be accessible through an access panel with “no-tool” removal as described in the unit cabinet section of this specification.

F. Self-Contained Air Conditioners

1. General:

Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing a fully hermetic scroll compressor(s) for cooling duty and gas combustion for heating duty.

Factory assembled, single-piece heating and cooling rooftop unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features required prior to field start-up.

Unit shall use Puron® (R-410A) refrigerant.

Unit shall be installed in accordance with the manufacturer's instructions.

Unit must be selected and installed in compliance with local, state, and federal codes.

2. Quality Assurance:

Unit meets ASHRAE 90.1 minimum efficiency requirements.

Unit shall be rated in accordance with AHRI Standards 210/240.

Unit shall be designed to conform to ASHRAE 15.

Unit shall be UL-tested and certified in accordance with ANSI Z21.47 Standards and UL-listed and certified under Canadian standards as a total package for safety requirements.

Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

Roof curb shall be designed to conform to NRCA Standards.

Unit shall be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory, and must be available upon request.

Unit shall be constructed to prevent intrusion of snow and tested to prevent snow intrusion into the control box up to 40 mph.

Unit shake tested to assurance level 1, ASTM D4169 to ensure shipping reliability.

3. Delivery, Storage, and Handling:

Unit shall be stored and handled per manufacturer's recommendations.

Lifted by crane requires either shipping top panel or spreader bars.

Unit shall only be stored or positioned in the upright position.

4. Operating Characteristics:

Unit shall be capable of starting and running at 115°F ambient outdoor temperature.

Compressor with standard controls shall be capable of operation down to 40°F ambient outdoor temperatures.

5. Electrical Requirements:

Main power supply voltage, phase, and frequency must match those shown on the electrical drawings.

6. Unit Cabinets:

Unit cabinet shall be constructed of galvanized steel, and shall be bonderized and coated with a prepainted baked enamel finish on all externally exposed surfaces.

Evaporator fan compartment interior cabinet insulation shall conform to AHRI Standards 210/240. Interior surfaces shall be insulated with a minimum 1/2 in. thick, 1 lb density, flexible fiberglass insulation, neoprene coated on the air side. Aluminum foil-faced fiberglass insulation shall be used in the gas heat compartment.

Base of unit shall have a minimum of 4 locations for thru-the-base gas and electrical connections.

Base Rail:

Base rail shall be a minimum of 16 gauge thickness.

Condensate pan and connections:

Shall be a sloped condensate drain pan made of stainless steel.

Shall comply with ASHRAE Standard 62.

Shall use a 3/4 in. 14 NPT drain connection, possible either through the bottom or side of the drain pan. Connection shall be made per manufacturer's recommendations.

Top panel:

Shall be a single piece top panel on all sizes.

Gas Connections:

All gas piping connecting to unit gas valve shall enter the unit cabinet at a single location on side of unit (horizontal plane).

Electrical Connections:

All unit power wiring shall enter unit cabinet at a single, factory prepared, knockout location.

Thru-the-base capability.

Standard unit shall have a thru-the-base electrical location(s) using a raised, embossed portion of the unit basepan.

Component access panels:

Cabinet panels shall be easily removable for servicing.

Unit shall have one factory installed, tool-less, removable, filter access panel.

Panels covering control box, indoor fan, indoor fan motor, gas components (where applicable), and compressors shall have molded composite handles.

Handles shall be UV modified, composite. They shall be permanently attached, and recessed into the panel.

Screws on the vertical portion of all removable access panel shall engage into heat resistant, molded composite collars.

Collars shall be removable and easily replaceable using manufacturer recommended parts.

7. Gas Heat:

General:

Heat exchanger shall be an induced draft design.

Shall incorporate a direct-spark ignition -system and redundant main gas valve.

Gas supply pressure at the inlet to the rooftop unit gas valve shall match that required by the manufacturer.

The heat exchanger shall be controlled by an integrated gas controller (IGC) microprocessor.

IGC board shall notify users of fault using an LED.

The LED shall be visible without removing the control box access panel.

IGC board shall contain algorithms that modify evaporator fan operation to prevent future cycling on high temperature limit switch.

Unit shall be equipped with anti-cycle protection with one short cycle on unit flame rollout switch or 4 continuous short cycles on the high temperature limit switch. Fault indication shall be made using an LED.

Stainless Steel Heat Exchanger construction:

Provide a direct-spark ignition system.

Provide a redundant main gas valve.

Burners shall be of the in-shot type constructed of aluminum-coated steel.

All gas piping shall enter the unit cabinet at a single location on side of unit (horizontal plane).

The stainless steel heat exchanger shall be of the tubular-section type, constructed of a minimum of 20-gauge type 409 stainless steel.

8. Coils:

Aluminum Fin-Copper Tube Coils:

Evaporator and condenser coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.

Evaporator coils shall be leak tested to 150 psig, pressure tested to 450 psig.

Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig.

9. Refrigerant Components:

Refrigerant circuit shall include the following control, safety, and maintenance features:

Fixed orifice metering system shall include a multiple feed distribution system.

Refrigerant filter drier — Solid core design.

Service gauge connections on suction and discharge lines.

Pressure gauge access through a specially designed access port in the top panel of the unit.

There shall be gauge line access port in the skin of the rooftop, covered by a black, removable plug.

Compressors:

Unit shall use fully hermetic, scroll compressor for each independent refrigeration circuit.

Compressor motors shall be cooled by refrigerant gas passing through motor windings.

Compressors shall be internally protected from high discharge temperature conditions.

Compressors shall be protected from an over-temperature and over-amperage conditions by an internal, motor overload device.

Compressor shall be factory mounted on rubber grommets.

Compressor motors shall have internal line break thermal, current overload and high pressure differential protection.

10. Evaporator Fan:

Shall be set with dedicated selection switch and adjustment pot on unit control board.

Blower fan shall be a Vane Axial fan design.

Shall be constructed of a cast aluminum stator and high impact composite material on rotor and air inlet casing.

11. Condenser Fans and Motors

Condenser fan motors:

Shall be furnished with a totally enclosed motor.

Shall use permanently lubricated bearings.

Shall have inherent thermal overload protection with an automatic reset feature.

Condenser Fans:

Shall be a direct-driven propeller type fan constructed of high impact composite mate-rial.

Shall have high impact composite blades completely formed into one piece without blade fasteners or connectors and shall be dynamically balanced.

12. Options and Accessories:

Integrated factory installed enthalpy based economizer shall be provided.

Damper blades shall be galvanized steel with composite gears.

Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below set points.

Shall be equipped with gear driven dampers for both the outdoor ventilation air and the return air for positive air stream control.

Standard leak rate shall be equipped with dampers not to exceed 2% leakage at 1 in. wg pressure differential.

Economizer controller shall be Honeywell W7212 that pro-vides:

Combined minimum and DCV maximum damper position potentiometers with compressor staging relay.

Functions with solid-state analog enthalpy or dry bulb changeover control sensing.

LED indicators for: when free cooling is available, when module is in DCV mode, when exhaust fan contact is closed.

Economizer controller iVu Open controls shall be a 4 to 20mA design controlled directly by the controller.

Shall be capable of introducing up to 100% outdoor air.

Shall be equipped with a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1 requirements.

Shall be designed to close damper(s) during loss-of-power situations with spring return built into motor.

Outside Air Damper:

Actuator shall be direct coupled to damper gear.

Damper will admit up to 100% outdoor air for economizer cycle.

The damper actuator shall plug into the rooftop unit's wiring harness plug. No hard wiring shall be required.

Outside air hood shall include aluminum water entrainment filter.

Flue Shield:

Flue shield shall provide protection from the hot sides of the gas flue hood.

Condenser Coil Hail Guard Assembly:

Shall protect against damage from hail.

Shall be either hood style or louvered.

Unit-Mounted, Non-Fused Disconnect Switch:

Switch shall be factory installed, internally mounted.

National Electric Code (NEC) and UL approved non-fused switch shall provide unit power shutoff.

Shall be accessible from outside the unit.

Shall provide local shutdown and lockout capability.

Convenience Outlet:

Powered convenience outlet.

Outlet shall be powered from main line power to the rooftop unit.

Outlet shall include 15 amp GFI receptacles with independent fuse protection.

Voltage required to operate convenience outlet shall be provided by a factory installed step-down transformer.

Outlet shall be accessible from outside the unit.

Flue Discharge Deflector:

Flue discharge deflector shall direct unit exhaust vertically instead of horizontally.

Deflector shall be defined as a "natural draft" device by the National Fuel and Gas (NFG) code.

Thru-the-Base Connectors:

Kits shall provide connectors to permit gas and electrical connections to be brought to the unit through the unit basepan.

Minimum of 4 connection locations per unit.

Roof Curbs (Vertical):

Full perimeter roof curb.

Formed galvanized steel with wood nailer strip and shall be capable of supporting entire unit weight.

Permits installation and securing of ductwork to curb prior to mounting unit on the curb.

Outdoor Air Enthalpy Sensor:

The outdoor air enthalpy sensor shall be used to provide single enthalpy control. When used in conjunction with a return air enthalpy sensor, the unit will provide differential enthalpy control. The sensor allows the unit to determine if outside air is suitable for free cooling.

Return Air Enthalpy Sensor:

The return air enthalpy sensor shall be used in conjunction with an outdoor air enthalpy sensor to provide differential enthalpy control.

Indoor Air Quality (CO2) Sensor:

Shall be able to provide demand ventilation indoor air quality (IAQ) control.

The IAQ sensor shall be available in duct mount, wall mount, or wall mount with LED display. The setpoint shall have adjustment capability.

Time Guard:

Shall prevent compressor short-cycling by providing a 5-minute delay (±2 minutes) before restarting a compressor after shutdown for any reason.

One device shall be required per compressor.

Hinged Access Panels:

Shall provide easy access through integrated quarter turn latches.

Shall be on major panels of: filter, control box, fan motor, and compressor.

Condensate overflow switch:

This sensor and related controller monitors the condensate level in the drain pan and shuts down compression operation when overflow conditions occur. It includes:

Indicator light — solid red (more than 10 seconds on water contact — compressors disabled), blinking red (sensor disconnected).

10 second delay to break — eliminates nuisance trips from splashing or waves in pan (sensor needs 10 seconds of constant water contact before tripping).

Disables the compressor(s) operation when condensate plug is detected, but still allows fans to run for Economizer.

MERV-8 Return Air filters:

Factory installed MERV-8 filters.

78. AIR HANDLING UNIT – AH-E (COOLING ONLY)

A. General

1. Packaged rooftop unit capacities and efficiencies are AHRI Certified within scope of AHRI Standard 210-240.

2. Factory assembled, internally wired, fully charged with R-410A, and 100 percent run tested to check cooling operation, fan and blower rotation, and control sequence before leaving the factory.

3. Colored and numbered wiring internal to the unit for identification.

4. Unit shall be UL listed and labeled.

B. Casing

1. Zinc coated, heavy gauge, galvanized steel.

2. Weather resistant pre-painted metal with galvanized substrate.

3. Removable single side maintenance access panels.

4. Lifting handles in maintenance access panels (can be removed and reinstalled by removing fasteners while providing a water and air tight seal).

5. Exposed vertical panels and top covers in the indoor air section insulated with a cleanable foil-faced, fire-retardant permanent, odorless glass fiber material.

6. Base pan shall have no penetrations within the perimeter of the curb other than the raised 1 inch high downflow supply/return openings to provide an added water integrity precaution, if the condensate drain backs up.

7. Base of the unit insulated with 1/8 inch, foil-faced, closed-cell insulation.

8. Unit base provisions for forklift and/or crane lifting on three sides of unit.

C. Coils

1. Microchannel Coils:

   Coils shall be microchannel design and leak tested at the factory.

D. Coil Guards

1. Provide condenser coil protection.

E. Compressors

1. The unit shall have direct-drive, hermetic, scroll type compressors with centrifugal type oil pumps.

2. Suction gas-cooled motor with voltage utilization range of plus or minus 10 percent of unit nameplate voltage.

3. Internal overloads on scroll compressors.

4. Crankcase heaters on all compressors.

5. Dual compressors.

6. Three stages of cooling.

F. Filters

1. Standard throwaway filters

2. 2 inch MERV 8 filters

G. Frostat™

1. Utilized as a safety device.

2. Opens to prevent freezing temperatures on evaporator coil.

3. Temperature will need to rise to 50°F before closing.

4. Utilized in low airflow or high outside air applications (cooling only).

H. Indoor Fan

1. Direct drive plenum fan design.

2. Plenum fan design — backward-curved fan wheel along with an external rotor direct drive variable speed indoor motor.

3. Supply fan speed adjustments can be made using the Symbio 700 controller.

4. Motors are electronically protected.

5. Variable speed direct drive motors are high efficiency – 6 to 25 tons.

I. Powered Convenience Outlet

1. Powered GFCI, 120V/15A, 2 plug, convenience outlet.

2. Provide service receptacle disconnect.

3. Convenience outlet is powered from the line side of the disconnect or circuit breaker, and therefore will not be affected by the position of the disconnect or circuit breaker.

J. Stainless Steel Drain Pan

1. Corrosion and oxidation resistance.

2. Constructed of 304 stainless steel.

K. Through-the-Base Electrical with Disconnect Switch

1. 3-pole, molded case, disconnect switch with provisions for through-the-base electrical connections.

2. Disconnect switch installed within unit in a watertight enclosure.

3. Wiring provided from the switch to the unit high voltage terminal block.

L. Economizer

1. Fully modulating 0-100 percent motor and dampers, minimum position setting, preset linkage, wiring harness with plug, spring return actuator and fixed dry bulb control.

2. Differential enthalpy control.

M. Motorized Outside Air Damper

1. Once set, when indoor fan starts, outdoor air dampers shall open to set position.

2. When indoor fan shuts down, damper shall close to the full closed position.

N. Powered Exhaust

1. Shall provide exhaust of return air, when using an economizer.

O. Roof Curb

1. Provide support and a watertight installation.

2. Shall be field-fabricated rectangular supply/return ductwork to allow connection directly to the curb.

3. Shall include wood nailer strips.

P. Comparative Enthalpy

1. Unit receives and uses information to provide improved comfort cooling while using the economizer.

2. Comparative enthalpy measures and communicates humidity for both outdoor and return air conditions, and return air temperature.

3. Unit receives and uses information to maximize use of economizer cooling, and to provide maximum occupant comfort control.

4. Comparative enthalpy shall be provided with a factory installed downflow economizer.

79. CABINET HEATERS – CH-1 & CH-2

A. Performance Data

1. Capacity: Unit capacities are in accordance with Industry Room Fan-Coil Air Conditioner Certification Program under AHRI Standard 440-97. Safety: All standard units are UL listed in the United States and Canada. Units comply with NFPA90A requirements.

B. Construction

1. All Units

The unit includes a chassis, coil, fan wheel(s), fan casing(s), fan board, and motor(s). The fan board assembly is easily removable. The fan board assembly includes a quick-disconnect motor plug. The chassis construction is 18-gauge galvanized steel, and continuous throughout the unit. The unit is acoustically and thermally insulated with closed-cell insulation. All panels are made rigid by channel forming.

2. Recessed Units

Exposed panels on recessed units are 18-gauge steel construction and ship separate from the unit. Bottom panels on horizontal recessed models ship with tamperproof screw fasteners and safety chain. Horizontal recessed units feature a telescoping panel to allow the panel to be adjusted to line up flush with the ceiling. The telescoping panel extends 1.25-inch to 2-inch depending on the configuration of airflow.

3. Unit Finish

All cabinet parts and exposed recessed panels are cleaned, bonderized, phosphatized, and painted with a baked powder finish in color selected by architect.

4. Fans

The galvanized metal fan wheels are centrifugal forward-curved and double-width. Fan wheels and housings are corrosion resistant. Fan housing construction is formed sheet metal.

5. Motors

All motors are brushless DC/electronically commutated motors (ECM) factory-programmed and run-tested in assembled units. The motor controller is -mounted in a touch-safe control box with a built- in integrated user interface and LED tachometer. If adjustments are needed, motor parameters can be adjusted through momentary contact switches accessible without factory service personnel on the motor control board.

Motors will soft-ramp between speeds to lessen the acoustics due to sudden speed changes. Motors can be operated at three speeds or with a field-supplied variable speed controller. The motor will choose the highest speed if there are simultaneous/conflicting speed requests.

All motors have integral thermal overload protection with a maximum ambient operating temperature of 104°F and are permanently lubricated. Motors are capable of starting at 50 percent of rated voltage and operating at 90 percent of rated voltage on all speed settings. Motors can operate up to 10 percent over voltage.

6. Extended End Pockets

   On vertical or horizontal cabinet units, an 8-inch extended end pocket is available on the piping end.

7. Tamperproof Locks

   Key-operated locking access doors and/or panels will help prevent nuisance tampering with unit and/or controls. Tamperproof locks are available on vertical cabinet, horizontal cabinet, vertical wall-hung cabinet, vertical recessed, and vertical slope-top units.

8. Leveling Feet

   Refrigerator type screw-in bolts to level the unit are available on vertical units.

C. Controls

1. Controls options are, fan speed control and Thermostat. A disconnect switch (for non-electric heat units), fused transformer, contactor(s), and terminal strip are provided with the control interface and Tracer® controller options.

2. Fan Speed Control

   The fan speed control shall be unit mounted. The speed control incorporates a 0-10 Vdc signal providing limitless control of the motor RPM between the factory set low and high speeds. The control box contains a line voltage to 24-volt transformer, ECM motor controller, and disconnect switch.

3. Disconnect Switch

   A unit mounted disconnect switch shall be provided.

D. Coils

1. All water coils are proof-tested at 300 psig (air) and leak-tested at 100 psig (air underwater). Maximum main coil working pressure is 300 psig. Maximum entering water temperature is 200°F. Tubes and u-bends are 3/8-inch OD copper. Fins are aluminum and are mechanically bonded to the copper tubes. Coil stub- outs are 5/8-inch OD copper tubing.

2. Hot Water Coils

   Hot water coils are proof tested at 350 psig (air underwater) and leak tested at 125 psig (air under water). Additionally, a pressure decay test is conducted at 120 psig.

   Maximum main coil working pressure is 300 psig. Maximum entering water temperature is 200°F. Tubes and u-bends are 3/8-inch OD copper. Fins are aluminum and are mechanically bonded to the copper tubes. Coil stub outs are 5/-inch OD copper tubing.

E. Filters

1. Filters are concealed and removable. Filters shall be 1-inch throwaway MERV 8.

F. Projection Panels

1. Projection panel shall allow semi-recessing of vertical recessed units, with a projection depth of 3”.

2. Panels shall be 16-gauge steel construction, painted with a baked powder finish. Provide recessing flange and color matching filler panels where required. Field verify conditions.

G. Piping Package

1. All piping packages shall be proof-tested at 300 psig (air) and leak tested at 100 (air underwater). The maximum working pressure of the interconnecting piping is 300 psig.

2. Control valves shall be mounted in factory installed piping package.

   Basic with manual circuit setter: Provide shut-off ball valve on the supply line and control valve and manual circuit setter on the return line.

3. Modulating and Analog (2–10 Vdc) Control Valves

Modulating and analog control valves shall be ball valve designed with zero leakage.

4. Shut Off Valves

Piping package shall include a ball valve on the hot water supply pipe and a circuit setter on the hot water return pipe.

80. HOT WATER BOILERS – B-1 & B-2

A. General Requirements

1. Furnish and install two (2) packaged, modulating, sealed combustion, power-vented, high efficiency gas-fired boiler with cast aluminum sectional heat exchangers that use outside or inside air for combustion.

2. Install packaged boiler unit according to manufacturer's installation instructions; All work to be done in a neat and workmanlike manner.

3. Weil-McLain SlimFit - 750, packaged boiler capable of burning natural gas.

4. Boiler shall have an AHRI gross output at 100% fire rate of 750 MBH per boiler.

5. Boiler shall be 94+% minimum AHRI certified thermal efficient as required by BTS 2000.

6. Boiler shall be capable of full modulation firing with a turn down of up to 5 to 1.

7. Boiler shall be manufactured to conform to Section IV of the ASME Boiler and Pressure Vessel Code.

Sectional cast aluminum block to be fire tested and hydrostatically pressure tested at factory in accordance with ASME requirements.

B. Product

1. Acceptable boiler manufacturer include, Weil-McLain.

2. Boiler Construction

Boiler heat exchanger:

Cast aluminum sectional block.

The boiler must have non-metallic condensate collector to capture condensate from both, the vent system and heat exchanger.

Factory Assembled and Tested

Boiler main components:

The combustion chamber will be sealed and located at the top of the block casting which will be of counter flow design to assure that sediment and any lime that might form will fall to the bottom away from the crown sheet area.

Boiler shall be supplied with a gas valve designed with negative pressure regulation. The inlet natural gas pressure to the boiler gas valve shall be a minimum of 3.5" W.C. and a maximum of 14" W.C.; If inlet gas pressure exceeds 14" W.C., a 100% lock-up type gas pressure regulator of adequate size shall be installed in gas supply piping and adjusted to prevent pressure in excess of 14" W.C.

The burner shall be premix combustion type, made with stainless steel and a woven metal fiber outer covering to provide a wide range of modulating firing rates.

The boiler shall be equipped with a variable speed blower system capable of modulating the boiler firing rate from 100% to 20%.

The boiler shall be equipped with a device capable of controlling the air/fuel ratio through a 5 to 1 turndown ratio.

The control system shall have an electronic display for boiler set-up wizard, boiler status, boiler diagnostics and typical heating systems presets.

3. Venting and Combustion Air – See Details on Drawing

4. Boiler Trim

All electrical components bear UL label.

Boiler shall be CSD-1 compliant with factory report for ASME CSD-1.

Water boiler controls furnished:

High limit temperature control with manual reset (190 degrees F maximum allowable boiler water temperature).

Combination pressure-temperature gauge; Gauge dial clearly marked and easy to read.

ASME certified pressure relief valve set to relieve at 30 (optional 50 or 80) PSIG.

Flue gas, supply water temperature, and return water temperature sensors.

Low water protection with manual reset.

High and low gas pressure switches with manual reset and indicator lights.

Built-in freeze protection.

Boiler Control to be UL 353 Listed and have the following features:

Express set up wizard and fully customizable options.

Modbus as standard and BACnet as an option.

Preset typical heating systems.

Ability to control additional boilers by sending 0-10 volt DC signal or contact closure.

Up to 8 boilers cascading / lead-lag operation and boiler rotation for equal run hours.

Multiple boiler operation with up to 24 circulators.

4 pump contacts per boiler.

Outdoor temperature reset and warm weather shutdown.

Variable temperature zones that require no mixing valves.

Multiple LCD digital temperature access points including supply, return, system temperatures, and flue gas temperature.

Color coded LCD display and keypad access.

Alarm contacts that include flame fail, high temperature and low water cut off.

Boiler schedule and contractor information.

Ignition control.

Adjustable priorities.

5. Boiler Manuals

The boiler shall be provided with complete instruction manuals, including:

Boiler Installation Manual

User Manual

Manufacturer's Data Report for ASME CSD-1

* * * END OF SECTION * * *

ELECTRICAL

SECTION 16000

INDEX

1. NOTE

   A. The General Conditions and the Special Conditions of the Contract apply to this Section. This Contractor shall be responsible for complete familiarity with same. Work shall include but not be limited to the following principle items.

2. SCOPE

   A. The work included under this section shall consist of the furnishing of all material, equipment and labor required to install all of the electrical work indicated on the drawings and as specified hereinafter, including the testing and adjustment of same.

3. DESCRIPTION OF WORK

   A. The following is a summary of the principal categories of work under this section. Note, however, that this listing is for general information only and work will not necessarily be limited to these categories. The detailed drawings and the following specifications cover the full extent of the work.

   B. Secondary Services:

      1. Additions and/or revisions to the existing electrical distribution system as indicated on the drawings.

      2. Temporary service for construction.

   C. Emergency Power:

   D. Exit Lighting:

      1. Additions and/or revisions to the existing electrical distribution system as indicated on the drawings.

      2. Exit lighting including conduit, wire, boxes, and fixtures.

   E. Lighting:

      1. Lighting fixtures including installation, complete with lamps, hangers, and accessories.

   F. Outside Lighting:

1. An addition (and revision) to the outside lighting fixture installation complete with lamps, wire, conduit, brackets, poles (concrete bases) and accessories.

G. Devices:

1. Power outlets and control devices including wall switches and receptacles as defined on the legend.

H. Fire Alarm & Security:

1. An addition and revision to the existing fire alarm system including bells, sending stations, smoke detectors, air handling unit duct detectors, annunciator, control unit modules and an independent conduit and wire network.

2. An intrusion alarm system will be provided and shall be connected to base security office.

I. Telephone Systems:

1. A system of empty conduit stubs, miscellaneous outlets, plates, backboards, etc., for a complete new owner installed telephone system.

J. Demolition:

1. Removal of existing electrical devices that are noted on drawings and those devices in the area of the work that are obviously necessary to be removed or relocated.

K. Mechanical Equipment:

1. Motor and power connections to items of mechanical and shop equipment including applicable controls.

4. PERMITS, FEES, INSPECTIONS, LAWS & REGULATIONS

A. Obtain and pay for all permits required in connection with this section of the work. In addition, pay all necessary inspection fees or similar charges. Laws and regulations which bear upon or affect this work shall be complied with and are hereby made a part of this section of the work. All work which such laws require to be inspected shall be submitted to the proper public officials for inspection.

B. The requirements of the National Electrical Code (NEC) as well as all local

ordinances and regulations, including those of the local utility company, shall be followed and adhered to with regard to the work under this section. Where the contract documents (plans, specifications, etc.) exceed the minimum requirements of the NEC and/or other regulations, etc., the document requirements shall govern.

C. At completion of the project furnish to the Owner, at no additional charge, a certificate(s) of inspection issued by the authorized agency (or agencies) having jurisdiction over this portion of the project, stating that all work executed under this section complies with the minimum requirements.

D. Note that the General Building Permit will be obtained and paid for by the successful General Contract Bidder. Contractors bidding this section of the work shall make a sufficient allowance in their bid to reimburse the General Contractor for their proportionate share of the permit cost.

E. Additional fees, charges, etc. imposed by other contractors and/or tradesmen, professional consultants, etc. for services rendered in connection with performing any portion of the work under this section shall be included as part of the work. This shall include surveys, profiles and/or other miscellaneous drawings, etc. that may be required in addition to the contract documents by any governing authority.

5. SITE INVESTIGATION

A. Prior to bidding, it is recommended that the contractor visit the job site and investigate all details which may have any effect on the installation, progress or completion of the project.

B. When a bid is received, it will be assumed that the contractor has made the job site visit(s) and is familiar with the conditions as they exist and any adjustments and/or modifications that may be necessary in order to perform and complete the work as specified.

C. At project start-up, certain areas will be designated for the storage of materials and equipment and cooperation with the Owner in minimizing interference with existing operations will be mandatory.

6. DRAWINGS

A. The drawings prepared for this project are an outline to show where conduit, devices and distribution equipment must go in order to harmonize with the building and installations of the various trades. All work must be installed in accordance with the drawings insofar as possible. All drawings shall be carefully checked during the course of bidding and construction. If any

discrepancies, errors or omissions or overlaps with other trades are discovered prior to or during the construction phase, notify the Engineer immediately for interpretation or correction. Note that an overlap with another trade does not relieve the contractor from the obligation of performing the work indicated on the drawings for this section of the project unless written notification stating such is obtained from the Engineer.

B. Take all necessary measurements and be responsible for same, including clearances for all equipment that is to be furnished. The Architect/Engineer shall reserve the right to make minor location changes of equipment where such adjustments are deemed desirable from an appearance, installation or operational standpoint. Such changes will normally be initiated sufficiently in advance to avoid extra work or unduly delay progress on the project.

C. In general, the conduit and wiring layouts shall be considered as diagrammatic for clearness and legibility and are to be used as a guide. Therefore, it is not intended that the drawings indicate all necessary offsets, junction boxes, pull boxes, etc. Conduit, wiring, fixtures, equipment, etc. may have to be offset, lowered or raised as required or as directed at the site in order to accommodate field conditions. In addition, relocate or shift equipment, fixtures and devices without cost, when so directed by the Engineer, providing such items have not been installed and the revised location is not greater than 10 feet from the location indicated.

D. Note also that electrical connections indicated on the drawings may not be shown in the correct location for the equipment, fixtures, devices, etc., actually selected for the project. Verify all connection locations with shop drawings of the item to be installed or make field measurements before proceeding with any rough-in work.

E. The general building and/or structural drawings shall be used to obtain dimensions and exact locations and as a check with other contractors to avoid interference with their work. Refer to applicable drawings on all branches of the work where other trades are involved on the project so that added field work and/or job delays resulting from conflicts between crafts can be avoided.

7. SPECIFICATIONS

A. Specifications shall be interpreted in conjunction with the drawings hereinbefore described and if anything is shown on the drawings and not mentioned in the specifications or vice versa, it is to be included in the work the same as though clearly set forth by both.

B. Furthermore, all materials or labor obviously required to fully complete the work shall be included in the bid, even though each item necessarily involved is not specifically mentioned or shown. Such work and/or material shall be furnished and shall be of the same grade or quality as the parts actually specified and shown. Should there be a conflict between the plans and specifications, the greater quantity or better quality shall be furnished.

C. Should an overlap of work between the various trades become evident, the Engineer shall be notified. Such an event shall not relieve any trade of the responsibility for the work called for under his branch of the specifications until a written clarification or directive is issued concerning the matter.

D. When selecting equipment to be used on this project, refer to Item EQUIPMENT CLEARANCES AND REQUIREMENTS in these specifications.

E. Note that all systems and items of equipment involved under this contract heading shall be furnished and installed in accordance with applicable requirements of federal, state and local codes including the ADA (Americans with Disabilities Act), OSHA requirements and applicable portions of NFPA. The above includes adhering to applicable requirements governing mounting heights for occupant operable controls.

F. All references made to codes, standards, etc. in these specifications or on the drawings shall be taken to mean the latest edition, amendment and/or revision of such reference in effect as of the date indicated on the Bid Documents.

G. All hardware, software and firmware purchased and/or installed under this contract, individually and in combination with each other, shall function free of any fault in processing dates and any information relating to dates, including calculating, comparing, and sequencing information and/or functions which depend on dates through and beyond January 1, 2000. Such fault-free operation shall not require any modification after the system is installed and it shall be transparent to the user.

8. MATERIALS AND WORKMANSHIP

A. Materials supplied under this contract shall be new and in strict accordance with the provisions of these plans and specifications. Any material required which is not specifically represented by a manufacturer's catalog number of quality standard, shall be subject to the approval of the Architect/Engineer in all cases. When two or more items of the same equipment are involved, they shall be identical in quality and made by the

same manufacturer.

B. Materials shall be the latest design of that manufacturer and shall be shipped to the job in the original container with proper identification as to size, type and dates of inspection and shipment.

C. Electrical work shall be performed by mechanics skilled in their respective trades. Tool marks will not be permitted on any exposed materials, fixture or fitting. In addition, all exposed materials, fixtures, equipment, etc. shall be installed in straight horizontal and/or vertical lines, parallel to the building lines wherever possible. Carelessly executed work as well as workmanship that is determined to be below normal industry standards of best practice, and/or work not conforming to the requirements of this item, shall be redone or repaired as required prior to final acceptance.

9. CUTTING AND PATCHING

A. All cutting and/or drilling of walls, slabs, structural members, etc., required in conjunction with work under this section shall be performed as part of the work and shall be done under the supervision of the General Contractor. Work shall be neatly done, without unnecessary removal of material. Holes, openings, etc. shall be located where they will not weaken the structure. No beams, joists, etc., shall be cut without written authorization from the Architect.

B. Cutting of holes in masonry and/or concrete shall be performed with a core drill to minimize spalling, etc. Locations shall be accurately determined and checked and the appropriate drill bit shall be used to minimize hole size.

C. Sleeves or thimbles for these holes as well as escutcheons and trim plates shall be provided as described in Item INSERTS, PENETRATIONS AND SLEEVES.

D. NOTE: Cutting of water lines, electric conduit or similar service lines in the course of work performed under this section shall be immediately repaired as part of the work of this section.

E. Patching and/or repairing of all work, including finished surfaces, necessitated by the demolition or installation of work under this section shall be considered as part of this work. It shall, however, be performed by mechanics of the appropriate trade in order to achieve a workmanlike job. This shall include, but not be limited to, all items of concrete and masonry work, millwork, gypsum board and/or plaster work, painting, floor finishes and ceiling finishes as well as all other surface finishes.

F. When the need for such patching or repairs arises, immediate arrangements shall be made with the appropriate trade(s) or with the General Contractor to perform the necessary work at no additional cost to the Owner. The final responsibility for acceptance of such work by the Owner's representative shall reside with the contractor for this section of the project.

10. PROTECTION

A. Provide proper protection to the building during the execution of all work involved under this contract heading.

B. This protection shall include covering all apparatus, building surfaces and/or other materials to protect same from dirt; adequate temporary connections to protect apparatus from damage of any sort; and required shielding to protect finished parts of the building. The following shall apply where applicable:

C. Protect finished floors from chips and cutting oil by the use of a metal chip receiving pan and an oil proof floor cover.

D. Protect equipment and finished surfaces from welding and cutting spatters with baffles and spatter blankets.

E. Protect all electrical equipment finished surfaces from paint droppings, insulation adhesive and sizing droppings, etc., by the use of drop cloths.

F. Exercise extreme caution in the handling and storage of tools, material and equipment in order to prevent damage to other contractor's work and/or materials and to avoid repair costs.

G. All switchgear, transformers, fixtures and other electrical equipment stored at the site with exposed openings, bearings, etc. shall be covered to exclude dust and moisture. All stockpiled conduit shall be placed on dunnage and protected from weather and from entry of foreign material.

H. Furnish necessary devices, strip heaters, wiring, connections, power, etc. to provide temporary heat to keep moisture out of apparatus and equipment such as transformers, motors, etc. furnished under this section.

11. PREPARATION OF BIDS

A. All bids shall be based upon furnishing and installing the make of materials and apparatus specified herein WITHOUT SUBSTITUTION, in order that all bids may be properly compared.

B. Other materials, equipment or systems that the bidder may desire to use as

a substitute for that specified will be considered IF PROPOSED AT THE TIME OF BIDDING and shown on the substitution sheet of the proposal. Such alternate items shall be of equally high quality with all safeguards, design features and operational requirements as shown on the drawings and/or as specified herein.

C. It is understood that proposals to use such substitutes shall be made in addition to and separate from the base bid in order to receive consideration and the addition to or deduction from base bid, if any, shall be duly noted on the bid form.

D. Regarding substitutes, note that any deviations from the following specifications or any special equipment requirements (ambient conditions, services, power conditioning, etc.) necessary for full time operation shall be clearly stated and completely itemized. Failure to meet these stipulations could result in additional expense that would be assigned to this section of the work and not considered as an extra. These substitute proposals will not, however, be considered as a basis for determining the low bidder unless they are specifically listed by Addendum as alternate proposals. Each substitute proposal offered shall list the manufacturer, the catalog number of the substitute item, and the specified item to be replaced by the substitute. In addition to this information, state the amount to be added to or deducted from base bid in the event the substitute proposal is accepted.

E. for later consideration unless delivery schedules or other factors beyond the Contractor's control justify same.

F. If more than one make of material or equipment is specified, the proposed manufacturer, brand, type, etc. shall be identified. If this provision is not complied with, the Owner may then make this selection without change in contract price.

G. Note that in the following specifications, where more than one manufacturer is listed for a particular item of operating equipment, the design will be based on the first named. If equipment by the other named manufacturer(s) or a proposed substitute requires redesign work, revised/modified services, or specific additional field work by other trade(s), the price submitted for providing this equipment must include the required additional amount to cover such work.

H. Lump sum pricing by suppliers on two or more dissimilar classifications of materials, without an accompanying price breakdown on the individual classifications, will not be tolerated. Notify the Engineer, upon receipt of a lump-sum quotation which prevents a legitimate comparison with other competitive individual quotations.

12. SHOP DRAWINGS

A. Prepare or obtain from the manufacturer, certified shop or erection drawings of all items of equipment to be furnished under this section and submit copies of same as required for review. This shall be done as soon as possible, well prior to proceeding with installation or construction and in the proper sequence to avoid delays in the work, the work of the Owner or other contractors. Unless otherwise indicated, a minimum of six (6) hard-copy sets OR one (1) electronic set shall be submitted. These drawings shall be complete in every respect, showing pertinent details regarding size, external and internal features, mechanical and/or electrical arrangements, locations of connections, installation and mounting instructions, materials, gauges, electrical characteristics, wiring diagrams, and other information necessary to show compliance with the intent of the contract documents. Note that in the following items of this specification, where more than one equipment manufacturer is listed, the first named has been used as the basis for design. All departures or deviations in performance, service requirements, size, etc. from first named by the make submitted shall be noted on the shop drawings. Where departures or deviations do occur, the contractor shall additionally itemize same on the cover sheet that accompanies the submittals. Failure to do so will risk subsequent rejection at the job site. (With regard to voluntary substitutions, refer also to Item BIDDING in this specification and item EQUIPMENT CLEARANCES AND REQUIREMENTS.

B. By submitting such drawings, the Contractor represents that he has selected and verified the materials and equipment, taken necessary field measurements, noted field construction criteria, etc., related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and the Contract Documents.

C. Materials and equipment to be furnished for this project shall be of current production by manufacturers regularly engaged in the manufacture of such items. When two or more similar units are required, they shall be the product of one manufacturer.

D. The review of shop drawings shall not be construed as a complete check but will indicate only that the capacity, general method of construction and/or detailing is satisfactory. Carefully check and verify dimensions for installation and service requirements before ordering equipment for the project.

E. Submittals shall be itemized on a standardized shop drawing submittal form stating the name of the project, specification section, paragraph and/or

drawing numbers applicable to submittal and shall bear the contractor's review stamp as evidence that the items have been initially checked for compliance with Contract Documents as stated above.

F. After review, shop drawings will be returned five (5) hard-copy sets OR one (1) electronic set, marked in one of the following ways:

1. "NO EXCEPTIONS NOTED" - Copies may be distributed as required for construction, shipment, etc. to proceed.

2. "EXCEPTIONS NOTED" - Contractor may proceed with and/or authorize construction, shipment, etc. taking into account the necessary corrections.

3. "EXCEPTIONS NOTED - REVISE AND RESUBMIT" - Contractor will be required to resubmit shop drawings in their entirety. No fabrication, erection or installation shall be authorized or initiated until shop drawings so marked have been completely revised, resubmitted and subsequently marked in accordance with either of the two preceding subparagraphs. Only shop drawings officially marked "NO EXCEPTIONS NOTED" or "EXCEPTIONS NOTED" will be permitted on the jobsite.

G. Upon return of submittals take appropriate action as specified above. Note that any shop drawing hard-copies received beyond the number required will be destroyed (not returned).

H. Where resubmittal is required, four (4) hard-copies OR one (1) electronic copy will be so noted by the reviewer, of which two (2) hard-copies OR one (1) electronic copy will be returned for corrections (one (l) hard-copy for the contractor and one (l) hard-copy for the supplier/subcontractor).

I. The following is a list, where applicable, of items requiring submittals.

1. Secondary Switchgear

2. Panelboards

3. Data Communications Wiring

4. Motor Starters

5. Safety Switches

6. Lighting fixtures, Lamps, and Ballasts

7. Wiring Devices and Cover Plates

8. Battery Powered Emergency Lighting Units

9. Fuses

16. Surface Raceway

J. Note that submittal review is for general construction, detailing and application only. Carefully check and verify dimensions for installation as well as clearance and service requirements before ordering equipment for the project. In addition, where an elevator(s) is involved, verify all equipment specific electrical requirements with the selected equipment supplier in order to verify breaker type, feeder sizing, etc. At completion, the entire installation shall be such that all equipment will function and be serviceable in a normal and satisfactory manner.

K. Shop drawings will be provided by the Owner for any Owner furnished equipment requiring service or connections under this section.

I. A complete set of shop drawings, officially marked in the prescribed manner noted previously, shall be filed on the job site. Such drawings shall be kept together, maintained in good condition and shall be readily available for reference.

13. WORK BY OTHERS

A. Each bidder shall read the specifications for the other branches of work to clarify the points of division of responsibility between the various trades. The following work will be by others:

General construction and site work . . .

Plumbing . . .

Heating and air conditioning . . .

Painting, except as specifically included in this contract . . .

Telephone equipment and wiring . . .

Heating and air conditioning temperature control wiring and interlocks of automatic temperature control equipment not indicated on the electrical drawings

B. The foregoing list of items of work by others constitutes only the major

portion of such work, and is intended merely as a guide. Other minor items of such work to be done by others may appear elsewhere in these specifications or on the drawings.

14. SUPPORTING MEMBERS

A. Furnish and install all steel angles, channels, bars or clamps required to support any type of permanent apparatus to be furnished and/or installed under this section.

15. EQUIPMENT IDENTIFICATION

A. Provide nameplates on all items of equipment including those listed below:

Primary Switchgear

Secondary Switchgear

Unit Substation

Transformers

Panelboards

Motor Starters and Contactors

Safety/Disconnect Switches

Control Panels

Motor Control Centers

Automatic Transfer Switches

Bus Ducts

B. Nameplates shall be laminated phenolic with black surface and white core. Use 1/16" thick material for plates up to 2" X 4". For larger sizes use 1/8" thick material. Attach to equipment by non-rusting screws.

C. Lettering shall include name of equipment, the specific unit identification number and any reference to ON-OFF or other instructions that are applicable. On bus duct runs this identification shall include phases A-B-C, neutral and voltage.

D. Lettering shall be condensed gothic. The space between lines shall be

equal to the width of the letters. Use minimum l/4" high letters which will print approximately four to the inch. Increase letter size up to 3/4" on larger plates.

E. All wiring device cover plates shall have identification with regard to panel number, circuit number, item controlled, etc.

16. CLEAN UP

A. All rubbish resulting from the work herein specified shall be removed from the premises as fast as it accumulates.

B. Upon completion of the work, remove from the project site all tools, equipment, surplus materials and rubbish pertaining to the work under this contract heading. Responsibility for this shall include paying all costs for such removal and disposition including hauling, dumping, proper and legal disposal of hazardous materials, etc.

17. MAINTENANCE OF EXISTING FACILITIES

A. Prior to the severing of the electrical service to any portion of the existing building, submit a plan to the Architect and the Owner's Representative, stating the nature and duration of the proposed interruption, as well as the method of procedure. Do not under any circumstances proceed with an interruption of service of any type without the Owner's written authorization.

18. WORK IN EXISTING BUILDING

A. All electrical fixtures, outlets shown dotted and associated wiring and conduit, etc., located in the remodeled portions of the existing building shall be disconnected, abandoned and either removed or covered with a stainless steel plate as directed by the Architect/Engineer.

B. ing electrical circuits and outlets which are to stay in use shall remain on the existing electrical panels. New work shall be connected to the new panels unless indicated otherwise.

C. Existing circuits may be reused where convenient. All remaining lights, switches, receptacles, motors, etc., not disturbed in the remodeling shall be checked for proper operation and circuits disturbed by the remodeling work or in violation of N.E.C. shall be properly reconnected as required.

D. All cutting and patching of existing walls, floors and ceilings required for the installation of any and all electrical work in the remodeled portions of the existing building shall be done under this section. (See Item CUTTING

AND PATCHING).

E. All electrical work to be installed in finished rooms of the existing building shall be installed concealed unless otherwise noted on the drawings.

F. Painting of all patched work in the existing building will be the responsibility of others.

19. TESTING, LOAD BALANCE AND ADJUSTMENT

A. Load balancing, adjustments and electrical testing shall be done under this section of the work.

B. A person skilled in the field of electrical testing and operating with proper test equipment shall perform the following:

C. Balance panelboard feeder loads, distribution feeder loads and main feeder loads between phases.

D. Assure that proper phase relationships are maintained, before and after balancing, to prevent reverse rotation of rotating equipment.

E. Test polarity and circuit continuity at each receptacle.

F. Each special system installed under this contract, such as clock, fire alarm, sound, nurse call, etc. shall be inspected and operationally tested by a qualified representative of the equipment vendor.

G. Submit a written report of each test to the Architect immediately following the test.

20. RECORD DRAWINGS

A. Provide and keep on the job two complete print sets of the contract working drawings on which shall be legibly recorded any variations from such contract drawings, change orders or alterations to the work made during construction. Record print sets shall show any changes in:

Size, type, capacity, etc., of material, device or piece of equipment;

Location of devices or equipment;

Location of outlet or source in building service systems;

Routing of feeders, bus ducts, or other building services;

Schedule data;

B. These prints shall also show the location of all concealed pull boxes, feeders, etc., as well as electric services, obtained by actual field-measured dimensions to each such item from readily identifiable and accessible walls or corners of the building. Changes, modifications, etc., shall be recorded daily. In addition, the Contractor will be given an electronic set of drawings (disks) on which to permanently record such changes at the completion of the project.

C. During the course of the project these prints shall be kept clean and undamaged and shall not be used for any purpose other than recording deviations from contract drawings and exact locations of concealed work. They shall be available at all times for the Owner's and/or the Engineer's inspection.

D. When the job is completed, record prints shall be turned over to the Engineer for review. Subsequent to this review, the prints will be returned to the Contractor for use in preparing the updated electronic file. Unless otherwise indicated, this shall be done in either AutoCad 14 or AutoCad 2000 format.

E. Note that providing the completed "as built" electronic file is a requirement for project close-out.

21. INSTRUCTIONS AND MANUALS

A. Provide four complete brochures in hard backed binders, each containing all operating, servicing, and maintenance information as well as parts lists for all equipment installed under this contract. Where diagrams are too large for the binder, arrange manila pockets with reinforced holes to hold folded drawings. The binder shall also contain a title sheet showing the Contractor's name and address and an index sheet listing the contents of the manual. A copy shall be submitted to the Engineer for verification prior to being submitted to the Owner.

B. Information shall be complete, indexed, and bound as described above. The following shall be clearly printed on the front cover of the binder:

Project name, address and date.

Name and address of Architect-Engineer.

Section of Work covered, i.e., Electrical

Name and address of Contractor.

Telephone number of Contractor, including night or emergency numbers.

C. Incorporate, within the binders, individual sections containing an index sheet, written operating instructions, shop drawings, equipment catalog cuts, manufacturer's instructions, and a list of equipment into the binders.

First Page - Title of Job, Owner, Address, Date of Submittal, Name of Contractor and Name of Architect-Engineer...Emergency operating instructions and/or list of service organizations (including address and telephone numbers) capable of rendering emergency service on 24 hour calls shall be furnished.

Second Page - Index/Table of Contents

Third Page - Introduction to First Section...This shall contain a complete written description of the system.

First Section: A written description of system contents, where the system is actually located in the building, how each part functions individually and how the system works as a whole...Conclude with a list of the items requiring service and either state the service and frequency needed or refer to the manufacturer's data in the binder that describes the proper service.

Second Section: A copy of each approved shop drawing, (clearly marked to identify the item furnished) with an index at the beginning of the section...Provide a separate list of all lighting fixtures and luminaires used on the job. The list shall include but not be limited to fixture type, manufacturer's catalog number and voltage, number of lamps, lamp type, ballast catalog number, manufacturer's name and quantity when required, catalog number and quantity of any replacement glass and/or plastic parts.

Third Section: A copy of each manufacturer's operating instructions with an index at the beginning of the section.

Fourth Section: A list of all equipment used on the job, Contractor's purchase order numbers, supplier's name and address.

D. Arrange for technical instruction of the Owner's maintenance personnel for such time as would be reasonably required to acquaint them with their duties. In addition, deliver to the Owner all special tools or equipment required for making normal adjustments on any equipment or apparatus furnished under this contract heading.

E. Technical instructions involving installed equipment shall include a demonstration of the equipment and/or the operating system(s) with a description of the operation explained to the owner's representatives. It shall be this Contractor's responsibility to arrange this demonstration with the Owner as well as representatives of suppliers. The demonstration shall take place after all testing and balancing and written reports of such work have been submitted to and accepted by the Architect/Engineer. The time when the satisfactory completion of this technical instruction and demonstration takes place will establish the date of final acceptance of the system and/or project unless otherwise stipulated.

22. EQUIPMENT CLEARANCES AND REQUIREMENTS

A. For many items of equipment described in these drawings and specifications several manufacturers are listed. The first named in each instance is the make on which the layout was based and on which clearances, service requirements, electrical and plumbing characteristics, etc. have been checked.

B. Due to the possibility of restrictions imposed by space limitations, the responsibility for resolving conflicts resulting from the use of equipment other than first named or of alternate equipment shall rest with the equipment supplier and the Contractor. Submittals for this equipment will be considered as a statement that clearances for access, service, maintenance, etc. have been checked and found adequate.

C. Alternate equipment or the equipment of additional manufacturers named in these documents shall meet all base bid specifications. In the event such equipment, or any equipment which the bidder proposes to furnish, deviates from the requirements of equipment first named regarding electric service, power wiring, control wiring, plumbing and/or piping, sound attenuation, vibration damping, etc., it shall be the responsibility of the bidder to include in his price a sufficient sum to cover all additional costs or charges resulting therefrom.

23. CONTRACTORS' FOREMAN

A. With reference to the work under this section, a competent foreman shall be assigned to the project. The foreman shall remain on the job during all normal working hours until the project is complete and shall be authorized to act as the Contractor's agent in the absence of said Contractor. This foreman shall not be relieved of his duties on the project except by permission or by request of the Architect.

24. WARRANTIES

A. Provide warranties to the Owner that the materials and equipment furnished are new, unless otherwise specified, and that all work is of good quality, free from faults and defects and in conformance with the Contract Documents. Unless otherwise specified, all warrants shall extend for a period of 12 months or greater as noted below. However, latent defects in materials, equipment or workmanship that are not discovered until sometime during the second year following acceptance, shall remain the contractor's responsibility to correct.

B. Warranties on all work and equipment shall commence on the date of substantial completion of the work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. These warranties and all related documents shall be presented in writing prior to the issuance of any Certificates. Warranties shall include equipment manufacturer's written certificates warranting the equipment furnished complies with all requirements of the drawings and specifications. This documentation shall be submitted in an appropriately marked, 3-ring hard cover binder.

C. If, within one year after the date of substantial completion of the work or within one year after acceptance by the Owner or within such longer period of time as noted above or as may be prescribed by the terms of any applicable special warranty stipulated in the Contract Documents, any portion of the work is found to be defective, functioning improperly, or not in accordance with the Contract Documents, it shall be promptly corrected upon receipt of official notification to do so. This obligation shall survive termination of the contract.

25. HOISTS, RIGGING, TRANSPORTATION AND SCAFFOLDING

A. Provide all necessary scaffolding, staging, cribbing, tackle, hoists and rigging to locate the material, equipment, etc. of this section in its proper place on the project. All such temporary work shall be removed from the premises when no longer required.

B. Pay all costs related to the transportation of materials and equipment to the job site. These costs shall be covered in the bid as no additional allowance will be made by the Owner.

C. Scaffolding and hoisting equipment shall comply with requirements of all pertinent Federal, State and Local Laws and Codes.

26. HOUSEKEEPING PADS

A. Provide concrete housekeeping pads for all floor mounted equipment furnished under this section. Unless otherwise detailed, pads shall be nominally 4" high with edges chamfered 1". Concrete shall be minimum 2500 psi test and all surfaces shall be free of voids and rubbed smooth. Provide at least 2 dowel rods into floor for anchorage. Pad top shall be dead level and shall have a steel trowel finish.

27. EQUIPMENT PREPARATION

A. At the completion of the job, or at such time as a portion of the work is to be turned over to the Owner, thoroughly clean all equipment installed under this section of the work. This includes switchgear, lighting fixtures, wall plates, etc. and involves the removal of all traces of grease, dirt, dust, etc., as well as temporary labels, shipping tags and the like. Equipment shall be turned over in factory inspected condition. See Item PAINTING.

B. Lamping of fixtures, equipment identification, system testing and balancing, etc., shall be as described elsewhere in these specifications.

28. REMOVALS, ALTERATIONS AND REUSE

A. The demolition drawings may not show all existing walls, lighting fixtures, devices, etc. that are to be removed. Investigate the site and review all currently available drawings of the building to evaluate the work necessary to fulfill the requirements of the contract documents.

B. Conduit:

Conduit located in remodeled areas that is in good condition, compatible for use in the new layout, may be reused in the new system.

C. Boxes:

All existing boxes being removed shall not be reused.

D. Wire:

All wire that is to be installed shall be new.

E. Existing materials, equipment, lighting fixtures, devices, panelboards, conduit and wiring that is removed and not reused shall be disposed of or placed in storage as directed by the Owner's representative.

29. WIRE, CABLE AND CONNECTORS

A. All building feeder and branch circuit wiring not specifically shown or necessarily covered by code, shall be type THHN/THWN 600 volt insulation - 75 deg. C copper conductors, complying, with NEC Standards.

B. Any wire size not specifically noted on the plans shall be at least equal in capacity to the rating of the overcurrent device serving the item to be connected and, in addition, shall be sized in accordance with the requirements of Articles 210.19 (a) and 215.2 (b) of the N.E.C. Note that where wire sizes specifically shown on the drawings have ampacity in excess of the protection device rating, those sizes shall be the minimum provided.

C. Wiring run from fixture junction boxes and in fixture wireways shall be 600 volt, 90EC type THHN wire or RHH.

D. Conductors shall not be drawn into a conduit segment until that segment of the conduit system is complete, with all terminations properly bushed and with the conduit free of moisture, foreign material, etc.

E. All connectors and lugs shall be of the solderless type and large enough to enclose all strands of the conductors with sufficient mechanical strength to withstand vibration and normal strains.

F. All connectors for conductors sized #10 AWG and smaller shall be 3-M SCOTCHLOK, Ideal Wingnut or Buchanan B-Cap's. Connections for conductors sized #8 AWG and larger shall be made with pressure type mechanical connectors and insulated with electrical tape to 150% of the insulating value of the conductor insulation.

G. Joints or splices in branch circuit wiring and feeders must be located as per NEC. All joints and splices shall be made electrically and mechanically sound in accordance with best practice.

H. All parallel runs of conductors shall be cut to equal length and installed accordingly.

I. Note that common neutrals are prohibited. An individual neutral must be provided for each circuit.

J. Low voltage system wiring shall be sized in strict accordance with the individual equipment and/or system manufacturer's specifications and/or recommendations and shall be plenum rated when not run in conduit. In addition, the wire type utilized shall be as recommended by the equipment

manufacturer. Note that where code requirements dictate, or where specified, this wiring shall be run in conduit.

30. CIRCUIT AND CONDUCTOR IDENTIFICATION

A. All branch circuit wiring shall be color coded thruout this project. A record of this color code shall be turned over to the Owner. Each phase shall be a different color and the phase color shall be the same thruout the project including branch circuiting.

B. All feeders and conductors not color coded shall be identified with permanent, legibly marked, self-sticking labels stating circuit number, voltage, phasing and circuit origination. Labels shall be as manufactured by W. H. Brady Co. or approved equal. Labels made by embossing machines will not be acceptable.

31. CONDUIT AND OUTLET BOXES

A. All wiring to be installed for this project shall be enclosed in rigid or intermediate metal conduit (RMC or IMC) or electrical metallic tubing conduit (EMT).

B. All metal conduit shall be steel and in strict accordance with applicable ANSI standards for steel conduit. Each length shall bear the UL label.

C. Conduit thruout shall be a minimum 3/4" size except for special connections, as detailed, and flexible runouts to fixtures, motors, etc., which may be 3/8".

D. Flexible Conduit Connections:

Flexible runouts shall consist of flexible metal conduit made from square locked or interlocked galvanized steel strip. The maximum allowable length of a flexible runout shall be 6'-0".

Flexible connections to lighting fixtures, motor equipment, etc. shall originate from a conduit and junction box network, pull box, or fused disconnect switch. Fixture-to-fixture flexible connections will not be acceptable.

Flexible connections to weatherproof lighting fixtures, motors, equipment, etc. or controls mounted on dynamic equipment located in a damp or dusty location or exposed to the weather shall be made with UL listed liquid and vapor tight flexible conduit. Such conduit shall be designed and catalogued for maximum water resistance and shall be used with the appropriate fittings.

E. All conduit runs located in mechanical rooms or open machine shop areas shall be rigid (RMC) or intermediate (IMC). Terminations adjacent to equipment shall tie into flexible runouts. This requirement shall also apply for conduit installed in damp areas or exposed to the weather or that could be subject to mechanical damage.

F. Unless otherwise specified, conduit imbedded in poured concrete shall be PVC. Note that generally, conduit shall not be run in concrete floor slabs except where surface mounted fixtures are indicated, cast-in-place boxes are indicated, or where specifically directed.

G. Where patient care areas are involved, all branch circuits shall be installed in a metal raceway system which shall qualify as an equipment grounding return path in accordance with the National Electrical Code.

H. All conduit installed on the project shall be concealed, wherever possible, unless otherwise noted or indicated on the drawings or unless permission is obtained from the Architect to run exposed. Where conduit is exposed, it shall be run parallel or perpendicular to the building lines. (See Item MATERIALS AND WORKMANSHIP).

I. Steel set screw type fittings or compression type steel couplings and connectors shall be used with EMT and may be used with IMC.

J. All empty conduit including conduit installed under this section for others, such as telephone conduit and/or conduit for future systems, etc., shall be provided with solid steel pull wire or nylon pull cord.

K. Where switches or outlets occur in partitions, mullions, door frames, etc., which serve as an integral raceway, furnish partition type wall boxes and flexible metal conduit with conductors.

L. Watertight conduit expansion joints, bonding jumpers, etc., shall be provided wherever the construction dictates such devices.

M. Exposed conduit rising through floors to surface panels and boxes shall have a nominal 4" high concrete pad encasing the conduits at the floor line. See Item HOUSEKEEPING PADS.

N. Conduit accessories such as outlet boxes, condulets, bends, fittings, etc.,shall be manufactured by Appleton, Steel City, Russell and Stoll, Raco, Crouse Hinds or Midwest.

O. Fixture outlet boxes shall be standard 4" x 4" x 2" deep and shall be octagonal or square with standard fixture studs.

P. All outlet and device boxes shall be flush mounted in areas with finished surfaces. They shall be rigidly attached to the structure by means of steel straps or channels. Boxes shall be aligned true to building lines. Listed mounting heights and dimensions shall be to the centerline of the box.

Q. From each flush mounted panelboard or terminal cabinet provide four empty 1" conduits stubbed to an accessible area above the ceiling and, where applicable, provide two empty 1" conduits stubbed to an accessible area below the floor.

R. All conduit extending thru the roof shall be flashed by one of the following methods:

S. On built-up roofs flashing shall be installed using 24" X 24" 4 lb. per sq. ft. sheet lead pan. Flashing shall extend a minimum of 8" above the roof with rain shield located 3" above flashing. Lead shall be properly burned at joints by an experienced lead burner.

T. On membrane roofs flashing will be by the roofing contractor.

U. On sloped asphalt shingle type roofs, flashing shall consist of a 24 gauge galvanized steel flashing base with elastomeric compound collar based on Oatey Co. Series 11500 or equal.

V. Note: Penetrations thru roof and methods of sealing shall be coordinated with roofing manufacturer and roofing contractor.

32. JUNCTION BOXES AND ACCESS DOORS

A. Junction boxes, other than those furnished integrally with specific items of equipment or described elsewhere in the contract documents, shall be furnished and installed as required and shall be in strict accordance with NEC guidelines. Boxes shall be of minimum 12 ga. galvanized steel and shall have removable covers fastened with flat head countersunk bolts on maximum 8" centers. Note that where construction conditions dictate, junction boxes shall be watertight.

B. Junction boxes shall be labeled to indicate circuits within. Use black permanent markers with minimum 1" letters. Such markers shall be visible from point(s) of accessibility.

C. All boxes shall be installed in accessible locations or shall be provided with a suitable means of access. Where other acceptable means of access is not available, provide approved access doors of the proper size and type to meet accessibility requirements for the equipment involved.

D. Access doors in rated walls and plastered, gypsum board or similar ceilings that are rated shall be fire rated as required. They shall meet NFPA requirements and carry the UL 1-1/2 hour "B" label. Construction shall incorporate a minimum 20 ga. steel insulated panel door, self-latching lock and continuous hinge. These doors shall be factory treated with a rust inhibitor and given a baked enamel primer.

E. Access doors for other plastered surfaces shall be similar to Milcor Style K or L with 16 ga. steel frame and 14 ga. steel panel. A 22 ga. casing bead shall surround the frame and the unit shall be finished similar to the labeled doors.

F. Access doors for all other construction conditions shall be all aluminum with extruded frame. Doors shall have a continuous hinge and flush latch. The units shall have a brush satin finish and shall be of a model suitable for the type of construction in which they are installed.

G. Access doors shall be as manufactured by Acudor, Cierra, Karp, Larsen's or Milcor.

33. GROUNDING

A. Provide a complete grounding system as required to conform to the latest standards and to comply with all pertinent articles of the N.E.C.

B. Equipment grounding conductors shall be run with the circuit conductors and shall consist of insulated solid or stranded copper conductors. No conduit grounding methods will be permitted.

C. Note that all branch circuits serving patient care areas shall be installed in a metal raceway system.

D. All grounding system connections shall be exothermically welded. Installation shall be made in strict accordance with manufacturer's instructions, utilizing the proper mold, miscellaneous supplies, etc. for each connection. All material used, including mold, weld material, tools and accessories, shall be supplied by one manufacturer. The connection material shall be by Cadweld, Thermoweld, or approved equal.

E. Submit, for review, a written description of the method or methods to be used for grounding and the extent of the standards being implemented, taking into account the necessity for full compliance to applicable codes, ordinances and utility company requirements.

34. INSERTS, PENETRATIONS AND SLEEVES

A. Fabricated steel linear inserts shall be furnished and set wherever conduit, equipment, etc., is to be hung from poured-in-place concrete beams, slabs, or walls. These inserts, equal to the 1-5/8" channel width series by Unistrut, shall be selected based on the load carrying recommendations of the manufacturer. Where not provided, furnish and install acceptable types of supports appropriate for the application. Inserts for precast concrete members shall be of a type approved by the precast unit manufacturer.

B. Sleeves or sections of conduit (RMC) shall be furnished for all conduit penetrations of poured concrete and masonry work throughout. Sleeve material and installation shall be in accordance with the following list.

C. Floor Slabs Above Grade:

Exposed Areas - (normally accessible areas) Sch. 40 steel pipe - sleeve to extend 2" above finish floor.

Concealed Areas - (pipe chases, shafts, etc.) - Min. 20 gage galvanized sheet metal.

D. Walls - General:

Poured Concrete, Masonry - Heavy-wall PVC conduit or Sch. 40 steel pipe - sleeve ends to be flush with face of wall.

Stud/Gypsum Board - Min. 20 gage galvanized sheet metal with flanged ends set flush with face of wall.

E. Note that where the necessary provisions for conduit penetrations in poured concrete or masonry have not been made, core drilling will be required under this section of the specifications.

F. Walls - Fire Rated:

Where fire rated walls are sleeved, as described above, non-metallic sleeve material is prohibited.

G. Walls - Exterior:

Steel pipe sleeves in exterior walls shall be galvanized. All sleeves of steel pipe or PVC conduit shall be machine cut to provide finished ends.

H. Penetrations - General:

In all cases where conduit, bus duct etc., pass between floors, rated walls, and/or rated partitions, the spaces between the structure or sleeve and the penetrating member shall be provided with an approved firestop sealant to produce a fire, smoke, and water barrier. Sealant material and installation shall be as described in Item FIRESTOPPING.

I. Miscellaneous:

Provide polished brass or chrome plated steel pipe escutcheons on both sides of all conduit penetrations thru walls where exposed in finished areas of the building. They shall have concealed hinge and shall be securely attached with set screw.

Unused sleeves located in floors and/or walls shall be sealed. In finished areas, exposed sleeves shall then be finished to match adjacent surfaces. The sealant material shall be as previously described.

Note that sleeves for electrical work in areas scheduled to be shelled-in or otherwise not completed shall be set as required for future work.

35. WIRING DEVICES AND PLATES

A. All wiring devices shall be furnished in strict accordance with the catalog numbers listed on the drawings and here-in specified.

B. Switches:

Light switches shall be flush wall mounted, side and back wired design with ivory toggle. They shall be rated 20 amp - 120/277 volt AC, specification grade. Toggles shall be of high impact thermoplastic such as nylon. The following table lists acceptable manufacturers along with their appropriate catalog numbers for the various switch types.

Hubbell	P & S	A-H/Cooper	Bryant
1-pole	1221	20AC1 1991	4901
3-way	1223	20AC3 1993	4903
4-way	1224	20AC4 1994	4904

C. Receptacles, General:

All receptacles shall be flush wall mounted unless otherwise approved. The mounting heights are from centerline of device above finished floor. Standard mounting heights are listed on the legend and non-standard are

shown on the plan.

D. Convenience Receptacle, General Purpose:

Receptacle shall be a duplex 20 amp, 120 volt, 3 wire grounding type. The face shall be of high impact thermoplastic such as nylon. The strap shall wrap around the device. Ground contacts shall be mounted to the strap. An auto-ground clip shall be provided. The device shall be a Hubbell 5352-I, P & S 5362-I, A-H/Cooper 5735-1, Sierra 1462, or Bryant 5352-I.

E. Convenience Receptacle, High Abuse:

Receptacle shall be a duplex 20 amp, 120 volt, 3 wire grounding type with nylon face. The strap shall be one-piece brass with integral ground contacts...Hubbell 5362, Bryant 5362, A-H/Cooper 5739, P & S 5362 or approved equal.

F. GFCI Receptacle:

This device shall be provided where indicated on the drawings and shall be a Hubbell GF5352-I, P & S 1591-FI, A-H/Cooper GF5342-I, or Bryant GF5262R.

G. Wall Plates:

Provide wall plates for each device application. Standard plates shall be smooth thermoplastic such as nylon, lexan, or glass-reinforced polyester. Unless otherwise indicated, plate color shall match the device color. All materials shall meet appropriate design and test requirements of NEMA-WD1-1974 as well as UL Plates shall be Hubbell series P, Sierra series RP, or approved equal. Where required plates are not available as a standard in the material listed above, use plates made from stainless steel.

H. Weatherproof covers shall be of polycarbonate, cast aluminum or stainless steel construction.

Device plates shall have identification as described in item EQUIPMENT IDENTIFICATION.

Plates shall be attached by metal screws finished to match plate color.

Plates shall be installed in a vertical position, unless otherwise indicated, with an alignment tolerance of 1/32".

I. All receptacles served by emergency power shall be red in color and shall be covered by a stainless steel red "P" series standard color "P" series plate

with the word "emergency" engraved on the plate above the device opening.

Emergency light switching devices shall be red with a standard plate having the word EMERGENCY engraved above the device opening.

Emergency light switching devices shall be standard color with engraved stainless steel red "P" series standard color "P" series plates with the word "emergency" engraved on the plate above the device opening.

When a room is served by normal power and emergency power, then adhere to the following for emergency devices:

Duplex receptacles shall be red and the plate shall be a non-engraved red plate in electrical and mechanical equipment rooms. In all other rooms, devices shall be standard color and labels shall have red lettering on a white background.

Switches shall be red and the plate shall be a non-engraved red plate.

If a plate is to cover a normal device and an emergency device in the same box, the emergency device shall be red, the plate shall be standard (ivory) and shall be engraved with the word "emergency" above the emergency device.

36. LIGHTING FIXTURES

A. The lighting fixtures shown on the plans and indicated on the schedule shall be the basis for bidding.

B. Catalog numbers listed in the fixture schedule do not necessarily have complete prefix and suffix designations for the various applications. Therefore, these numbers shall be verified so that the fixtures will be made for the correct ballast voltage and will be supplied with all hangers, plaster frames, end caps, etc., required for a complete installation.

C. Immediately preceding the final inspection, thoroughly clean fixtures, removing all dust, dirt, finger marks, grease, etc. This shall include all lenses, louvers, etc.

D. General:

LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on the drawings, and as specified.

LED light fixtures shall be Reduction of Hazardous Substances (RoHS)-compliant.

LED drivers shall include the following features unless otherwise indicated:

Minimum efficiency: 85% at full load.

Minimum Operating Ambient Temperature: -20˚ C. (-4˚ F.)

Input Voltage: 120 - 277V (±10%) at 60 Hz.

Integral short circuit, open circuit, and overload protection.

Power Factor: ≥ 0.95.

Total Harmonic Distortion: ≤ 20%.

Comply with FCC 47 CFR Part 15.

LED modules shall include the following features unless otherwise indicated:

Comply with IES LM-79 and LM-80 requirements.

Minimum CRI: 80 or higher. Minimum Color Fidelity Index (IES Rf): 80 or higher.

Color temperature between 3500° - 5000°K and as specified in the drawings' LIGHTING FIXTURE SCHEDULE.

Minimum Rated Life: 50,000 hours per IES L70.

Light output lumens as indicated in the LIGHTING FIXTURE SCHEDULE.

37. EXIT LIGHT SYSTEM

A. An exit circuit is herein defined as any circuit containing one or more exit fixtures and, in some cases, lamp(s) in normal lighting fixtures.

B. All exit circuits shall be completely isolated from normal lighting circuits. This will require that exit circuits be run in separate conduit, etc., containing no wiring other than that required to supply circuits as defined above.

38. EXTERIOR LIGHTING FIXTURES

A. Provide a complete exterior lighting installation including luminaries, lamps, poles, bases, conduit, conductors, concrete encasement, fusing, control devices, etc. as indicated on drawings.

B. Fuses:

Provide fusing in each phase conductor serving fixture. They shall be located near the ballast or behind handhole access covers in the pole bases where applicable.

The fuses shall be Bussman #KTK fuses, mounted in HEB fuseholders, and shall be sized to protect that specific load.

C. Lightning Arrestor:

Provide an arrestor for each phase in the base of each pole. Connect phase conductors through the arrestors, terminating at a 1/2" diameter copper clad driven ground rod.

D. Splicing shall be made with approved waterproof splicing kits and shall be in the pole base behind the handhole.

E. Controls shall be as noted or detailed on the drawings.

F. Concrete Base:

The base shall be provided by the concrete contractor/ by the general contractor/ under this section of the work.

If anchor bolts are exposed below mounting plate and above concrete base, they shall be grouted-in solid.

39. DATA COMMUNICATIONS WIRING

SYSTEM DESCRIPTION

A. Data system includes data outlets and wiring for office applications.

B. Data system equipment consists of:

1. Data outlets.

2. UTP cabling.

3. Conduit System.

C. Acceptable Manufacturers:

The equipment and services described in this specification are those supplied and supported by Chapel-Romanoff Technologies LLC, (CRT),

Kastle Technologies, or Jacobs Telephone Contractors, Inc.

SUBMITTALS

A. Shop drawings to include the following items as minimum:

1. Outlets.

2. Labels.

3. UTP Wire.

4. System switches

5. Cable Management Equipment

PRODUCTS

A. Outlets

1. Provide single or dual data outlet as indicated.

2. Dual flush mounted data outlet.

a. Two 8 position RJ45 jacks with T568A (ISDN) wiring.

b. Two (2) blank inserts.

c. Color: blue.

3. Single flush mounted data outlets:

a. One (1) 8 position RJ45 jack with T586A (ISDN) wiring.

b. Three (3) blank inserts.

c. Color: blue

B. Cover Plates

1. Provide flush mount type to accept four (4) modular data outlets.

2. Indicate outlet number of “Data” cover plate. Provide labeling to Owner’s requirement.

3. Color: grey.

4. Construction: Themo – plastic.

C. Patch Panels

1. To be provided by Owner.

D. Data Racks

1. To be provided by Owner.

E. Cable Management

1. Cable management at data racks:

a. To be provided by Owner.

2. Cable management in accessible ceiling spaces:

a. Cable bundle support mounted to steel structure with beam clamps as required. Support to be 2-inch diameter bridle ring.

b. Provide quantity as required to support all loose cables at spacings up to point of entry into zone conduit system.

c. Provide support for individual cables using caddy clip at 40 inch spacings.

F. Patch and Line Cords

1. To be provided by Owner.

G. Labels

1. Provide indicating labels on UTP wiring and outlet assemblies.

2. Labels to be:

a. Outlet identification labels. Computer printable type: indicating “Data Outlet”.

b. Labeling on wire from outlet to patch panel: heat shrink labels sized for data cables indicating data outlet # and port # on respective ends.

c. Coordinate labeling with Owner prior to fabrication.

H. UTP Wiring

1. 4 pair, 24 gauge, solid conductor, unshielded twisted pairs, CSA FT4 fire rating, Category 6, guaranteed for 2.4 Giga bytes per second transmission/receiving rate.

2. Provide one cable from each single outlet back to patch panel (two cables from each duel data outlet back to patch panel).

I. Conduit Systems

1. Install conduit systems and pull boxes for data wiring including:

a. Vertical stubs in walls from outlets into accessible ceiling space.

J. System Switch

1. To be provided by Owner.

EXECUTION

A. Installation

1. Install data system wiring and components.

2. Terminate UTP cables at outlets and patch panel as indicated. Ensure that the minimum number of twists per inch in the cable pairs is maintained at each connection point.

3. Ensure that manufacturer’s bending radius limitations are adhered to.

4. Protect cables from damage during installation.

5. Zone conduits to be installed, as indicated, running back to patch panel location.

6. Conduits to be run from data outlets to corridor ceiling space. Provide insulated conduit bushing at open end of wall stub-up.

B. Conduit System Restrictions

1. Do not provide conduit raceways that exceed 1-inch or contain more than two 90° bends (or equivalent) between pull points or pull boxes.

2. Do not provide pull boxes in lieu of conduit bends.

3. LB connectors not permitted.

4. Provide inside radius bends to a minimum of 6 times the internal diameter for conduits 2-inch and smaller. For larger conduits provide inside radius bends to a minimum of 10 times the internal diameter of the conduit.

5. Ensure conduits terminations are free from sharp edges and fitted with insulated bushings.

6. Ream individual lengths of conduit to remove sharp edges.

7. Provide sufficient conduit size to permit maximum 50% fill capacity.

C. Testing General

1. Cabling and connectors to be tested by an experienced company employing trained technicians with minimum 5-years experience in data cabling industry. Experience to be acceptable to the Owner.

D. Testing UTP Cabling

1. System to meet continuity and attenuation tests outlined in ANSI/TIA-568-C.2.

2. Category 6 cable to meet ANSI standard ANSI/TIA-568-C.2 (capable of data transmission up to 2.4 G. bps).

3. Perform system and channel tests after UTP cable installation to ensure that installation meets standard indicated above and values indicated in the IBDN design guide issue 2 (IBDN-DG-9202). Tests to be performed using a Level IV tester. Minimum tests to be performed.

a. Continuity.

b. Attenuation.

c. Near and Crosstalk.

d. Resistance.

e. Pair Assignment Test.

f. Low Band Noise.

g. High Band Noise.

h. Mid Band Noise.

i. Length of Cable.

j. Return loss

k. ELFEXT

l. Propagation delay.

m. Deby skew.

Perform permanent link tests to cover all equipment wiring including patch panels and line cords. Perform tests from data closet outwards to data outlet line cord.

4. Provide to construction manager written copy of the testing sequence to be performed, testing equipment to be used, and standards to which cable is being tested.

5. Provide a written report to the Construction Manager indicating each cable tested and the results of the testing. Provide printout from the Level IV tester for each cable.

6. Replace cable and/or connection equipment that fails tests.

40. NETWORK LIGHTING CONTROLS

PART 1: GENERAL

1.0 Section Includes

A. Network lighting control system and components:

a. Touch panel controls

b. Mobile Control

c. Lighting management modules

d. Low voltage wall stations

e. Remote Mounted Power Modules

f. Digital sensors

1.1 References

A. Underwriters Laboratories (UL):

1. UL 508 - Industrial Control Equipment American National Standards Institute (ANSI)

2. UL 924 - Emergency Lighting and Power Equipment

B. National Fire Protection Association (NFPA):

1. NFPA 70 - National Electric Code

C. American National Standards Institute (ANSI):

1. ANSI E1.11-2008 USITT DMX512-A - Asynchronous Serial Digital Data Transmission Standard for Controlling Lighting Equipment and Accessories

2. ANSI E1.20-2006 - Remote Device Management over USITT DMX512

D. IEC 61000-4-2 Electromagnetic Compatibility (EMC) – Part 4-2: Testing and Measurement Techniques-Electrostatic Discharge Immunity Test; 2008

1.2 Administrative Requirements

A. Coordination

1. Coordinate placement of daylight and occupancy sensors to achieve optimum performance. Proper sensor placement should be coordinated with others in order to avoid obstructions that would interfere with maintaining prescribed light levels.

2. Coordinate the work to provide luminaires and lamps that are compatible with the lighting controls to be installed.

3. Coordinate location of touch panels and keypad stations with finish work that is to be installed by others.

4. Notify architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Pre-installation meeting: Conduct on-site meeting with lighting control representative prior to starting work as part of manufacturer's standard startup service. Representative to review with the installer:

1. Low voltage wiring requirements

2. Line voltage and low voltage separation requirements

3. Lighting management panel locations

4. Sensor locations
5. Touch Panel locations
6. Keypad locations
7. Wall station locations
8. Networked luminaire wiring requirements
9. Connections to other equipment

1.3 Submittals

A. Submit under provisions of Section { }

B. Specification Conformance Document. Clearly define where the equipment submitted for review:

1. Meets specification exactly as specified
2. Meets specification as an alternate with clear definition of compliance

C. Shop Drawings include

1. CAD renderings of the device with precise dimensions
2. Network diagrams
3. System schematic/typical riser diagrams
4. Lighting management panel load schedules

D. Product Data Sheets

1.4 Project Closeout Documentation

A. Provide a factory published manual

1. Warranty
2. Technical support contact
3. Electronic manual on manufacturer’s website for free download

1.5 Quality Assurance

A. Manufacturer: Minimum 10 years of experience designing and assembling architectural lighting controls

B. All devices are 100% factory function tested prior to delivery

C. Compliant with the requirements of NFPA 70

D. All power components UL listed for required loads

1.6 Project Conditions

A. Only install equipment after the following site conditions are maintained:

1. Ambient Temperature 14 to 105 degrees F (-10 to 40 degrees C)

2. Relative Humidity less than 90% non-condensing

B. Standard electrical enclosures are permanently installed

C. Equipment is protected from dust, debris and moisture

1.7 Warranty

A. Two (5) year 100% parts replacement

1.8 Maintenance & Sustainability

A. Provide new parts, upgrades, and/or replacements available for a minimum of 5 years available to the end user

B. Provide free telephone technical support

PART 2: PRODUCTS

2.1 Manufacturers

A. Acceptable: Acuity Brands Lighting, Inc. – System: Acuity Controls

B. Basis of controls design Manufacturer: **Acuity Brands, One Lithonia Way, Conyers GA 30012**:

1. Fresco Controls System

C. Substitutions: Not Permitted {Under Division 1}:

1. All substitutions must be submitted in writing for approval at least 14 days prior to bid date.

2. Proposed substitute products must be documented with a line by line compliance review.

2.2 General:

A. Provide system hardware that is designed, tested, manufactured, warranted by a single manufacturer.

B. Operational Life: At least 10 years expected life while operating within the specified ambient temperature and humidity range.

C. Standards Compliance & Compatibility: Provide architectural control product with native DMX512-A control and BACnet/IP.

D. Luminaire Compatibility: Supports RGB luminaires in 8 bit and/or 16 bit configurations also supporting MSB or LSB first luminaire settings. Support native control of Tunable White luminaires.

E. Design and test equipment to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2 Level 4.

F. Power Failure Memory: automatically store system settings and recover from a power failure without requiring user input.

G. Wireless devices:

1. Automatically sync for system operation without addressing

2. Send and receive messages for real-time operation and feedback.

3. Use industry standard RF protocols.

4. Be in compliance with FCC and IEEE standards

H. Time Clock: automatically adjust for daylight savings time and leap year.

2.3 Dimming and Switching Performance Requirements:

A. Light levels are user adjustable on a circuit by circuit basis Electrolytic capacitors operate at least 36 degrees F (20 degrees C) below the capacitor's maximum temperature rating when the device is under full load.

B. Inrush tolerance: Use MOSFET that has a maximum rating of six times the operating current of the dimmer/relay.

C. Surge tolerance: Panels are designed and tested to withstand surges of 6,000V, 3,000A according to IEEE C62.41.2 and IEC 61000-4-5 without impairment to performance.

D. Power failure recovery: When power is interrupted and subsequently restored, within 3 seconds lighting to automatically return to same levels prior to power failure.

E. Utilize half cycle to half cycle zero cross movement to allow for voltage compensation in order to overcome line noise and lamp flickering.

F. Incorporate electronic soft start default at initial turn-on that smoothly ramps lights to appropriate levels within 0.5 seconds.

G. Utilize air gap off to disconnect the load line from the line supply

H. Control all light sources in smooth and continuous manner. Dimmers with visible steps are not acceptable.

I. Assign load type to each dimmer that will provide proper dimming curve for the specific light source to be controlled.

J. Minimum and maximum.

2.4 Touch Panel Controls

A. Product: Fresco Touch Screen (7TSN).

B. Preset lighting scene controller.

1. General Requirements:

a. 7” full color multi-touch capacitive touchscreen for controlling lighting and system components.

b. Control up to 65,000 zones of lighting/shades per system.

c. Control up to 36 lighting channels/scenes per touch screen that include on/off, dimming, tunable white, RGB, and/or shade control.

d. Link up to 24 touch screens for a possibility of 864 lighting zones/scenes.

e. Connect up to 128 network devices per touch screen.

f. On screen lighting design.

g. Lighting zones/scenes can be comprised of lighting intensity, color, color temperature, and luminaire position.

h. Modify color and color temperature using a digital color palette and dUV rating scale.

i. Proximity screen sensor for auto “wake-up”.

j. Auto dimming and user adjustable backlight.

k. User programmable screen lock limiting access to all feature control and programming.

l. Full alpha-numeric scene and zone naming.

m. Configurable interface to reflect project requirements.

n. Lighting zones/scenes support control of forward/reverse phase dimming, 0-10v, RGB, nLight® enabled luminaires, nLight® power packs, DALI, tunable white and moving fixtures.

o. Integral astronomical time clock enables lighting scenes.

p. Partition status control and visualization.

q. Direct DMX control for a single universe (512 slots).

r. Connect up to 128 nLight® enabled devices.

s. Digital motion senor control.

t. Digital daylight harvesting response.

u. RS-232/contact closure capable for 3rd party integration.

v. Local wireless Bluetooth connectivity with mobile app.

w. Compatible with Fresco Lighting Management Panels (LMP).

x. Frame Color: {Black} {Aluminum} {White} {Custom}.

2. Electrical:

a. Fresco Input: 24VDC.

b. Fresco Power Supply: 120-277V AC.

c. RS-485 network terminal.

d. nLight enabled RJ-45 ports (in/out).

e. CAT5e Ethernet network terminal.

f. {DMX/RDM network terminal}.

3. Mounting:

a. Installs in a standard triple gang US back box.

b. Remote mounted power supply.

c. Plug in wire harness for RS-485 and DMX connections.

4. Protocols:

a. RS-485

b. IEEE 802.15 Bluetooth® compliant

c. {Controller is compliant to industry standard ANSI E1.11 - 2008, USITT DMX512-A}

d. {Supports extended RDM capability as defined by ANSI E1.20}

e. IEEE 802.11 Ethernet compliant

f. nLight Digital communication

g. BACnet/IP ISO 16484-5

2.5 Mobile Control

A. Fresco iPad Application

B. Allows mobile control and programming of the Fresco Touchscreen (7TSN)

1. General Requirements:Mobile Apple device supports Bluetooth® communication protocol.

b. Provides user control and edit capability of lighting scenes and zones.

c. Edit intensity, color, color temperature, and movement.

d. Edit lighting schedules.

e. Restrict number of users able to connect to touchscreen.

f. Restrict access to making system changes.

g. No PC required for mobile operation.

2.6 Low Voltage Wall Stations

A. Push button lighting scene controller (nPODM by nLight®)

1. General Requirements:

a. Use Cat5 wiring with RJ45 adapters for connection between devices.

b. Recess into single gang junction box.

c. Allows control of any lighting fixtures part of the lighting control system.

d. Upon button press, LED to immediately illuminate.

e. Controller can be setup as scene recall, toggle, or raise/lower.

f. Controller station LED’s track system status logic.

g. Replacement of unit does not require reprogramming.

h. Allows connection to additional stations, sensors, or power packs.

i. Custom button engraving.

j. Colors {White}{Ivory}{Lt Almond}{Gray}{Black}{Red}

B. Push button architectural finish lighting controller (FCS RB)

1. General Requirements:

a. Recess into single gang junction box

b. No visible fasteners on faceplate

c. Backlit button labels

d. Allows control of any lighting fixtures part of the lighting control system

e. Upon button press, LED to immediately illuminate

f. Controller can be setup as scene recall, toggle, or raise/lower

g. Controller station LED's track system status logic

h. Replacement of unit does not require reprogramming

i. Allows connection to additional touchscreens, button stations, or AVI

j. Custom button engraving, including icons

k. Field changeable button assemblies

l. Colors {White}{Lt Almond}{Black}

2.7 Remote Mounted Power Modules

A. Networked relay and dimming power packs.

B. Products: (nLight®)

1. nPP16 D EFP (Power pack with 16A relay and 0-10VDC dimming output).

2. nPP16 D ER EFP (UL924 listed secondary power pack with with 0-10VDC dimming output and 16A relay for switching emergency lighting circuit).

3. nPP PCD EFP (Universal phase dimming pack with 16A relay and auto sensing dimming output).

C. General requirements

1. Power pack will incorporate one or more Class 1 relays and contribute low voltage power to the rest of the system

2. Secondary power packs incorporate the relay(s), 0-10VDC. dimming output, or line voltage dimming output.

3. Accept 120/277VAC and plenum rated.
4. All devices have two RJ-45 ports.
5. Parameters available and configurable remotely from software and locally via device push-button.
6. Power pack to be securely mounted to junction box with ½ inch threaded chase nipple or mounted within luminaire ballast channel.
7. Power (secondary) packs that provide up to 16A switching of all load types.
8. Power (secondary) packs that provide up to 5A switching of all load types as well as 0-10VDC dimming or fluorescent ballasts/LED drivers.
9. Specific secondary packs provide up to 5A of switching and can dim 120VAC incandescent or 120/277VAC line voltage dimmable fluorescent (2-wire and 3-wire versions).
10. Specific secondary packs provide up to 5A of switching and can dim 120/277VAC magnetic low voltage transformers.
11. Specific secondary packs provide up to 5A of switching and can dim 120VAC electronic low voltage.
12. Specific power/secondary are UL924 listed for switching of emergency power circuits.

2.8 Digital Sensors

A. Wired Networked Occupancy/Vacancy Sensors/Photocells

B. Products: Network Wall Switch Sensors

1. nWSXA (PIR, 1 Relay)
2. nWSXA PDT (Dual Tech, 1 Relay)

C. Products: Network Standard Range 360° Ceiling Mount Sensors

1. nCM PDT 9 (Low Voltage, Dual Tech, Small Motion)
2. nCM PDT 10 (Low Voltage, Dual Tech, Large Motion)

D. General requirements

1. Occupancy sensors sense presence of human activity within the desired space and control on/off function of the lights.
2. Utilize passive infrared (PIR) technology which detects occupant motion.

3. Sensors are available for ceiling, wall, corner, recessed, and fixture mounting conditions.
4. Dual technology sensors utilize PIR/Microphonics (also known as Passive Dual Technology or PDT).
5. Sensors utilizing Microwave or Ultrasonic technology will not be accepted.
6. Sensors are available with zero, one, or two Class 1 switching relays, and up to one 0-10VDC dimming output.
7. Provide multiple lens options which are interchangeable for specific applications.
8. Communication and Class 2 low voltage power is delivered to each device with CAT-5 cabling and terminate with RJ-45 connectors.
9. All sensors have two RJ-45 ports for purpose of daisy chain wiring method.
10. Sensors are equipped with automatic override for 100 burn-in of lamps.
11. Wall switch sensors have optional features for photocell/daylight override, vandal resistant, and low temperature/high humidity option.
12. Sensors capable of being embedded into luminaire.
13. Photocells provide on/off set-point and deadband to prevent artificial light from cycling.
14. Photocell and dimming sensor set-point is automatically calibrated using sensor microprocessor.
15. Photocell min/max thresholds may be manually configured.
16. Dimming sensors control 0-10VDC dimmable ballasts by sinking up to 20mA of Class 2 current.

2.9 Device Quality

A. Perform 100% function testing of all devices.

PART 3: EXECUTION

3.1 Installation

A. Follow manufacturer's instructions for all installation steps.

B. Provide a complete installation per Contract Documents.

C. Properly terminate all DMX wiring per installation instructions.

D. Use only recommended DMX cable and follow local codes.

E. Properly terminate all CAT5 wiring per installation instructions.

F. Properly terminate all RS-485 connections per installation instructions.

3.2 Startup and Programming

A. Provide telephone support via toll free line.

B. Factory trained service available for purchase.

3.3 Maintenance

A. Factory trained service technicians available within the continental US.

B. Offer integrated help on-screen and via online videos.

C. Factory telephone support via toll free line.

END OF SECTION

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SECTION 31 10 00 - SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Removing surface debris,
   2. Removing designated paving, curbs, and site development, etc.
   3. Removing topsoil and subsoil.
   4. Rough grading and site contouring.
   5. Removing trees, shrubs, and other plant life.

1.2 SUBMITTALS

A. Product Data: Submit data for herbicide.

PART 2 PRODUCTS

2.1 SITE CLEARING

A. Herbicide: approved by authority having jurisdiction.

PART 3 EXECUTION

3.1 PREPARATION

A. Call Local Utility Line Information service not less than three working days before performing Work. Identify all public and private utilities as is applicable to the work. Provide services of private utility location services as is applicable to the work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

3.2 PROTECTION

A. Locate, identify, and protect utilities indicated to remain, from damage.

B. Protect trees, plant growth, and features designated to remain, as final landscaping.

C. Protect bench marks, [survey control points,] [and existing structures] from damage or displacement.

3.3 CLEARING

A. Clear areas required for access to site and execution of Work.

B. Remove paving, curbs, and other site improvements to be removed.

C. Remove trees and shrubs. Remove stumps, main root ball and root system.

D. Apply herbicide to remaining stumps or plant life to inhibit growth.

3.4 REMOVALS

A. Remove debris, rock, and extracted plant life from the Site.

B. Remove paving, curbs, and existing site improvements as identified.
   1. Neatly saw cut edges at right angle to surface. Replace / re-cut any failed edges for a new clean cut.

C. Remove abandoned utilities. Indicate removal termination point on as-built drawings if applicable.

D. Continuously clean up and remove waste materials from the Site. Do not allow materials to accumulate on Site.

E. Do no burn or bury materials on Site. Leave Site in clean condition.

3.5 TOPSOIL EXCAVATION

A. Excavate topsoil from **areas to be further excavated, relandscaped, or regraded** without mixing with foreign materials for use in finish grading.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on Site to depth not exceeding **8** feet and protect from erosion. Stockpile material per the Civil Drawings until disposal.

D. Remove excess topsoil not intended for reuse from Site, unless directed otherwise by Owner.

3.6 ROUGH GRADING

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

B. Identify known underground, above ground, and aerial utilities. Stake and flag locations.

C. Notify utility company to remove and relocate utilities as applicable.

D. Excavate topsoil and subsoil from areas to be further excavated, re-landscaped or re-graded.

E. Stockpile topsoil in area designated on site.

F. Remove excess topsoil and subsoil not being reused, from site.

3.7 CLEAN UP

A. Remove debris, rock larger than 1.5 cu ft, and extracted plant life from site.

END OF SECTION

SECTION 31 23 17 - TRENCHING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Excavating trenches for utilities outside building to utility service.
   2. Compacted fill from top of utility bedding to subgrade elevations.
   3. Backfilling and compaction.

1.2 QUALITY ASSURANCE

A. Perform Work according to City of Vandalia standards as applicable.

1.3 FIELD MEASUREMENTS

A. Verify field measurements, inverts, etc prior to fabrication.

1.4 COORDINATION

A. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Subsoil / Granular Fill: Type as required to suit conditions, suitability installed in compacted lifts.

2.2 ACCESSORIES

A. Geotextile Fabric: Non-biodegradable, woven.

PART 3 EXECUTION

3.1 LINES AND GRADES

A. Lay pipes to lines and grades indicated.
   1. Architect/Engineer may make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.2 PREPARATION

A. Call local utility line information service not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum locations.

C. Protect plant life, lawns and other features remaining as portion of final landscaping.

D. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Maintain and protect above and below grade utilities indicated to remain.

F. Establish temporary traffic control when trenching is performed in public right-of-way. Relocate controls as required during progress of Work.

3.3 TRENCHING

A. Excavate subsoil required for utilities to utility service.

B. Perform excavation within 24 inches of existing utility service according to utility's requirements.

C. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.

D. Excavate bottom of trenches maximum 24 inches wider than outside diameter of pipe.

E. Excavate trenches to depth required for utilities. Provide uniform and continuous bearing and support for bedding material and pipe and utilities.

F. Do not interfere with 45-degree bearing splay of foundations.

G. When Project conditions permit, slope side walls of excavation starting 24 inches above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this Section.

H. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by Architect/Engineer until suitable material is encountered.

I. Cut out soft areas of subgrade not capable of compaction in place. Backfill and compact to density equal to or greater than requirements for subsequent backfill material.

J. Trim excavation. Remove loose matter.

K. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Architect/Engineer.

L. Remove excess subsoil not intended for reuse, from Site.

3.4 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

C. Design sheeting and shoring to be removed at completion of excavation Work.

D. Repair damage caused by failure of sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

E. Repair damage to [new] [and] [existing] Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen fill materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Place geotextile fabric prior to placing subsequent fill materials.

D. Place material in continuous layers as follows:
   1. Subsoil Fill: Maximum 8 inches compacted depth.
   2. Structural Fill: Maximum 6 inches compacted depth.
   3. Granular Fill: Maximum 6 inches compacted depth.

E. Employ placement method that does not disturb or damage foundation perimeter drainage, utilities in trench, and any other obstructions or utilities encountered.

F. Maintain optimum moisture content of fill materials to attain required compaction density.

G. Protect open trench to protect the public/residents.

3.6 TOLERANCES

A. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.

B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.7 FIELD QUALITY CONTROL

A. Perform laboratory material tests according to ASTM D1557.

B. Perform in place compaction tests according to following:
   1. Density Tests: ASTM D1556.
   2. Moisture Tests: ASTM D3017.

C. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

3.8 PROTECTION OF FINISHED WORK

A. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

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SECTION 32 12 16 - ASPHALT PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Asphalt Paving, Base, Asphalt Maintenance and Rehabilitation and related materials.

1.2 SUBMITTALS

A. Product Data:
   1. Submit product information for asphalt and aggregate materials.
   2. Submit mix design with laboratory test results supporting design.

1.3 QUALITY ASSURANCE

A. Perform Work according to State of Ohio, ODOT standards as applicable.
   1. State of Ohio Department of Transportation Construction and Materials Specifications Guide shall be used as a reference for all applicable materials, construction conditions, operations, and finished products, etc.

B. Mixing Plant: Conform to State of Ohio, ODOT standard.

C. Obtain materials from same source throughout.

1.4 AMBIENT CONDITIONS

A. Do not place asphalt when ambient air or base surface temperature is less than 50 degrees F, or surface is wet or frozen.

B. Place bitumen mixture when temperature is not more than 15 degrees F below bitumen suppliers bill of lading and not more than maximum specified temperature.

PART 2 PRODUCTS

2.1 ASPHALT MATERIALS

A. Subgrade: ODOT Item 204.
   1. Compact the subgrade materials that have a maximum dry density of 100 to 105 pounds per cubic foot to not less than 102 percent of maximum dry density. Compact all other subgrade materials to not less than 100 percent of maximum dry density. Determine the maximum dry density using AASHTO T99, AASHTOT T272, or test section method in Supplement 1015.

B. Aggregate Base Course: ODOT Item 304.
   1. 98% of the material's maximum dry density as determined by the modified Proctor Test (AASHTOT-180 or ASTM D-1557)

C. Tack Coat: ODOT Item 407.
   1. Use one of following types: 702.04 RS-1, SS-1, SS-1h, CRS-1, CSS-1, or CSS-1h; or 702.13

D. Intermediate Asphalt Surface: ODOT Item 403/448, Type 1, medium duty.

E. Asphaltic Concrete Surface Course: ODOT Item 404/448, Type 1, medium duty.

2.2 ASPHALT MAINTENANCE MATERIALS

A. Sealcoat: ASTM D244; ASTM D 2939
   1. Asphalt Emulsion Pavement Sealer with mineral/sand filler, polymer additive, water.

B. Spot Primer: Oil spot primer formulated to ensure adhesion of pavement sealer to oil, gas, grease, and chemical stained areas on asphalt pavement.

C. Crack Seal: ODOT Item 423.
   1. Type II; mixture of PG 64-22 certified binder and polyester fibers; hot applied type. Modified, single component, rubber/asphalt joint and crack sealant. Formulated for sealing asphalt cracks.

PART 3 EXECUTION

3.1 EXAMINATION

A. General:
   1. Install Work in accordance with ODOT and City of Eaton standards, including all base and preparation.
   2. Scheduling: Schedule and manage work to minimize cold joints in the paving system. Coordinate requirements with Owner prior to mobilizing on the job.
   3. Clean all existing surfaces and remove any foreign debris.
   4. Ensure positive drainage to storm drains/ catch basins throughout. Provide leveling course as required to attain proper drainage [confirm conditions with Owner prior to proceeding].

B. Mechanically sweep, blow, or scrub pavement surfaces immediately prior to commencement of Work. Clean pavement surfaces of all loose foreign matter. Verify surfaces are dry.

C. Protect existing improvements, adjacent finishes, overhanging trees, and plant life from heat damage by individual shielding and water spray.

D. Protect manhole covers and frames, catch basin covers and frames.

3.2 APPLICATION – GENERAL REQUIREMENTS

A. New Asphalt Paving
   1. Adjust sub-grade elevations to prep for new asphalt paving and to match adjacent elevations of parking lot where applicable.
   2. Install new compacted aggregate base course.
   3. Notify Owner of any subgrade deficiencies requiring undercut.
   4. NOTE: Contractor responsible to maintain positive drainage across entire lot. Contact Owner for additional directive as needed by existing conditions.
   5. Apply Tack Coat
   6. Machine install base course asphalt over primed area. Minimum thickness of finished, compacted pavement to be as specified and asphalt tonnage yield should be based on the specified compacted minimum thickness. Tickets will be collected at end of each day and final tonnage yield must be within 5% of expected fully compacted yield.
   7. Apply Tack Coat
   8. Machine install surface asphalt over primed area. Minimum thickness of finished, compacted pavement to be as specified and asphalt tonnage yield should be based on the specified compacted minimum thickness. Tickets will be collected at end of each day and final tonnage yield must be within 5% of expected fully compacted yield.
   9. Compact each layer using 3 ton or greater vibratory rollers.
   10. Seal all edges of paved area where matched to existing asphalt surfaces using non-tracking sealant.

3.3 ASPHALT MAINTENANCE REPAIRS

A. Crack Sealer
   1. All Longitudinal, transverse and block cracks are to be thoroughly cleaned using compressed air lance as necessary. Remove all vegetation and debris from cracks. Clean lot of all debris.
      a. Notify Owner in advance if size [width or depth] of crack exceeds the manufacturer's recommendations for crack seal. Request directive to proceed.
   2. Seal cracks per ASTM D3405/D6690

3. All fatigue crack areas are to be circled by filling perimeter of area. Do not fill interior of any fatigue (alligator) crack areas.

B. Sealcoat
1. Thoroughly clean pavement surface of all dirt and debris. Remove all vegetation overgrowing perimeter of parking lot.
2. Scrape and prime oil spots with latex oil primer.
3. Apply two coats of approved emulsion sealer meeting manufacturer's recommended application methods and all state and federal specifications.
4. Mix sealer according to manufacturer's recommendations, with 3-5 lbs. sand load and 2% polymer additive.
5. First coat to be applied using squeegee applicator at a rate of 0.12 gallons per square yard.
6. Second coat to be applied using a sprayer at a rate of 0.08 gallons per square yard.
7. Barricade freshly sealed area to direct traffic to stay off area for minimum of 24 hours after final coat has dried.

END OF SECTION

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SECTION 32 13 13 - CONCRETE PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete paving for: paving, curbs, and sidewalks

1.2 SUBMITTALS

A. Product Data:
   1. Submit product information for concrete, cement, and aggregate materials.
   2. Submit mix design with laboratory test results supporting design.

1.3 QUALITY ASSURANCE

A. Perform Work according to State of Ohio, ODOT standards as applicable.
   1. State of Ohio Department of Transportation Construction and Materials Specifications Guide shall be used as a reference for all applicable materials, construction conditions, operations, and finished products, etc.
   2. Perform Work in accordance with ACI 330.

PART 2 PRODUCTS

2.1 MATERIALS

A. Subgrade: ODOT Item 204.
   1. Compact the subgrade materials that have a maximum dry density of 100 to 105 pounds per cubic foot to not less than 102 percent of maximum dry density. Compact all other subgrade materials to not less than 100 percent of maximum dry density. Determine the maximum dry density using AASHTO T99, AASHTOT T272, or test section method in Supplement 1015.

B. Aggregate Base Course: ODOT Item 304 [304.01 and 304.02].
   1. 98% of the material's maximum dry density as determined by the modified Proctor Test (AASHTOT-180 or ASTM D-1557)

C. Concrete: ODOT Item 452 Nonreinforced Portland cement concrete pavement

D. Concrete: ODOT Item 499.
   1. Class QC 1, 4,000 PSI design strength at 28 days; 2,000 Coulombs maximum Permeability; Cement Content minimum 520 lb.; well –graded aggregate
   2. Maximum slump 4 inches.
   3. Air Content: 6% +/- 2%; ASTM C260

E. Cement: ASTM C150 Normal Type I Portland type, gray color.

F. Fine and Coarse Aggregates: ASTM C33, Class 4S.

G. Water: ASTM C94, potable, Clean, not detrimental to concrete without deleterious amounts of chloride ions.

2.2 REINFORCEMENT MATERIALS

A. Reinforcement:
   1. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade, deformed billet bars, uncoated finish.
   2. Welded Deformed Wire Fabric: ASTM A497/A497M; in flat sheets; unfinished.
   3. Dowels: ASTM A615/A615M; 60 ksi yield strength, plain steel bars; cut to length indicated on Drawings, square ends with burrs removed; unfinished.

2.3 ACCESSORIES

A. Forms: Wood or steel material, profiled to suit conditions; conform to ACI 301.

B. Joint Filler: ASTM D1751; Asphalt impregnated wood fiberboard.

C. Reinforcement Mesh: 6x6-W1.4xW1.4 welded wire reinforcement

D. Liquid Surface Sealer: Penetrating Silane/Siloxane Sealer; clear, non-yellowing UV resistant; vapor permeable.

E. Curing Compound: ASTM C309, white pigmented water based liquid membrane.

F. Use accelerating admixtures in cold weather only when approved by the Architect/Engineer in writing. Use of admixtures will not relax cold weather placement requirements.

G. Use set retarding admixtures during hot weather only when approved by the Architect/Engineer in writing.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify gradients and elevations of base.

B. Verify compacted base is ready to support paving and imposed loads.

C. Moisten substrate to minimize absorption of water from fresh concrete.

D. Sawcut and remove existing concrete to allow installation of new concrete as indicated.

3.2 FORMING

A. Place and secure forms to correct location, dimension, and profile. Secure forms to allow the placement of concrete to be continuous and true.

B. Place joint filler in joints, vertical in position, in straight lines. Secure to formwork.

C. Place control joints at maximum 30 foot intervals. Align joints.

D. Place joint filler between paving components and other appurtenances.

E. Chamfer outside corners and edges of permanently exposed concrete. – ¾” chamfer

3.3 PLACING CONCRETE - GENERAL

A. Place concrete in accordance with ACI 330.

B. Place reinforcement to achieve pavement and concrete alignment as appropriate.

C. Check with electronic level that the correct slopes have been achieved to provide drainage.

D. Do not disturb reinforcement or formwork components during concrete placement.

E. Place concrete continuously between predetermined joints.

F. Apply surface sealer per manufacturer’s instructions.

3.4 INSTALLATION

A. Finishing:
   1. Apply surface retarder where exposed aggregate finish is required.
   2. Area Paving: Light broom.
   3. Sidewalk Surfaces: Light broom, radiused and trowel joint edges.
   4. Curbs and Gutters: Light broom.
   5. Apply curing compound on exposed concrete surfaces immediately after finishing.

END OF SECTION

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SECTION 32 92 19 – SEEDING / SITE REPAIR

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Seeding and Site Repairs related to the site development.

1.2 DEFINITIONS

A. Weeds: Vegetative species other than specified species to be established in given area.

1.3 SUBMITTALS

A. Product Data: Topsoil, Seed mix, fertilizer, mulch, and other accessories.

1.4 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2 PRODUCTS

2.1 SEED MIXTURE

A. Seed Mixture: Green Velvet's Finest mixture, fescue or bluegrass to match existing and for soils conditions, sun/shade, etc. ODOT Item 659.

B. Commercial Fertilizer for seed: Commercial-grade complete fertilizer, consisting of 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.

C. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium; 5 percent nitrogen; 10 percent phosphorous; and 5 percent potassium; by weight.

D. Straw Mulch: Clean, mildew- and seed-free salt hay or threshed straw.

2.2 SOIL AND SOIL MODIFICATION MATERIALS

A. Topsoil: ASTM D 5268, Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, free of subsoil, clay or impurities, plants, weeds and roots, free of stones 1 inch or larger. Equal to ODOT Item 653.

B. Fertilizer: Fifty percent of elements derived from organic sources,

C. Lime: ASTM C602, Class T agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.

D. Organic Compost: leaf and mushroom compost to be added to mulch at 1 cubic yard per 5 cubic yards of mulch.

E. Weed-Control Additive: Preen weed control.

2.3 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are **not** acceptable.

2.4 SOURCE QUALITY CONTROL

A. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

B. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.

C. Testing is not required when recent tests and certificates are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify prepared soil base is ready to receive Work of this Section.

3.2 PLACING TOPSOIL

A. Spread topsoil to minimum depth of 6 inches. Rake smooth.

B. Grade topsoil to eliminate rough, low or soft areas. Slope for positive drainage.

C. Place topsoil into pits and beds intended for plant root balls to minimum thickness of 6 inches.

D. At affected areas of the site, strip existing topsoil and stockpile for reuse. Spread as required to meet new grades.

E. Provide additional fill as required to complete the work. Additional fill material shall be free of organic matter, rubbish, debris, and rocks greater than 4” diameter.

3.3 SEEDING

A. Apply seed at a rate of 10 lb per 1000 sq ft, evenly in two intersecting directions.

B. Immediately following seeding, apply agricultural mulch to a thickness of 1/8 inches.

C. Apply water with fine spray immediately after each area has been mulched.

3.4 SEED PROTECTION

A. Identify seeded areas with stakes and string around area periphery.

3.5 MAINTENANCE

A. Water to prevent grass and soil from drying out. Maintain until vigorously growing.

B. Control growth of weeds. Apply herbicides. Remedy damage resulting from improper use of herbicides.

C. Immediately reseed areas showing bare spots.

D. Repair washouts or gullies.

3.6 SCHEDULE OF SITE REPAIR

A. Backfill areas impacted by work with topsoil.

B. Re-seed area impacted by work.

C. Apply mulch/straw.

D. Water and maintain seed until vigorously growing.

END OF SECTION